ISO 9001:2015 AICTE-CII: GOLD Category Institute NAAC-'A' Grade Institute (CGPA: 3.21) NIRF-2022 Rank Band : 201-250

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE
Opp : Yerragattu Gutta, Hasanparthy (Mandal), WARANGAL - 506 015, TELANGANA, INDIA
काकतीय प्रौद्योगिकी एवं विज्ञान संस्थान, वरंगल - ५०६०१५, तेलंगाना, भारत
కాకతీయ సాంకేతిక విజ్ఞాన శాస్త్ర విద్యాలయం, వరంగల్ - ౫౦౬ ౦౧౫ తెలంగాణ, భారతదేశము
(An Autonomous Institute under Kakatiya University, Warangal)
(Approved by AICTE, New Delhi; Recognised by UGC under 2(f) & 12(B); Sponsored by EKASILA EDUCATION SOCIETY)

Estd: 1980 KITSW

website: www.kitsw.ac.in | E-mail: principal@kitsw.ac.in | : +91 9392055211, +91 7382564888

• B.Tech. •

COMPUTER SCIENCE AND ENGINEERING
(Artificial Intelligence & Machine Learning) CSM

Rules & Regulations for undergraduate Programme
B.Tech. 4-Year Degree Programme (URR-18R22)

(Applicable from the Academic Year 2022-23)

SYLLABI (I to VIII SEMESTERS)

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE
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VISION OF THE INSTITUTE

- *To make our students technologically superior and ethically strong by providing quality education with the help of our dedicated faculty and staff and thus improve the quality of human life*

MISSION OF THE INSTITUTE

- *To provide latest technical knowledge, analytical and practical skills, managerial competence and interactive abilities to students, so that their employability is enhanced*
- *To provide a strong human resource base for catering to the changing needs of the Industry and Commerce*
- *To inculcate a sense of brotherhood and national integrity*

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERIG (AI&ML)

VISION OF THE DEPARTMENT

- *? Attaining centre of excellence status in various fields of Computer Science and Engineering by offering worthful education, training and research to improve quality of software services for ever growing needs of the industry and society.*

MISSION OF THE DEPARTMENT

- *Practice qualitative approach and standards to provide students better understanding and profound knowledge in the fundamentals and concepts of computer science with its allied disciplines*
- *Motivate students in continuous learning to enhance their technical, communicational, and managerial skills to make them competent and cope with the latest trends, technologies, and improvements in computer science to have a successful career with professional ethics.*
- *Involve students in analyze, design and experimenting with contemporary research problems in computer science to impact socio-economic, political and environmental aspects of the globe.*

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)	
UG - COMPUTER SCIENCE &ENGINEERING (NETWORKS) -AI & ML	
PROGRAM EDUCATIONAL OBJECTIVES (PEOs)	***Within first few years after graduation, the COMPUTER SCIENCE AND ENGINEERING (NETWORKS)*** *graduates will be able to …*
PEO1: ***Technical Expertise***	*Apply the fundamental knowledge of the core courses of computer science, Artificial Intelligence and Machine Learning for developing the effective and transformational software solutions.*
PEO2: ***Successful Career***	*Excel in profession, higher education and entrepreneurship with updated technologies in software, artificial intelligence and data science based domains.*
PEO3: ***Soft Skills and Life Long Learning***	*Exhibit professional ethics, effective communication and team work in solving contemporary knowledge engineering problems and to excel in social innovations.*

PROGRAM OUTCOMES (POs) & PROGRAM SPECIFIC OUTCOMES (PSOs)	
UG - COMPUTER SCIENCE & ENGINEERING (NETWORKS)- AI & ML	
PROGRAM OUTCOMES (POs)	***At the time of graduation, the COMPUTER SCIENCE AND ENGINEERING (NETWORKS)*** *graduates will be able to …*
PO1: ***Engineering knowledge***	*apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems*
PO2: ***Problem analysis***	*identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences*
PO3: ***Design development of solutions***	*design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental Considerations*
PO4: ***Conduct investigations of complex problems***	*use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions*
PO5: ***Modern tool usage***	*create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations*

PO6: ***The engineer and society***	*apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice*
PO7: ***Environment and sustainability***	*understand the impact of the professional engineering solutions in societal and environmental contexts, demonstrate the knowledge of, and need for sustainable development*
PO8: ***Ethics***	*apply ethical principles and commit to professional ethics, responsibilities, and norms of the engineering practice*
PO9: ***Individual and team work***	*function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings*
PO10: ***Communication***	*communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions*
PO11 ***Project management and finance***	*demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments*
PO12: ***Life-long learning***	*recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change*

PROGRAM SPECIFIC OUTCOMES (PSOs):	
PSO1: Software Development and Quality assurance	*Apply the fundamentals of computer science and engineering knowledge in developing the effective computing solutions for real world complex engineering problems.*
PSO2: Maintenance	*Design and configure solutions for various artificial intelligence systems and cognitive applications using contemporary hardware and software tools.*
PSO3: Immediate professional practice	*Develop effective machine learning applications to improve efficiency of existing data processing applications by continuous adaptation of flourishing updates.*

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (NETWORKS)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)
SCHEME OF INSTRUCTION & EVALUATION

URR-18R22

I-SEMESTER OF 4-YEAR B. TECH DEGREE PROGRAM

[5Th+2P+3MC]

Sl. No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	BSC	U18MH101	Engineering Mathematics – I	3	1	-	4	10	30	40	60	100
2	ESC	U18CS102	Programming for Problem Solving using C	3	-	-	3	10	30	40	60	100
3	BSC	U18CH103	Engineering Chemistry	3	1	-	4	10	30	40	60	100
4	ESC	U18ME104	Engineering Drawing	2	-	4	4	10	30	40	60	100
5	ESC	U18CE105	Engineering Mechanics	3	1	-	4	10	30	40	60	100
6	ESC	U18CS107	Programming for Problem Solving using C Laboratory	-	-	2	1	40	-	40	60	100
7	BSC	U18CH108	Engineering Chemistry Laboratory	-	-	2	1	40	-	40	60	100
8	MC	U18CH109	Environmental Studies	2	-	-	-	10	30	40	60	100
9	MC	U18EA110	EAA *: Sports/Yoga/NSS	-	-	2	-	100	-	100	-	100
10	MC	U18EA111	Universal Human Value-I (*Induction Programme*)	-	-	-	-	-	-	-	-	-
			Total:	16	3	10	21	240	180	420	480	900

[L= Lecture, T = Tutorials, P = Practicals & C = Credits] EAA: Extra Academic Activity * indicates mandatory non-credit course

Total Contact Periods/Week: 29 **Total Credits: 21**

Stream-I: ME, CSE, IT, CSN,CSE(IOT) **Stream-II: CE, EIE, EEE, ECE, ECI,CSE(AI&ML)**

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (NETWORKS)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)

URR-18R22

SCHEME OF INSTRUCTION & EVALUATION
II-SEMESTER OF 4-YEAR B. TECH DEGREE PROGRAM

[5Th+4P+1MC]

Sl. No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	BSC	U18MH201	Engineering Mathematics – II	3	1	-	4	10	30	40	60	100
2	ESC	U18CS202R1	Data Structures through C	3	-	-	3	10	30	40	60	100
3	BSC	U18PH203	Engineering Physics	3	1	-	4	10	30	40	60	100
4	HSMC	U18MH204	English for Communication	2	-	2	3	10	30	40	60	100
5	ESC	U18EE205	Basic Electrical Engineering	3	1	_	4	10	30	40	60	100
6	ESC	U18EE206	Basic Electrical Engineering Laboratory	-	-	2	1	40	-	40	60	100
7	ESC	U18CS207R1	Data Structures through C Laboratory	-	-	2	1	40	-	40	60	100
8	BSC	U18PH208	Engineering Physics Laboratory	_	_	2	1	40	-	40	60	100
9	ESC	U18ME209	Workshop Practice	-	_	2	1	40	-	40	60	100
10	MC	U18EA210	EAA: Sports/Yoga/NSS*	-	-	2	-	100	-	100	-	100
Total:				14	3	12	22	310	150	460	540	1000

[L= Lecture, T = Tutorials, P = Practicals & C = Credits] EAA: Extra Academic Activity * indicates mandatory non-credit course

Total Contact Periods/Week: 29
Total Credits: 22
Stream-I: ME, CSE, IT, CSN,CSE(IOT)
Stream-II: CE, EIE, EEE, ECE, ECI,CSE(AI&ML)

Internships: All students should plan for mandatory 6-8 weeks internship, from end of II semester to commencement of VII semester at industry/R&D organizations/industries of national importance (IITs/IIITs/NITs). As part of Internship Evaluation in VII Semester, students are expected to submit a well-documented internship report and give an informative ppt presentation in VII semester.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING(NETWORKS)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 15
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URR-18R22

SCHEME OF INSTRUCTION & EVALUATION
III-SEMESTER OF 4-YEAR B. TECH DEGREE PROGRAM

[7Th+2P]

S.No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	BSC	U18MH301	Engineering Mathematics – III	3	1	-	4	10	30	40	60	100
2	HSMC	U18MH302	Soft and Inter personal Skills	_	_	2	1	100	-	100	-	100
3	PCC	U18AI303	Object Oriented Programming through JAVA	3	1	-	4	10	30	40	60	100
4	PCC	U18AI304	Operating Systems	3	-	-	3	10	30	40	60	100
5	PCC	U18AI305	Computer Organization and Architecture	3	-	-	3	10	30	40	60	100
6	PCC	U18AI306R22	Advanced Data Structures	3	-	-	3	10	30	40	60	100
7	PCC	U18AI307	Formal Languages and Automata Theory	3	-	-	3	10	30	40	60	100
8	PCC	U18AI310	Object Oriented Programming through Java Laboratory	-	-	2	1	40	-	40	60	100
9	PCC	U18AI311R22	Advanced Data Structures Laboratory	_	_	2	1	40	-	40	60	100
			Total:	18	2	6	23	240	180	420	480	900

[L= Lecture, T = Tutorials, P = Practicals & C = Credits] Total Contact Periods/Week : 26Total Credits: 23

Stream-I: ME, CSE, IT, CSN,CSE(IOT) Stream-II: CE, EIE, EEE, ECE, ECI,CSE(AI&ML)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING(NETWORKS)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL – 15
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URR-18R22

SCHEME OF INSTRUCTION & EVALUATION
IV-SEMESTER OF 4-YEAR B. TECH DEGREE PROGRAM

[6Th+3P+2MC]

Sl. No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	OE	U18OE401	Open Elective-II	3	1	-	4	10	30	40	60	100
2	HSMC	U18TP402	Professional English	-	-	2	1	100	-	100	-	100
3	OE	U18OE403	Open Elective-I	3	-	-	3	10	30	40	60	100
4	PCC	U18AI404	Artificial Intelligence	3	-	-	3	10	30	40	60	100
5	PCC	U18AI405	Database Management Systems	3	1	-	4	10	30	40	60	100
6	PCC	U18AI406	Python Programming	3	-	-	3	10	30	40	60	100
7	PCC	U18AI407	Database Management Systems Laboratory	-	-	2	1	40	-	40	60	100
8	PCC	U18AI408	Python Programming Laboratory	-	-	2	1	40	-	40	60	100
9	OE	U18OE411	Open Elective-I based Laboratory	_	_	2	1	40	-	40	60	100
10	MC	U18MH415	Essence of Indian Traditional Knowledge	2	-	-	-	10	30	40	60	100
			Total:	17	2	8	21	280	180	460	540	1000
11	MC	U18CH416	Environmental Studies*	2	_	_	_	10	30	40	60	100

[L= Lecture, T = Tutorials, P = Practicals & C = Credits] **Total Contact Periods/Week: 27** **Total Credits: 21**

Open Elective-I: U18OE403A: Object Oriented Programming (CSE) U18OE403B: Fluid Mechanics & Hydraulic Machines(CE) U18OE403C: Mechatronics (ME) U18OE403D: Web Programming (IT) U18OE403E: Microprocessors (ECE) U18OE403F: Strength of Materials (ME)	Open Elective-II: U18OE401A: Applicable Mathematics (MH) U18OE401B: Basic Electronics Engineering (ECE) U18OE401C: Elements of Mechanical Engineering (ME) U18OE401D: Measurements & Instrumentation (EIE) U18OE401E: Fundamentals of Computer Networks (CSE) U18OE401F: Renewable Energy Sources (EEE) U18OE401G: Essential Mathematics and Statistics for Machine Learning (MH)	Open Elective-I based Lab: U18OE411A: Object Oriented Programming Laboratory (CSE) U18OE411B: Fluid Mechanics & Hydraulic Machines Laboratory (CE) U18OE411C: Mechatronics Laboratory (ME) U18OE411D: Web Programming Laboratory (IT) U18OE411E: Microprocessors Laboratory (ECE) U18OE411F: Strength of Materials Laboratory (CE)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING(NETWORKS)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL – 15
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URR-18R22

SCHEME OF INSTRUCTION & EVALUATION
V-SEMESTER OF 4-YEAR B. TECH DEGREE PROGRAM

[6Th+3P+Seminar]

Sl. No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	MC	U18MH501	Universal Human Values –II	2	-	-	-	10	30	40	60	100
2	PE	U18AI502	Professional Elective - I / MOOC-I	3	-	-	3	10	30	40	60	100
3	PCC	U18AI503	Internet of Things	3	-	-	3	10	30	40	60	100
4	PCC	U18AI504	Software Engineering	3	-	-	3	10	30	40	60	100
5	PCC	U18AI505	Compiler Design	3	-	-	3	10	30	40	60	100
6	PCC	U18AI506	Machine Learning	3	-	-	3	10	30	40	60	100
7	PCC	U18AI507	Advanced Java Programming Laboratory	-	-	2	1	40	-	40	60	100
8	PCC	U18AI508	Internet of Things Laboratory	-	-	2	1	40	-	40	60	100
9	PCC	U18AI509	Machine Learning Laboratory	-	-	2	1	40	-	40	60	100
10	PROJ	U18AI510	Seminar	-	-	2	1	100	-	100	-	100
Total:				17	1	8	19	280	180	460	540	1000
Additional Learning*: *Maximum credits allowed for Honours/Minor in Engineering*				-	-	-	*7*	-	-	-	-	-
Total credits for students opted for Honours/Minor:				-	-	-	***19+7***	-	-	-	-	-

** List of courses for additional learning through **MOOCs** towards Honours/Minor in Engineering shall be prescribed by the department under Honours/ Minor Curricula*

[L= Lecture, T = Tutorials, P = Practicals & C = Credits] Total Contact Periods/Week : 26Total Credits : 19

Professional Elective-I / MOOC-I:
U18AI502A: Computer Networks
U18AI502B: Advanced Database Management System
U18AI502C: Computer Graphics
U18AI502M: MOOCs course

MOOCs: Students are encouraged to do Massive Open Online Courses (MOOCs) on SWAYAM platform(https://www.swayam.gov.in) offered by NPTEL, CEC, IIM-B, IGNOU. Students shall contact the Head of the Department (HoD) to get their interested MOOCs approved by the HoD/Dean Academic Affairs for proper transfer of the credits for the MOOCs.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING(NETWORKS)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL – 15
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URR-18R22

SCHEME OF INSTRUCTION & EVALUATION

VI-SEMESTER OF 4-YEAR B. TECH DEGREE PROGRAM

[6Th+3P+Miniproject]

Sl. No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	HSMC	U18TP601	Quantitative Aptitude & Logical Reasoning	2	-	-	1	10	30	40	60	100
2	HSMC	U18MH602	Management, Economics and Accountancy	3	-	-	3	10	30	40	60	100
3	PE	U18AI603	Professional Elective - II / MOOC-II	3	-	-	3	10	30	40	60	100
4	PCC	U18AI604	Design and Analysis of Algorithms	3	-	-	3	10	30	40	60	100
5	PCC	U18AI605	Deep Learning	3	-	-	3	10	30	40	60	100
6	PCC	U18AI606	Computer Vision and Image Processing	3	1	-	4	10	30	40	60	100
7	PCC	U18AI607	Design and Analysis of Algorithms Laboratory	-	-	2	1	40	-	40	60	100
8	PCC	U18AI608	Deep Learning Laboratory	-	-	2	1	40	-	40	60	100
9	PCC	U18AI609	Computer Vision and Image Processing Laboratory	-	-	2	1	40	-	40	60	100
10	PROJ	U18AI610	Mini Project	-	-	2	1	100	-	100	-	100
Total:				17	-	8	21	280	180	460	540	1000
Additional Learning*: *Maximum credits allowed forHonours/Minor in Engineering*				-	-	-	*7*	-	-	-	-	-
Total credits for *students opted for* ***Honours/Minor students:***				-	-	-	*21+7*	-	-	-	-	-

** List of courses for additional learning through **MOOCs** towards Honours/Minor in Engineering shall be prescribed by the department under Honours/ Minor Curricula*

[L= Lecture, T = Tutorials, P = Practicals & C = Credits] **Total Contact Periods/Week: 26** **Total Credits: 21**

Professional Elective-II / MOOC-II:
U18AI603A: Natural Language Processing
U18AI603B: Information Retrieval Systems
U18AI603C: Soft Computing
U18AI603M: MOOCs Course

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING(NETWORKS)
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URR-18R22

SCHEME OF INSTRUCTION & EVALUATION
VII-SEMESTER OF 4-YEAR B. TECH DEGREE PROGRAM

[4Th+2P+1MC+1MP-I]

Sl. No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	OE	U18OE701	Open Elective – III	3	_	_	3	10	30	40	60	100
2	PE	U18AI702	Professional Elective - III / MOOC-III	3	-	-	3	10	30	40	60	100
3	PE	U18AI703	Professional Elective - IV / MOOC-IV	3	-	-	3	10	30	40	60	100
4	PCC	U18AI704	Cloud Computing	3	-	-	3	10	30	40	60	100
5	PCC	U18AI705	Cloud Computing Laboratory	-	-	2	1	40	-	40	60	100
6	PCC	U18AI706	Natural Language Processing Laboratory	-	-	2	1	40	-	40	60	100
7	PROJ	U18AI707	Major Project - Phase – I	-	-	6	3	100	-	100	-	100
8	MC	U18AI708	Internship Evaluation	-	-	2	-	-	-	-	-	-
Total:				12	_	12	17	220	120	340	360	700
Additional Learning: Maximum credits allowed forHonours/Minor in Engineering*				-	-	-	*7*	-	-	-	-	-
Total credits for students opted for Honours/Minor students:				**-**	**-**	**-**	***17*+7**	**-**	**-**	**-**	**-**	**-**

** List of courses for additional learning through **MOOCs** towards Honours/Minor in Engineering shall be prescribed by the department under Honours/ Minor Curricula*

[L= Lecture, T = Tutorials, P = Practicals & C = Credits] Total Contact Periods/Week: 24Total Credits: 17

Open Elective-III:	Professional Elective-III / MOOC-III:	Professional Elective-IV / MOOC-IV:
U18OE602A: Disaster Management U18OE602B: Project Management U18OE602C: Professional Ethics in Engineering U18OE602D: Rural Technology and Community Development	U18AI702A: Reinforcement Learning U18AI702B: Big Data Analytics U18AI702C: Social and Information Network Analysis U18AI702M: MOOCs course	U18AI703A:Robotics U18AI703B: Cognitive Computing Systems U18AI703C: Cryptography and Network Security U18AI703M: MOOCs course

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING(NETWORKS)
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SCHEME OF INSTRUCTION & EVALUATION
VIII-SEMESTER OF 4-YEAR B. TECH DEGREE PROGRAM

[3Th+1MP-II]

Sl. No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	PE	U18AI801	Professional Elective - V / MOOC-V	3	-	-	3	10	30	40	60	100
2	PE	U18AI802	Professional Elective - VI / MOOC-VI	3	-	-	3	10	30	40	60	100
3	OE	U18OE803	Open Elective - IV / MOOC-VII	3	-	-	3	10	30	40	60	100
4	PROJ	U18AI804	Major Project - Phase – II	-	-	14	7	60	-	60	40	100
			Total	9	-	14	16	90	90	180	220	400
Additional Learning: Maximum credits allowed forHonours/Minor in Engineering*				-	-	-	*7*	-	-	-	-	-
Total credits for students opted for Honours/Minor students:				**-**	**-**	**-**	***16+7***	**-**	**-**	**-**	**-**	**-**

** List of courses for additional learning through **MOOCs** towards Honours/Minor in Engineering shall be prescribed by the department under Honours/ Minor Curricula*

[L= Lecture, T = Tutorials, P = Practicals & C = Credits] **Total Contact Periods/Week: 23** **Total Credits: 16**

Professional Elective-V / MOOC-V:	Professional Elective-VI/ MOOC-VI:	Open Elective-IV/MOOC-VII:
U18AI801A: Ethical Hacking U18AI801B: Virtual Reality Technologies U18AI801C: Robotic Process Automation U18AI801M: MOOCs course	U18AI802A: Data Visualization U18AI802B:Fog and Edge Computing U18AI802C: Block Chain Technologies U18AI802M: MOOCs course	U18OE803A: Operations Research U18OE803B: Management Information Systems U18OE803C: Entrepreneurship Development U18OE803D: Forex &Foreign Trade U18OE803M: MOOCs Course

ISO 9001:2015 AICTE-CII: GOLD Category Institute NAAC-'A' Grade Institute (CGPA: 3.21) NIRF-2020 Rank Band: 201-250

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE
Opp : Yerragattu Gutta, Hasanparthy (Mandal), WARANGAL - 506 015, Telangana, INDIA.
काकतीय प्रैद्योगिकी एवं विज्ञान संस्थान, वरंगल - ५०६ ०१५ तेलंगाना, भारत
కాకతీయ సాంకేతిక విజ్ఞాన శాస్త్ర విద్యాలయం, వరంగల్ - ౫౦౬ ౦౧౫ తెలంగాణ, భారతదేశము
Estd-1980 KITSW
(An Autonomous Institute under Kakatiya University, Warangal)
(Approved by AICTE, New Delhi; Recognised by UGC under 2(f) & 12(B); Sponsored by EKASILA EDUCATION SOCIETY)
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RULES AND REGULATIONS FOR UNDERGRADUATE PROGRAMME
B.TECH 4-YEAR DEGREE PROGRAMME (URR-18)
CHOICE BASED CREDIT SYSTEM (CBCS)
(Applicable from the academic year 2018-19)

1. INTRODUCTION

1.1 Kakatiya Institute of Technology & Science, Warangal (KITSW) is a UGC autonomous institute under Kakatiya University (KU) Warangal. The institute offers 4 year (8 semesters) Bachelor of Technology (B.Tech) degree programme, under Choice Based Credit System (CBCS) with effect from the academic year (A.Y) 2018-19.

1.2 The provisions contained in these regulations given the conditions for imparting course of instructions, conducting examinations and evaluation of students' performance leading to B.Tech. 4-year degree programme to be offered by the Kakatiya Institute of Technology & Science, Warangal and awarded by Kakatiya University, Warangal.

1.3 These regulations shall be called the ***Kakatiya Institute of Technology & Science, Warangal (KITSW) regulations for the award of B.Tech 4-year degree programme*** *by Kakatiya University, Warangal.*

1.4 They shall come into effect from the date of getting approval from the Academic Council of the Kakatiya Institute of Technology & Science, Warangal

1.5 They shall be applicable for all students enrolling for B.Tech 4-year degree programme at the Kakatiya Institute of Technology & Science, Warangal from the academic year 2018-19.

2. DEFINITIONS

2.1 ***"B.Tech."*** means Bachelor of Technology, an Under Graduate Degree awarded from the Kakatiya University, Warangal

2.2 ***"University"*** means Kakatiya University, Warangal

2.3 ***"Institute"*** means Kakatiya Institute of Technology & Science, Warangal

2.4 ***"UGC"*** means University Grants Commission, New Delhi

2.5 ***"AICTE"*** means All India Council for Technical Education, New Delhi

2.6 ***"MHRD"*** means Ministry of Human Resource & Development, Govt. of India, New Delhi

2.7 ***"TSCHE"*** means Telangana State Council for Higher Education, Govt. of Telangana, Hyderabad

2.8 ***"GB"*** means Governing Body of the Institute

2.9 ***"AC"*** means Administrative Committee of the Institute

2.10 ***"FC"*** means Finance Committee of the Institute

2.11 ***"Academic Council"*** means Academic Council of the Institute

2.12 ***"Principal"*** means Principal of the Institute

2.13 ***"Dean"*** means Dean of specific affairs of the Institute

2.14 ***"HoD"*** means Head of the Department of specific programme offered by the Institute

2.15 ***"BoS"*** means Board of Studies in the engineering of a specific programme offered by the Institute

2.16 ***"CoE"*** means Controller of Examinations of the Institute.

3. UNDER GRADUATE PROGRAMMES

3.1 The Institute shall offer the following Under Graduate Programmes under CBCS:

1. B.Tech Civil Engineering (CE)
2. B.Tech Mechanical Engineering (ME)
3. B.Tech Electronics & Instrumentation Engineering (EIE)
4. B.Tech Electrical & Electronics Engineering (EEE)
5. B.Tech Computer Science & Engineering (CSE)

6. B.Tech Information Technology (IT)
7. B.Tech Electronics & Communication Engineering (ECE)
8. B.Tech Computer Science & Engineering (Networks) (CSN)
9. B.Tech Electronics Communication & Instrumentation Engineering (ECI)
10. B.Tech Computer Science & Engineering (Artificial Intelligence & Machine Learning)
11. B.Tech Computer Science & Engineering (IoT)
12. B.Tech Computer Science & Engineering (Data Science)

3.2 The provisions of these regulations shall also be applicable to any new undergraduate programmes that are introduced from time to time with approval from appropriate bodies such as MHRD / AICTE / UGC, etc.

4. ADMISSION

4.1 a) Candidates seeking admission to 1st year of the Four Year B.Tech. degree programme shall have passed the Intermediate Examination of the Board of Intermediate Education, Telangana with Mathematics and Physical Sciences (Physics and Chemistry) as optional subjects or any other examination recognized by the University as equivalent to it.

b) **Lateral Entry:** Candidates seeking admission directly into 2nd year of 4-year B.Tech. degree programme as **"Lateral Entry"** student shall have passed 3 year full time Diploma (after 10th Std) offered by State Board of Technical Education and Training, Telangana or any other examination recognized by the University as its equivalent.

4.2 The Admissions shall be made in accordance with the guidelines issued by TSCHE.

4.3 **Change of Branch:** There is a provision for change of branch in B.Tech. III semester level only in accordance with guidelines provided by Commissioner of Technical Education, Govt. of Telangana State. Branch change shall be strictly according to the merit list prepared by the Institute from the regular students on the basis of total marks obtained by the student in I and II semester examinations put together. Only those students who have passed in all the subjects in single attempt shall be eligible to apply for change in branch, provided there is a clear vacancy in a particular branch limited to prescribed / approved intake by AICTE in the previous academic session when the students were admitted at I semester level.

Vacancy in a particular branch

= Approved intake – (No. of regular students + No. of repeaters)

5. ACADEMIC SESSION

5.1 Each academic session is divided into two semesters (odd and even), each of 16 weeks including two Mid Semester Examinations (MSE).

a) **Odd Semester**: From June/July to October/November of academic year. However, academic session of the first semester will be decided based on counseling schedule declared by the TSCHE.

b) **Even Semester**: From November/December to March/April of academic year.

5.2 The Institute shall announce the schedule for all the academic activities well before the commencement of the academic year and take all the necessary steps to follow them scrupulously.

5.3 The academic activities in a semester normally include registration, course work, Continuous Internal Evaluation (CIE), End Semester Examination (ESE) and declaration of results.

6. REGISTRATION

6.1 All the students are required to register in person at the beginning of each academic year on the dates specified in the academic calendar (almanac).

6.2 The sole responsibility for registration rests with the student concerned.

6.3 Registration of students will be centrally organized by the Academic section.

6.4 The Registration procedure involves:

a) Filling of the prescribed registration form

b) Payment of fees and clearance of outstanding dues (if any)

c) Signing undertakings (undertaking for regular attendance, discipline and against ragging) along with the parents

6.5 If for any compelling reasons like illness, etc., a student is unable to register on the announced day of registration, he/she can register within 12 working days from the beginning of the academic year on payment of an additional late fee as prescribed by the Institute.

6.6 **No late registration shall be permitted after 12th working day** from the scheduled date of commencement of class work for that academic year.

6.7 Only those students will be permitted to register who have

a) cleared all institute and hostel dues of previous semesters
b) paid all required prescribed fees for the current academic year
c) not been debarred / detained from registering for a specified period on disciplinary or any other grounds
d) cleared the minimum academic requirement as detailed in Regulation No. 15

7. CURRICULUM

7.1 The Model curriculum/ Course structure as suggested by AICTE, New Delhi; CBCS and Credit Based Semester System (CBSS) as denoted by UGC, New Delhi is followed for all UG programmes.

7.2 a) The duration of the programme leading to B.Tech degree will be 8 semesters (4 academic years)
b) However, for the lateral entry students, the duration of the program leading to B.Tech degree will be 6 semesters (3 academic years)

7.3 The curricula for different degree programmes as proposed by the department and recommended by the BoS shall have the approval of the Academic Council.

7.4 As suggested by AICTE, the courses offered for UG programme are broadly classified as: Basic Science Courses (BSC), Engineering Science Courses (ESC), Humanities and Social Sciences including Management Courses (HSMC), Professional Core Courses (PCC), Professional Elective (PE) courses, Open Elective (OE) courses, Mandatory Courses (MC) and Project (PROJ) based courses

7.5 The courses offered would have a ***Lecture – Tutorial – Practical (L-T-P)*** component to indicate contact hours. Separate laboratory (practical) course may exist (0-0-P) in certain cases as decided.

7.6 The academic programmes of the Institute follow the credit system.

7.7 Each course shall have credits(C), which reflects its weightage. The number of credits of a course in a semester shall ordinarily be calculated as under:

$$\textit{Number of credits of a course, } C = L + T + (P/2)$$

where ***L, T, P*** represent the No. of Lecture, Tutorial and Practical hours / week

7.8 The students admitted for B.Tech. programme under Lateral Entry scheme have to be offered a mandatory course on "Environmental Studies" in the 4th semester of B.Tech. programme.

7.9 **Course Code:** Each course offered in the Undergraduate (B.Tech.) curriculum at this institute shall be listed by using a total of 8 digits, as follows:

Ex: **U18CE106**

a) The first letter, to represent the **U**nder Graduate Programme
Ex. U for Undergraduate Course
b) The next two numbers, to represent the year in which the syllabus is proposed / revised.
Ex. 18 for the year 2018 from which syllabus is applicable for the batches admitted from academic year 2018-19
c) The next two letters, to represent the concerned department offering that course.
Ex. CE for Civil Engineering
d) The last three numbers, to represent the course number and semester in which it is being offered.
Ex. XYZ; X - Semester number ; YZ – Course number
106 represents course number 06 offered in first semester

In general, a **course code** "**U18CE106**" represents an **Undergraduate Course number-06 for the batches admitted from the year 2018 offered by the Department of Civil Engineering in first semester.**

7.10 The syllabus of each course in the B.Tech. curriculum shall be divided into four (4) units.

8. ATTENDANCE

8.1 All the students are normally required to have 100% attendance in aggregate. However, condonation for shortage of attendance upto 25% may be granted by the principal based on recommendation of HoD concerned.

8.2 The condonation for shortage of attendance upto 25% (as mentioned in Regulation No. 8.1) shall be taken up only when the student takes prior permission for his absence stating fully the genuine reasons along with supporting documents to the HoD concerned.

8.3 Hence, students not having the mandatory requirement of minimum 75% of attendance in aggregate shall be detained and shall not be permitted to appear for the MSE-II & ESE of that semester.

8.4 All such students who are detained have to repeat the entire semester when it is offered, by following the due registration procedure.

8.5 Attendance of all courses shall be entered before the end of each working day by the faculty concerned through the College Management System (CMS) portal of the institute website. Students are advised to monitor the status of their attendance through this CMS portal.

9. CONDUCT AND DISCIPLINE

9.1 All students shall be required to conduct themselves in a manner befitting the reputation of the institution, within and outside the premises of the Institute; and are expected to complete their studies without any break.

9.2 As per the order of Hon'ble Supreme Court of India, ragging in any form is strictly banned. Involvement of a student in ragging will be considered as a gross indiscipline and may lead to his / her expulsion from the Institute.

9.3 Detailed rules regarding the conduct and discipline (code of conduct) are made available on Institute website.

10. EVALUATION PROCEDURE

10.1 The evaluation of students in every course of 4-year B.Tech. programme (8 semesters) and Lateral Entry students of B.Tech. programme (6 semesters), is a continuous process and is based on their performance in different examinations as mentioned below:

a) Sessional, involving **Continuous Internal Evaluation (CIE)** conducted all through the semester which includes **Teachers Assessment (TA)** through assignments and **Mid-Semester Examinations (MSE)**

b) Terminal, often designated as **End Semester Examination (ESE)** which includes written examination for theory courses and practical/ design/ drawing examination with built-in oral part for laboratory/ design / drawing courses.

10.2 A student's performance in a course (subject) shall be judged by taking into account the result of CIE and ESE together.

10.3 CIE and ESE shall have 40:60 weightage i.e. CIE carrying 40% weightage and ESE carrying 60% weightage.

10.4 **Continuous Internal Evaluation (CIE) for Theory Course**:

10.4.1 CIE throughout the semester shall consist of TA and MSE.

10.4.2 The distribution given to each component of CIE for a theory course is given below:

S. No.	Particulars	Weightage
1.	Teacher's Assessment (TA) (**Assignments**)	10%
2.	Mid Semester Examination (MSE**) (MSE-I & MSE-II**)	30%
	Total Weightage	**40%**

10.4.3 **TA**:

a) There shall be 2 Assignments and 2 Minor exams (Quiz/Slip test, etc.) for each course at regular intervals of time

b) Minor-I shall be based on Unit-I syllabus, Minor-II shall be based on Unit-III syllabus, Assignment-I shall be based on Unit-I & Unit-II syllabi and to be submitted before MSE-I, Assignment-II shall be based on Unit-III & Unit-IV syllabi and to be submitted before MSE-II.

c) Average of Assignment-I, Assignment-II, Minor-I and Minor-II marks shall be taken under TA

10.4.4 **MSE**:

a) There shall be two mid semester examinations (MSE-I and MSE-II) of two-hour duration each.

b) It is mandatory for the student to take both MSEs

c) MSE evaluation shall be done as given below:
MSE marks awarded = (70% of the best of MSE-I & MSE-II marks)
+ (30% of the other MSE marks)

Ex: A student secured following marks
MSE-I marks = 10 out of 30
MSE-II marks = 20 out of 30
The MSE marks awarded will be = (70% of 20) + (30% of 10) = 14 + 3 =17

10.4.5 The marks obtained by the students in MSE must be submitted to the Controller of Examination (CoE) by the teachers within 1 week from the date of conduct of the examination.

10.4.6 The dates for MSE and ESE will be declared by the CoE in consultation with the Dean, Academic Affairs.

10.5 **End Semester Examination (ESE) for Theory Course**:
There shall be an End Semester Examination (ESE) at the end of each semester for three hour duration for each course.

10.6 **Continuous Internal Evaluation (CIE) for Practical (Laboratory) Course:**

10.6.1 CIE for practical course shall carry 40% weightage.

10.6.2 CIE throughout the semester shall consist of the following:

Assessment	Weightage
Regular Experimentation / Job work and Viva-voce	20%
Regular submission of record	10%
Quiz / Skill test / Viva-voce at the end of semester	10%
Total Weightage	**40%**

10.7 **End Semester Examination (ESE) for Practical (Laboratory) Course:**

10.7.1 There shall be an ESE at the end of each semester for three hour duration for each practical course.

10.7.2 The ESE for practical course shall carry 60% weightage.

10.7.3 The marks distribution at ESE shall be as follows:

Assessment	Weightage
Procedure / Experimentation / Tabulation / Result, as applicable …	45%
Viva-voce	15%
Total Weightage	**60%**

10.8 **Continuous Internal Evaluation (CIE) for Seminar & Mini Project :**

10.8.1 **Seminar**:

d) The HoD shall constitute a *Department Seminar Evaluation Committee (DSEC)*

e) *DSEC* shall allot a faculty supervisor to each student for guiding on (i) selection of topic (ii) literature survey and work to be carried out (iii) preparing a report in proper format and (iv) effective seminar presentation

f) There shall be only continuous Internal Evaluation (CIE) for seminar

g) The CIE for seminar is as follows:

Assessment	Weightage
Seminar Supervisor Assessment	20%
Seminar Report	30%
Seminar Paper	20%
DSEC Assessment: *Oral presentation with PPT and viva-voce*	30%
Total Weightage:	**100%**

Note: It is mandatory for the candidate to appear for oral presentation and Viva-voce to qualify for course evaluation.

h) **Seminar Topic**: The topic should be interesting and conducive to discussion. Topics may be found by looking through recent issues of peer reviewed Journals / Technical Magazines on the topics of potential interest

i) **Report:** Each student is required to submit a well-documented report on the chosen seminar topic as per the format specified by *DSEC.*

j) **Anti-Plagiarism Check:** The seminar report should clear plagiarism check as per the Anti-Plagiarism policy of the institute.

k) **Presentation:** Each student should prepare PPT with informative slides and make an effective oral presentation before the *DSEC* as per the schedule notified by the department

l) The candidate has to register the Seminar as supplementary examination in the following cases:
   (i) student is absent for oral presentation and viva-voce
   (ii) student fails to submit the report in prescribed format
   (iii) student fails to fulfil the requirements of seminar evaluation as per specified guidelines

m) Supplementary examination for seminar
   (i) The CoE shall send a list of candidates registered for supplementary to the HoD concerned
   (ii) The *DSEC*, duly constituted by the HoD, shall conduct seminar evaluation and send the award list to the CoE within the stipulated time

10.8.2 **Mini Project**:

a) The HoD shall constitute a *Departmental Mini Project Evaluation Committee (DMPEC)*

b) Every student shall take up independent Mini project on innovative ideas. However, wherever not feasible a group of 2 to 4 students shall be allowed to take up mini project. The *DMPEC* shall take a decision on number of students in a group.

c) *DMPEC* shall allot a faculty supervisor to each student for guiding on (i) selection of topic (ii) literature survey and work to be carried out (iii) preparing a report in proper format and (iv) effective mini project oral presentation

d) There shall be only Continuous Internal Evaluation (CIE) for mini project

e) The CIE for mini project is as follows:

Assessment	**Weightage**
Mini Project Supervisor Assessment	20%
Working model / process / software package / system developed	20%
Mini Project report	20%
Mini Project paper	10%
Video pitch	10%
DMPEC Assessment: *Oral presentation with PPT and viva-voce*	20%
Total Weightage:	**100%**

Note: It is mandatory for the candidate to appear for oral presentation and Viva- voce to qualify for course evaluation.

i) **Mini Project Topic**: The topic should be interesting and conducive to discussion. Topics may be found by looking through recent issues of peer reviewed Journals/ Technical Magazines on the topics of potential interest

ii) **Working Model**: Each student is required to develop a working model/ process/ system on the chosen work and demonstrate before the *DMPEC* as per the dates specified by *DMPEC*

iii) **Report:** Each student is required to submit a well-documented report on the chosen seminar topic as per the format specified by *DMPEC*

iv) **Anti-Plagiarism Check:** The seminar report should clear plagiarism check as per the Anti-Plagiarism policy of the institute

v) **Presentation:** Each student should prepare PPT with informative slides and make an effective oral presentation before the *DMPEC* as per the schedule notified by the department

vi) **Video Pitch:** Each student should create a pitch video, which is a video presentation on his/ her mini project. Video pitch should be no longer than 5 minutes by keeping the pitch concise and to the point, which shall also include key points about his/ her business idea / plan (*if any*) and social impact

f) The candidate has to register the Mini project as supplementary examination in the following cases:
   (i) Student is absent for oral presentation and viva-voce
   (ii) Student fails to submit the report in prescribed format

(iii) Student fails to fulfill the requirements of Mini project evaluation as per specified guidelines.

g) Supplementary examination for mini project
   (i) The CoE shall send a list of candidates registered for supplementary to the HoD concerned
   (ii) The *DMPEC,* duly constituted by the HoD, shall conduct Mini project evaluation and send the award list to the CoE within the stipulated time.

10.9 **Evaluation for Major Project Work:**

10.9.1 Final year major project work is a team work and represents the culmination of study towards the B. Tech degree. **Major project offers an opportunity to integrate the knowledge acquired from various courses and apply it to solve real-world complex engineering problems**. The **Student Learning Assessment Process** (SLAP) shall include good number of presentations, demonstration of work undertaken, submission of a project report, writing project paper in scientific journal style & format, preparing project poster and creating video pitch on the complete project work.

10.9.2 Activities of major project SLAP shall be planned in such a way to ensure that the students acquire the essential Knowledge, Skills and Qualities (KSQ) of a professional engineer.

10.9.3 Major project work shall be normally conducted in two stages: Major project work. *Phase-I* in seventh semester and Major project work *Phase-II* in eighth semester. Nearly 50 - 75% of the proposed work to be completed in 7th semester as *Phase-I* and the remaining work to be continued and completed in 8th semester as *Phase-II*

10.9.4 **Major Project *Phase-I*:**

a) Every student is expected to put approximately **72 hours of work** into the major project *phase-I* course over the 12 weeks of 7th semester

b) The HoD shall constitute a *Departmental Project Evaluation Committee (DPEC)*

c) The convener DPEC shall allot faculty supervisors to all project teams for guiding on (i) project objectives and expected deliverables (ii) plan their project work and timeline (iii) enough resources for successful project completion (iv) Knowledge, Skills and Qualities (KSQ) to be acquired to propose solutions to the identified real-world problem for the project work (v) preparing a well-documented report in proper format and (iv) effective major project oral presentation

d) The project supervisors shall ensure students focus on the project objectives, expected deliverables and students have sufficient resources for successful project completion

e) The project supervisors are also expected to continuously emphasize and guide the students on following project timeline, meeting cadence, activity journaling in project log book

f) There shall be only Continuous Internal Evaluation (CIE) for Major Project *Phase-I*

g) CIE for the Major Project *Phase-I* in seventh semester is as follows:

Major project work Phase-I Assessment *(7th semester)*	**Weightage**
A. Supervisor Assessment	**20%**
B. DPEC Assessment *(i) Registration Presentation (10%)* *(ii) Progress Presentation-I (20%)* *(iii) Project progress*: Part of working model/ process/software package/system developed (30%)* *(iii) Well-documented Progress Report on Phase-I work (10%)* *(iv) Video pitch on Phase-I (10%)*	**80%**
Total Weightage	**100 %**

** Students are advised to complete major part of the project in phase-I only*

g) **Working Model:** Every project team shall be required to develop a working model/ process/software package/system, on the chosen work. The progress made in this shall be demonstrated during progress presentation-I at the end of *phase-I* and the completed working model/ process/software package/system before the DPEC as per the dates specified by DPEC at the end of *phase-II*.

h) **Progress Report on *phase-I*:** Every project team shall be required to submit a well-documented progress report on dissertation phase-I as per format specified by DPEC.

i) **Video pitch on *phase-I*:** Every project team shall be required to create a pitch video, which is a video presentation on their major project work *phase-I*. It should be 3 to 5-minute-long video (no longer than 5 minutes), highlight the progress made at various stages during *phase-I* project implementation

j) A student shall register for supplementary examination for the Major project work *phase-I* in the following cases:
   (i) Student is absent for oral presentation and viva-voce as part of progress presentation-I
   (ii) Project team fails to submit the progress report on *phase-I* in prescribed format
   (iii) Project team fails to submit the video pitch on the progress made during the *phase-I* period.
   (iv) Student fails to fulfill the requirements of major project work *phase-I* evaluation as per specified guidelines

k) Supplementary examination for major project work *phase-I*
   (i) The CoE shall send the list of students, registered for supplementary examination, to the HoDs concerned
   (ii) The DPEC shall conduct major project *phase-I* supplementary exam and send the award list to the CoE within the stipulated time

10.9.5 **Major Project *Phase-II*:**

a) All the major project teams shall take the *phase -I* work forward and complete the remaining work as *Phase-II* in the 8th semester.

b) Every student is expected to put approximately 168 hours of work into the major project *phase-II* course over the 12 weeks of 8th semester

c) The project supervisors are expected to guide the students to systematically continue the *phase-I* work, useful work during inter-semester break, meeting the deadlines as proposed in project timeline

d) The project supervisors shall ensure students focus on the project objectives and expected deliverables and ensure students have sufficient resources for successful project completion

e) The project supervisors are also expected to continuously emphasize and guide the students on following project timeline, meeting cadence, activity journaling in project log book.

f) The evaluation for Major Project work *Phase-II:* There shall be Continuous Internal Evaluation (CIE) and End Semester Examination (ESE). The evaluation for *phase-II* shall be as given below:

Assessment	Weightage
A. CIE **(i) Supervisor Assessment (10%)** **(ii) DPEC Assessment (50%)** *(a) Progress presentation-II (10%)* *(b) Final presentation (10%)* *(c) Working model / process / software package / system developed (20%)* *(d) Project video pitch (5%)* (e) *Project paper (5%)*	**60%**
B. ESE *(i) Well-documented project report (15%)* *(ii) Oral presentation with PPTs and viva-voce (15%)* (iii) *Project poster (5%)*	**40%**
Total Weightage	**100%**

g) **Working Model:** Every project team shall be required to develop a working model/ process/software package/system, on the chosen work. The completed working model/ process/software package/system shall be demonstrated during final presentation at the end of *phase-II*.

h) **Video pitch**: Every project team shall be required to create a pitch video, which is a video presentation on their major project work *phase-I & phase-II*. The project team shall present the produced video pitch during Final presentation

i) **Project poster**: At the end, the project teams shall present their project in the form of posters (A2 size). The teams shall have to present their work during the poster presentation session scheduled at the end of the 8th semester, at the time of demonstration of complete porotype / working model / software package / system developed.

j) **Well-documented plagiarism-cleared project report**: Every project team shall be required to submit a well-documented project report on the work carried out, as per the format specified by the DPEC. The report should clear plagiarism check as per the anti-plagiarism policy-2020 of the institute.

k) A student shall register for supplementary examination for the Major project work *phase-II* in the following cases:
   (i) Student is absent for oral presentation and viva-voce as part of ESE presentation
   (ii) Student fails to fulfill the requirements of major project work *phase-II* evaluation as per specified guidelines

l) Supplementary examination for major project work *phase-II*
   (i) The CoE shall send the list of students, registered for supplementary examination, to the HoDs concerned
   (ii) The DPEC, duly constituted by the HoD, shall conduct major project *phase-II* supplementary exam and send the award list to the CoE within the stipulated time

10.10 **Evaluation for Internship:**

10.10.1 The students shall undergo 6-8 weeks internship during summer/winter vacation at industry/R&D organization / Academic Institutes like IITs, IIITs & NITs.

10.10.2 The students preferably shall undergo internship at one organization only. In case of any difficulty, the stipulated period of internship shall be completed at different organizations with minimum of one week internship at every stage.

10.10.3 The internship evaluation shall be done in the VII semester of study and hence the students shall complete the prescribed period of internship before start of VII semester (from end of II semester to commencement of VII semester).

10.10.4 The internship evaluation shall be done by ***Department Internship Evaluation Committee* (DIEC)** based on the submitted report by student and oral presentation.

10.10.5 There shall be only Continuous Internal Evaluation (CIE) for internship evaluation.

10.10.6 The CIE for the Internship evaluation in VII semester shall be as below:

Internship evaluation	**Weightage**
A. **Internship Supervisor's Assessment** *(i) Feedback from the internship supervisor* *- on completion of internship assignment / work (20%)* *(ii) Feedback from the internship supervisor* *- on quality of work in internship assignment / work (10%)* *(iii) Feedback from the internship supervisor* *- internship log book (10%)* *(iv) Feedback from the internship supervisor* *- on attendance, punctuality and work hours (10%)*	**50%**
B. DIEC Assessment *(i) Internship duration (8 /6 weeks) (15% / 10%)* *(ii) Internship Report (20%)* *(iii) Oral Presentation (with PPT) and viva voce (15%)*	**50%**
Total Weightage:	**100%**

Note: *It is mandatory for the student to appear for oral presentation (with PPT) and viva voce to qualify for course evaluation*

(a) **Internship Report:** Each student is required to submit a well-documented internship report (both *soft copy and softbound hard copy*) as per format specified by DIEC

(b) A student shall register for supplementary examination for the internship evaluation in the following cases:
   (i) absent for oral presentation and viva-voce
   (ii) fails to submit the internship report in prescribed format
   (iii) fails to fulfill the requirements of internship evaluation as per specified guidelines

(c) Supplementary examination for internship evaluation
   (i) The CoE shall send the list of students, registered for supplementary examination, to the HoDs concerned
   (ii) The DIEC, duly constituted by the HoD, shall conduct internship evaluation supplementary exam and send the award list to the CoE within the stipulated time

10.11 **Evaluation of MOOCs:**

10.11.1 a) **SWAYAM-MOOCs:** Massive Open Online Courses (MOOCs) are such online courses which are developed as per the pedagogy and made available on the SWAYAM (Study Web of Active-learning by Young and Aspiring Minds) platform of *Government of India*

b) **SWAYAM** shall notify to all Institutions, on 1st June, 1st November every year, the list of online learning courses going to be offered in the forth coming semester.

10.11.2 a) The student shall be allowed to register for MOOCs courses for the designated Professional electives and Open electives mentioned in the curriculum.

b) The student shall select a relevant MOOCs course carrying 3 credits.

10.11.3 The Institutional MOOCs coordinator with the help of departmental MOOCs coordinator shall guide the students throughout the course.

10.11.4 **Evaluation and Certification of MOOCs**:

a) The Principal Investigator (PI) shall be a Subject Matter Expert (SME) belonging to a reputed educational institution, called Host Institution

b) The host Institution and PI shall be responsible for evaluating the registered students for MOOCs course

c) After conduct of examination and completion of the evaluation, the PI through host institution shall award Marks/Grade as per the evaluation scheme announced.

10.11.5 **Credit Mobility of MOOCs**:

a) Institution shall allow the credit mobility for the courses earned through MOOCs.

b) A certificate regarding successful completion of the MOOCs courses shall be issued through host Institution and sent to the parent institution.

c) The parent institution shall give equivalent credit weightage to the students for the credits earned through online learning courses through SWAYAM platform in the credit plan of the programme.

10.11.6 In case the student is unable to complete the MOOCs course, he/she shall be allowed to select one of courses listed under respective PE/OE offered at institute/department concerned and appear for supplementary examination. In such case, the student is deemed to have passed the course, if he/she scores minimum 35% of maximum marks allotted to the course in the registered supplementary ESE only (i.e. 35 marks out of 60 in ESE).

11. MINIMUM REQUIREMENT FOR PASSING A COURSE

11.1 **Theory Course**: A student is deemed to have passed in a theory course, if he / she secures

a) 35 percent of marks assigned to End Semester Examination (ESE) **and**

b) 35 percent of marks assigned to the Mid Semester Examination (MSE) & End Semester Examination (ESE) of the course taken together **and**

c) 35 percent of marks assigned to Teacher's Assessment (TA), Mid Semester Examination (MSE) and End Semester Examination (ESE) of the course taken together.

11.2 The marks assigned to MSE will be considered as per the Regulation no. 10.4.4

11.3 **Laboratory Course**: A student is deemed to have passed in a laboratory course, if he/she secures
a) 35 percent of marks assigned to End Semester Examination (ESE) **and**
b) 35 percent of marks assigned to the Teacher's Assessment (TA) and End Semester Examination (ESE) of the laboratory course taken together.

12. GRADING SYSTEM

12.1 At the end of the semester a student is awarded a letter grade in each of his / her courses taking into account the total marks secured (X) in that course

where, X = Marks secured in CIE + Marks secured in ESE

12.2 For arriving at a grade obtained by a student in a particular course (subject), initially numeric marks obtained by the student out of 100 are to be determined. Once a numeric mark is obtained, the same is to be converted to a letter grade following the guidelines given in 12.3 below.

12.3 The Institute shall follow absolute grading system. The grades will be awarded to each course as under:

Grade	Total Marks Secured (X)
S	$X \geq 90$
A	$80 \leq X < 90$
B	$70 \leq X < 80$
C	$60 \leq X < 70$
D	$45 \leq X < 60$
P	$35 \leq X < 45$
F	$X < 35$

12.4 The typical grades and their numerical equivalents on 10-point scale (called Grade Points) are as follows:

Performance	Letter Grade	Grade Points (G_i)
Superior	S	10
Excellent	A	9
Very Good	B	8
Good	C	7
Average	D	6
Pass	P	4
Fail	F	0

12.5 **F-Grade** is a Fail Grade. The course in which the student has earned F-Grade will be termed as backlog course.

12.6 In addition, there shall be a transitional **M-Grade.** M-Grade for "Debarred" due to indiscipline / malpractice during examination.

12.7 A Semester Grade Point Average (SGPA) will be computed for each semester. The SGPA will be calculated as follows:

$$SGPA = \sum_{i=1}^{n} C_i G_i \Big/ \sum_{i=1}^{n} C_i$$

where 'n' is the no. of courses (subjects) offered (excluding mandatory non-credit courses) for the semester, 'C_i' is the credits allotted to a particular course, 'G_i' is the grade-points carried by the letter corresponding to the grade awarded to the student for the course as illustrated in 12.4.

12.8 The SGPA would indicate the performance of the student in the semester to which it refers. SGPA will be rounded off to the second place of decimal and recorded as such.

12.9 Starting from the second semester, at the end of each semester, a Cumulative Grade Point Average (CGPA) will be computed for every student as follows:

$$CGPA = \sum_{i=1}^{m} C_i G_i \Big/ \sum_{i=1}^{m} C_i$$

where 'm' is the total number of courses (subjects) the student has been offered from the first semester onwards upto and including the present semester, 'C_i 'and 'G_i' are as explained in 12.7.

12.10 The CGPA would indicate the cumulative performance of the student from the first semester up to the end of the semester to which it refers. CGPA will be rounded off to the second place of decimal and recorded as such.

12.11 SGPA and CGPA are calculated in consideration of only credits cleared, i.e. F-Grade credits are not included for calculation.

13. SUPPLEMENTARY EXAMINATIONS

13.1 A student who obtained the F-Grade in a course (theory or practical) can appear in a subsequent End Semester Examination (ESE) in the same course as supplementary candidate.

13.2 However the marks secured in Continuous Internal Evaluation (CIE) by the student in that course during the semester study shall remain unaltered.

13.3 The students those who have passed in the supplementary examination will be awarded grade with **'*'** marked on the courses passed in the supplementary.

13.4 **Makeup Examination for VIII semester courses:**
Makeup Examination for the students having backlog courses at VIII semester of 4th year B.Tech. programme shall be conducted immediately after the release of VIII semester regular examinations result.

14. REVALUATION

a) Revaluation is allowed for only theory courses.

b) If the award of the revaluator varies from the original award by less than or equal to 20% of maximum marks prescribed for the course, the original award shall be taken as final.

c) If the award of the revaluator varies from the original award by more than 20% of the maximum marks prescribed for the course, the answer script will be examined by the second revaluator. If the award ofthe bothrevaluators is more than 20% of the maximum marks prescribed for the course, then average of the two revaluated awards thus available shall be taken as final. Otherwise, the original award shall be taken as final.

15. CONDITIONS FOR PROMOTION

15.1 A student shall have to satisfy the attendance requirements for the semester (as per the Regulation No. 8) for promotion to the next higher semester. In addition,

a) for promotion to the fifth semester, a student should not have more than four backlogs in the first and second semesters taken together.

b) for promotion to the seventh semester, a student should not have more than four backlogs in the courses of first to fourth semester taken together.

c) the grade (marks) secured in mandatory non-credit courses will not be counted for the purpose of backlogs. However, a minimum P-Grade is compulsory in those courses for the award of the degree.

16. IMPROVEMENT EXAMINATION

16.1 Students who wish to improve their SGPA / CGPA are permitted for SGPA / CGPA improvement only for theory courses. The student may opt to re-appear all the courses of a semester at the immediately succeeding End Semester Examination (ESE) for improving his / her grades. However, the students should clear all the courses of a particular semester in which he / she intends to take an improvement examination.

16.2 Further, when once the student appears for the improvement examination, he / she shall forego the grades secured in the earlier End Semester Examination (ESE) in the whole set of courses prescribed for that semester. However, the marks secured in Continuous Internal Evaluation (CIE) by the student in those courses during the semester study shall remain unaltered.

16.3 Students those who have re-appeared for improvement will be awarded grade with **'$'** marked on the courses appeared for improvement examination. **'$'** will state the grade improvement. Such improved grades will not be counted for the award of Prizes, Medals and Rank.

16.4 However, the students who register for improvement examinations and wish to drop from appearing the examinations, by written application to the CoE, before commencement of examinations, shall be permitted to retain their earlier grades.

17. GRADUATION REQUIREMENT

17.1 A student shall be declared to be eligible for award of the B.Tech. degree, if he / she has registered and completed all the courses with a minimum P-grade scored in every course and secured a total of stipulated 160 credits.

17.2 Normally a student should complete all the requirements consecutively in 8 semesters (4 academic years) for the award of B.Tech. degree. However, the students who fail to fulfill all the requirements for the award of B.Tech. degree within a period of 16 consecutive semesters (8 academic years from the registration in 1st semester) shall forfeit his / her enrolment to the program.

17.3 The students admitted in the lateral entry scheme should complete all the requirements consecutively in 6 semesters (3 academic years) for award of B.Tech. degree. However, the students who fail to fulfill all the requirements for the award of B.Tech. degree within a period of 12 consecutive semesters (6 academic years from the registration in 3rd semester) shall forfeit his / her enrolment to the program.

17.4 a) **CGPA to Percentage conversion**: As per UGC and AICTE guidelines, the CGPA will be converted to percentage of marks as below:

Percentage of marks = (CGPA – 0. 50) x 10

Ex: If CGPA is 6.75, the equivalent Percentage of marks = (6.75-0.50) x 10 = 62.5%

b) CGPA to Class conversion:

S. No.	Division	Eligibility Criteria
1	First Division with Distinction	a) Student should secure CGPA≥8.0 b) Student should pass all the courses along with the batch of students admitted with him/her within 8 consecutive semesters (6 consecutive semesters for lateral entry students) c) Student who appeared for improvement examination upto 6th semester will also be considered d) Student who have cleared any course in supplementary examination shall not be awarded Distinction
2	First Division	a) Student should secure CGPA, which is 6.50 ≤ CGPA < 8.0 within the time frame of the programme i.e. 16 semesters (12 semesters in case of lateral entry students) b) Student who have cleared any course in supplementary examination and secured CGPA≥6.50
3	Second Division	Student should secure CGPA, which is 5.50 ≤ CGPA < 6.50 within the time frame of the programme i.e. 16 semesters (12 semesters in case of lateral entry students)
4.	Pass Division	Student should secure CGPA, which is 4.0 ≤ CGPA < 5.50 within the time frame of the programme i.e. 16 semesters (12 semesters in case of lateral entry students)
5.	Fail	Student with CGPA < 4.0 will not be eligible for award of degree

17.5 **Honours / Minor in Engineering can be conferred as per AICTE guidelines and Model curriculum January 2018**

A student will be conferred with Under Graduate degree as "*Bachelor of Technology in XXX Engineering/Technology, with Honours*" (or) "*Bachelor of Technology in XXX Engineering/Technology, with Minor in YYY Engineering/Technology*", if he/she completes an additional 20 credits. These additional 20 credits could be acquired through SWAYAM-NPTEL MOOCs / other MOOCs such as Coursera, Udemy, IITB spoken tutorials. These additional 20 credits earned through SWAYAM-NPTEL MOOCs /other MOOCs should be in addition to the credits acquired through SWAYAM - MOOCs offered in the curriculum as part of Professional Electives/ Open Electives. The University will award degrees to the students who are evaluated and recommended by the Institute.

17.5.1 **Honours:** Honours is an additional credential a student may earn, if he/she does additional learning for 20 credits *in his/her own discipline* of B.Tech programme. These additional credits shall be acquired through MOOCs from the *list of courses for Honours,* prescribed by the respective departments. These courses shall mostly be advanced courses (or) courses designed to give more exposure to different areas of one's own discipline. On

successful accumulation of these additional credits, at the time of graduation, it shall be mentioned in the degree certificate as "*Bachelor of Technology in XXX Engineering / Technology, with Honours*".

17.5.2 **Minor in Engineering:** A minor in engineering is an additional credential a student may earn, if he/she does additional learning for 20 credits *in a discipline other than his/her major discipline* of B.Tech programme. These additional credits shall be acquired through MOOCs from the *list of courses for a Minor Engineering* prescribed by the respective departments. On successful accumulation of these additional credits, at the time of graduation, it shall be mentioned in the degree certificate as "*Bachelor of Technology in XXX Engineering / Technology, with Minor in YYY Engineering/Technology*".

17.5.3 A student shall be eligible to register for a Honours in the same discipline of his/her study, and/or a Minor in Engineering offered by other department.

17.5.4 A student can register for both Honours in the same discipline and also a Minor in Engineering in other discipline. On successful accumulation of prescribed credits for Honours and also prescribed credits for Minor in Engineering, at the time of graduation, it shall be mentioned in the degree certificate as "*Bachelor of Technology in XXX Engineering / Technology, with Honours and Minor in YYY Engineering/Technology*".

17.5.5 Student who has completed B.Tech. IV semester in his/ her regular B.Tech. programme without any standing backlogs and with a minimum CGPA of 8.0 shall be allowed to register for Honours and/or Minor in Engineering.

17.5.6 Student who wants to register for Honours and/or Minor in Engineering shall opt for registration at the end of IV semester of his/ her B.Tech. programme, subject to the conditions prescribed by the AAC from time to time.

17.5.7 Student registered for Honours and/or Minor in Engineering shall ensure the following in his/her regular B.Tech programme

(i) student should maintain a minimum SGPA of 7.0 from V semester to VIII semester of regular B.Tech programme and

(ii) student should maintain a CGPA of 8.0 at the end of VIII semester of regular B.Tech programme

If the student fails to meet the above criteria, his/her registration for Honours and/or Minor in Engineering shall stand cancelled and he/she will be awarded only regular B.Tech degree.

17.5.8 A student may withdraw from Honours/Minor in Engineering at any time before graduating. Such students shall submit an application for withdrawal to the Dean AA, before start of any semester. The Dean AA, shall communicate the list of such students to the HoDs concerned (parent-department /minor-department) with a copy to the CoE.

17.5.9 During the curriculum revision, the HoDs in coordination with their Department Academic Advisory Committee (DAAC) shall identify the list of courses to be offered by the department under Honours curricula/ Minor in Engineering curricula and forward the same to the office of the Dean AA.

17.5.10 Student shall be permitted to take a maximum of 2 theory courses and one laboratory course during any semester for additional learning towards Honours curricula/ Minor in Engineering curricula.

17.5.11 Student shall take laboratory courses, listed under Honours curricula/Minor in Engineering curricula, in the parent-department/minor-department during inter-semester break and complete the course with a course project.

17.5.12 Office of the Dean AA shall compile and release list of courses under Honours curricula/ Minor in Engineering curricula for different departments/ programmes/disciplines, highlighting the importance of each discipline.

17.5.13 By the end of April of every academic year, the Dean AA in coordination with HoDs shall notify the department wise list of equivalent courses in MOOCs/ SWAYAM-NPTEL MOOCs against the list of courses notified under Honours curricula/ Minor in Engineering curricula, by respective departments.

17.5.14 Office of the Dean AA shall release registration notification for Honours/ Minor in Engineering, during even semester of every academic year inviting interested students of B.Tech IV semester to apply.

17.5.15 Interested students shall submit three (03) copies of applications in the prescribed format, *notified by the Dean AA*, along with supporting documents to the concerned HoD in the parent-department. The HoD in coordination with DAAC shall scrutinize the submitted applications and forward the consolidated list of registered students along with two sets of applications to the Dean AA.

17.5.16 The Dean AA shall notify, in coordination with the CoE, the list of eligible students towards **Honours** and forward this list to the **parent-department**. These notified students shall be allowed to do additional learning towards Honours in Engineering from V semester onwards.

17.5.17 The Dean AA shall notify, in coordination with the CoE, the list of eligible students towards Minor in Engineering and forward this list to the minor-department in which student opted to gain prescribed credits for Minor in Engineering along with one set of application. These notified students shall be allowed to do additional learning towards Minor in Engineering from V semester onwards.

17.5.18 In the process of additional learning towards Honours/ Minor in Engineering, the student shall exercise carefully all options to ensure the following:

(i) The credits earned in a course studied in regular curriculum towards fulfilment of basic degree, shall not be claimed under credits for additional learning towards Honours/ Minor in Engineering and vice versa

(ii) A course once studied in regular curriculum, shall not be taken again for additional learning towards Honours/ Minor in Engineering

17.5.19 The HoD in coordination with department MOOCs coordinator and faculty counsellor concerned, shall monitor progress of the registered student during the semester for successful completion of registered courses of Honours curricula.

17.5.20 The minor-department HoD in coordination with minor-department MOOCs coordinator and faculty counsellor concerned, shall monitor progress of the registered student during the semester for successful completion of registered courses of Minor in Engineering curricula.

17.5.21 On successful completion of registered courses, the student shall submit the course completion details in "Semester wise progress report (*for additional learning towards Honours/Minor in Engineering*)" in the prescribed format notified by the Dean, AA along with Certificate/ Grade sheet/ Mark sheet (indicating credits of the course) to the HoDs concerned (parent-department /minor-department).

17.5.22 The HoDs shall consolidate "Semester wise progress report (*for additional learning towards Honours/Minor in Engineering*)" of all the students registered for *Honours/Minor in Engineering* in their departments and forward the same to the Dean AA.

17.5.23 The Dean AA shall ensure genuineness of the submitted certificates, of registered students, with the help of the Institute MOOCs coordinator and forward the semester wise progress of registered students to the CoE.

17.5.24 The CoE shall ensure for reflecting the earned credits for additional learning towards Honours/Minor in Engineering in corresponding student semester grade sheet, subsequently in consolidated grade sheet and transcripts.

17.5.25 Separate CGPA for Honours and/or Minor in Engineering shall be mentioned in the consolidated grade sheet.

17.5.26 The students who have registered for Honours/ Minor in Engineering but unable to accumulate the 20 credits prescribed towards Honours/ Minor in Engineering at the time of graduation, he/she shall be awarded the Degree in his/her discipline without any mention about Honours/ Minor in Engineering.

17.6 The University will award degrees to the students who are evaluated and recommended by the Institute.

18. MALPRACTICE IN EXAMINATION

18.1 Malpractice in examination is an illegal activity and is prohibited.

18.2 Mobile phones are strictly prohibited in the examination hall.

18.3 Exchange of question paper and material like pen, pencil, sharpener, eraser, scale, calculator, etc., during examination is strictly prohibited.

18.4 Malpractice in examination is viewed very seriously. Malpractice includes oral communication between candidates, possessing forbidden material, mobile phones (switched off/on) etc.

18.5 Any malpractice or engaging in any improper conduct and violation of the examination code by the student during examinations is liable for the punishment as given below:

S. No	Nature of Malpractice	S. No	Punishment
1.	Taking help from others, consulting and or helping other examinees during the examination period inside the examination hall or outside it, with or without their consent or helping other candidates to receive help from anyone else	a)	Cancelling the examination of the paper in which he / she indulged in malpractices
2	If the examinee attempts to disclose his / her identity to the valuer by writing his / her Hall-Ticket Number at a place other than the place prescribed for it or any coded message including his / her name or addressing the valuer in any manner in the answer book		Cancelling the examination of the paper in which he / she indulged in malpractices
3.	Candidate is found in possession of forbidden material; relevant or not relevant but not used	b)	Cancellation of the result of (i) all examinations taken including current examination in that session (or) (ii) current examination and proposed examinations to be taken during that session (or) (iii) current examination
4.	Destroying the material found in his / her possession or acting in any other manner with a view to destroying evidence	c)	Cancellation of the result of all examinations taken or proposed to be taken during that session and prohibiting his/her admission to or continuation in any course of the Institute for a period of one year. The student will be eligible to appear for the next corresponding semester/year examination in the succeeding academic year
5.	Smuggling main answer book / additional answer book / question paper / matter in to or out of the examination hall & Conspiring to interchange Hall Ticket Numbers		-do-
6.	Candidate is found in possession of forbidden material, relevant or not relevant but used		-do-
7.	In case of (i) impersonation, (ii) misbehavior with the invigilators/any person related to examination work, (iii) insertion of written sheets in different hand writing in the main/additional answer book, and (iv) creation of disturbance in and around the examination hall during or before the examination	d)	Cancellation of the result of all examinations taken or proposed to be taken during that session and prohibiting his/her admission in to or continuation in any course of the Institute for a period of two years. Further, the candidate shall not be allowed to appear for any examination during the period of punishment
8.	If a candidate is found guilty of malpractice in the improvement examination (after completion of course)	e)	Punishment will be awarded subject to the above rules and further, he/she will not be permitted to appear for further improvement examination

19. ROLL NUMBER ALLOTMENT

The Roll Number given to the student shall have a total 8 digits as follows:

Ex: **B18CE108**

a) The first letter, to represent Bachelors (B.Tech.) degree programme.
   Ex: B for **B**.Tech. programme
b) The next two numbers, to represent the year in which the student admitted into I semester.
   Ex: 18 for 20**18**
c) The next two letters, to represent the concerned department to which the student belongs.
   Ex: CE for **C**ivil **E**ngineering
d) The last three numbers, to represent the three - digit roll number of the student.

In general, a **student with roll number** "**B18CE108**" represents a **B.**Tech. student admitted in 20**18** in **C**ivil **E**ngineering bearing a roll number **108.**

20. AMENDMENTS

Notwithstanding anything contained in this manual, the Academic Council of the Institute reserves the right to modify / amend the curricula, requirements and rules & regulations pertaining to its undergraduate programmes, without any further notice.

ISO 9001:2015 AICTE-CII: GOLD Category Institute NAAC-'A' Grade Institute (CGPA: 3.21) NIRF-2022 Rank Band : 201-250

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE
Opp : Yerragattu Gutta, Hasanparthy (Mandal), WARANGAL - 506 015, TELANGANA, INDIA
काकतीय प्रौद्योगिकी एवं विज्ञान संस्थान, वरंगल - ५०६०१५, तेलंगाना, भारत
కాకతీయ సాంకేతిక విజ్ఞాన శాస్త్ర విద్యాలయం, వరంగల్ - ౫౦౬౦౧౫, తెలంగాణ, భారతదేశము
(An Autonomous Institute under Kakatiya University, Warangal)
(Approved by AICTE, New Delhi; Recognised by UGC under 2(f) & 12(B); Sponsored by EKASILA EDUCATION SOCIETY)
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URR-18R22

Syllabi of B.Tech. (I & II semesters)

Common for all Branches

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (NETWORKS)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)
SCHEME OF INSTRUCTION & EVALUATION

URR-18R22

I-SEMESTER OF 4-YEAR B. TECH DEGREE PROGRAM

[5Th+2P+3MC]

Sl. No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	BSC	U18MH101	Engineering Mathematics – I	3	1	-	4	10	30	40	60	100
2	ESC	U18CS102	Programming for Problem Solving using C	3	-	-	3	10	30	40	60	100
3	BSC	U18CH103	Engineering Chemistry	3	1	-	4	10	30	40	60	100
4	ESC	U18ME104	Engineering Drawing	2	-	4	4	10	30	40	60	100
5	ESC	U18CE105	Engineering Mechanics	3	1	-	4	10	30	40	60	100
6	ESC	U18CS107	Programming for Problem Solving using C Laboratory	-	-	2	1	40	-	40	60	100
7	BSC	U18CH108	Engineering Chemistry Laboratory	-	-	2	1	40	-	40	60	100
8	MC	U18CH109	Environmental Studies	2	-	-	-	10	30	40	60	100
9	MC	U18EA110	EAA *: Sports/Yoga/NSS	-	-	2	-	100	-	100	-	100
10	MC	U18EA111	Universal Human Value-I (*Induction Programme*)	-	-	-	-	-	-	-	-	-
			Total:	16	3	10	21	240	180	420	480	900

[L= Lecture, T = Tutorials, P = Practicals & C = Credits] EAA: Extra Academic Activity * indicates mandatory non-credit course

Total Contact Periods/Week: 29 **Total Credits: 21**

Stream-I: ME, CSE, IT, CSN,CSE(IOT) **Stream-II: CE, EIE, EEE, ECE, ECI,CSE(AI&ML)**

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (NETWORKS)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)

URR-18R22

SCHEME OF INSTRUCTION & EVALUATION
II-SEMESTER OF 4-YEAR B. TECH DEGREE PROGRAM

[5Th+4P+1MC]

Sl. No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	BSC	U18MH201	Engineering Mathematics – II	3	1	-	4	10	30	40	60	100
2	ESC	U18CS202R1	Data Structures through C	3	-	-	3	10	30	40	60	100
3	BSC	U18PH203	Engineering Physics	3	1	-	4	10	30	40	60	100
4	HSMC	U18MH204	English for Communication	2	-	2	3	10	30	40	60	100
5	ESC	U18EE205	Basic Electrical Engineering	3	1	_	4	10	30	40	60	100
6	ESC	U18EE206	Basic Electrical Engineering Laboratory	-	-	2	1	40	-	40	60	100
7	ESC	U18CS207R1	Data Structures through C Laboratory	-	-	2	1	40	-	40	60	100
8	BSC	U18PH208	Engineering Physics Laboratory	_	_	2	1	40	-	40	60	100
9	ESC	U18ME209	Workshop Practice	-	_	2	1	40	-	40	60	100
10	MC	U18EA210	EAA: Sports/Yoga/NSS*	-	-	2	-	100	-	100	-	100
Total:				14	3	12	22	310	150	460	540	1000

[L= Lecture, T = Tutorials, P = Practicals & C = Credits] EAA: Extra Academic Activity * indicates mandatory non-credit course

Total Contact Periods/Week: 29
Total Credits: 22
Stream-I: ME, CSE, IT, CSN,CSE(IOT)
Stream-II: CE, EIE, EEE, ECE, ECI,CSE(AI&ML)

Internships: All students should plan for mandatory 6-8 weeks internship, from end of II semester to commencement of VII semester at industry/R&D organizations/industries of national importance (IITs/IIITs/NITs). As part of Internship Evaluation in VII Semester, students are expected to submit a well-documented internship report and give an informative ppt presentation in VII semester.

U18MH101 ENGINEERING MATHEMATICS- I

Class: B.Tech. I-Semester

Branch(s): ME, CSE, IT, CSN, CSIOT
CE, EEE, ECE, ECI, CSAIML, DS

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in

LO1: basic concepts of convergence of a series, mean value theorems, expansion of a function in series

LO2: partial differentiation and it's applications to functions of two/several variables

LO3 : differential equations of first order and first degree along with certain applications

LO4: the methods of solving higher order linear differential equations and introduce few applications to engineering problems

UNIT-I (9+3)

Infinite Series: Sequences & Series, General properties of series, Series of positive terms, Comparison test, Limit comparison test, Integral test, D'Alembert's Ratio test, Cauchy's nth root test, Alternating series- absolute convergence.

Differential Calculus (Functions of One Variable): Limits, Continuity, Differentiability, Rolle's theorem (Physical and algebraic interpretations), Lagrange's mean value theorem (Geometrical interpretation), Cauchy's mean value theorem. Taylor's theorem and Power series representation of functions, Maclaurin's series, Asymptotes and Tracing of Simple Curves

UNIT-II (9+3)

Differential Calculus (Functions of Several Variables): Partial differentiation, Total differentiation, Change of variables, Application to find Tangent plane and Normal to a surface, Jacobians. Taylor's theorem for function of two variables (without proof), Maximum and minimum values of functions of two variables. Langrage's method of undetermined multipliers. Differentiation under integral sign.

UNIT-III (9+3)

Differential Equations of First Order: Practical approach to differential equations. Formation and solution of differential equation. Solution of first order and first degree differential equation, variables separable form, homogeneous form, reducible to homogeneous form, First order linear equations, Equations reducible to linear equation (Bernoulli's equation), Exact differential equations, Equations reducible to exact form.

Applications of First Order Differential Equations: Simple examples of Physical applications (Orthogonal trajectories, RL series circuit problem).

UNIT-IV (9+3)

Higher Order Linear Differential Equations with Constant Coefficients: Liner differential Equations of higher order with constant coefficients, General solution, Complementary function, Particular Integral. Methods of evaluation of particular Integrals. Wronskian, Linear dependence of solutions, Method of Variation of parameters. Cauchy's homogenous linear equation. Applications: Simple examples of RLC series circuit problem.

Text Books:

[1] Grewal, B.S., Higher Engineering Mathematics, 43/e, Delhi, *Khanna Publishers* ,2014.

Reference Books:

[1] Kreyszig E, Advanced Engineering Mathematics,9th edition, Inc, U.K, John wiely *& sons,* 2013.

[2] Shanti Narayan, Differential Calculus, New Delhi, S. Chand & Co

[3] S.S. Sastry, Engineering Mathematics 3/e, Vol.II, Prentice Hall of India,2014

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: *demonstrate the convergence of a series and interpret mean value theorems*

CO2: *apply partial differentiation to functions of several variables in solving various engineering problems*

CO3: *utilize appropriate methods of differential equations of first order and first degree in solving real life engineering problems*

CO4: *solve the higher order linear differential equation with constant coefficients and few problems on engineering applications*

Course Articulation Matrix (CAM): U18 MH101 ENGINEERING MATHEMATICS- I

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	U18MH101.1	3	2	1	--	--	--	--	--	--	--	--	1	-	-
CO2	U18MH101.2	3	3	2	--	--	--	--	--	--	--	--	1	-	-
CO3	U18MH101.3	3	2	2	--	--	--	--	--	--	--	--	1	-	-
CO4	U18MH101.4	3	3	2	--	--	--	--	--	--	--	--	1	-	-
U18MH101		3	2.5	1.75	--	--	--	--	--	--	--	--	1		

U18CS102 PROGRAMMING FOR PROBLEM SOLVING USING C

Class: B.Tech. I -Semester

Branch(s): ME, CSE, CSN, IT, CSIoT CE, EEE, ECE, ECI, CSAIML , DS

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on

LO1*: computer fundamentals and concepts of problem solving using structured programming paradigm*

LO2*: control structures and array operations*

LO3*: string functions and modular programming concepts*

LO4*: structures, unions, pointers and files in C programming*

UNIT-I (9)

Introduction to Computers: Block diagram of computer, types of computers, computer languages, problem solving and program development steps, algorithm, flowchart

Overview of C: History, basic structure of C program

Constants, Variables and Data Types: Character set, C tokens, declaration of variables, symbolic constants and macros

Operators and Expressions: Arithmetic, relational, increment, decrement, conditional, logical, bit-wise, special operators, arithmetic expressions, precedence of operators and associativity **Managing Input and Output Operations:** Reading a character, writing a character, formatted input, formatted output

UNIT-II (9)

Decision Making and Branching: Simple if, if-else, nested–if, else-if ladder, switch, conditional operator, goto statement

Decision Making and **Looping:** While, do-while, for statements, nested loops, break and continue statements

Arrays: One dimensional array, declaration of one dimensional arrays, initialization of one dimensional arrays, two dimensional arrays, initializing two dimensional arrays, linear search

UNIT-III (9)

Character Arrays and Strings: Reading strings, writing strings, string handling functions, table of strings

User Defined Functions: Need of user defined functions, definition of function, return values and their types, function calls, function declaration, category of function, no arguments and no return values, arguments but no return values, arguments with return values, no arguments but returns a value, recursion, storage classes

UNIT-IV (9)

Structures and Unions: Declaring structure variables, accessing structure members, array of structures, structures within structures, unions

Pointers: Understanding **pointers**, declaring and initializing pointer variables, pointer expressions, pointers and arrays, pointers and character strings, array of pointers, pointers as function arguments, pointers and structures

File Management in C: Defining and opening a file, input and output operations on sequential text files

Text Books:

1. E.Balagurusamy, Programming in ANSIC**,** 6th ed, New Delhi: Tata McGraw Hill, 2012

Reference Books:

1. Kerninghan and Ritchie, The C Programming Language, 2nd ed, New Delhi: Prentice Hall of India, 1988
2. A.K.Sharma, Computer Fundamentals and programming in C, Hyderabad: Universities Press, 2018.
3. Peter Norton, Introduction to Computers, 6th ed. New Delhi: Tata McGraw-Hill, 2008
4. Herbert Schildt, Complete Reference with C, 4th ed. New Delhi: Tata McGraw Hill, 2000
5. Yaswanth Khanetkar, Let Us C, 13th ed. Bangalore: BPB Publications, 2012

Course Learning Outcomes (COs):

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

CO1*: demonstrate knowledge on fundamental of C programming language and design an algorithm & flow chart for a given application*

CO2*: apply logical skills for problem solving using control structures and arrays*

CO3*: develop string programs and modular programming withfunctions*

CO4*: implement structures, unions, pointers and files in Cprogramming*

Course Articulation Matrix (CAM): U18CS102 PROGRAMMING FOR PROBLEM SOLVING USING C

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18CS102.1	1	1	-	-	-	-	-	-	-	1	-	1	2	1	1
CO2	U18CS102.2	1	2	2	1	-	-	-	-	-	1	-	1	2	2	2
CO3	U18CS102.3	1	2	2	1	-	-	-	-	1	1	-	1	2	2	2
CO4	U18CS102.4	1	2	2	2	1	-	-	-	1	1	-	1	2	2	2
U18CS102		1	1.75	2	1	1	-	-	-	1	1	-	1	2	1.75	1.75

U18CH103 ENGINEERING CHEMISTRY

Class: B.Tech. I–Semester
B.Tech. II-Semester

Branch(s) : CE, EEE, ECE, ECI, CSAIML, DS ME, CSE, CSN, IT, CSIoT

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Examination	60 Marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on...

LO1: fundamental concepts of electrochemistry, electrochemical cells

LO2 : corrosion science, phase rule application to various equilibria, I/C engine fuels.

LO3 : basic spectroscopic techniques of chemical analysis, water analysis and treatment

LO4: basic concepts of organic chemistry, polymerization reactions, versatile applications of polymers

UNIT-I (9+3)

Electrochemistry: Specific conductance ,equivalent conductance, effect of dilution, Conductometric titrations -acid base titrations, their advantages over conventional methods, Electrode potential, Nernst equation, Electrochemical series and its applications, Calomel electrode, Determination of pH using quinhydrone electrode, hydrogen electrode, Potentiometric titrations (acid base titrations), Commercial cells- Lead-acid storage cell , Fuel cells-Hydrogen-oxygen fuel cell.

UNIT-II (9+3)

Corrosion: Introduction-corrosion by pure chemical reaction (dry corrosion), Electrochemical corrosion(wet corrosion), Factors influencing corrosion, Prevention methods of corrosion - cathodic protection, hot dipping methods(galvanizing, tinning), cladding, electroplating.

Phase rule: Description of the terms-phase, component and degrees of freedom, Gibbs phase rule equation, Application of the phase rule to one-component system (water system), two-component system (silver-lead system), Pattinson's process for desilverisation of lead.

Fuels: Characteristics of fuels for internal combustion engines, Knocking , Octane number, Cetane number, Compressed natural gas(CNG), Power alcohol.

UNIT-III (9+3)

Introduction to Methods of Chemical Analysis: Introduction to spectroscopy- Microwave spectra- theory, Application of microwave spectra in the determination of bond length of a diatomic molecule; Infra-red spectra, theory, Applications- calculation of force constant and identification of functional groups in organic compounds, Lambert-Beer's law and its applications.

Water Analysis and Treatment: Hardness of water, Determination of hardness of water by using EDTA, Determination of alkalinity, Determination of fluoride by spectrophotometry, Determination of dissolved oxygen, biochemical oxygen demand, chemical oxygen demand, Softening of water by ion-exchange process, Desalination of brackish water- Reverse osmosis, Electrodialysis

UNIT-IV (9+3)

Organic Chemistry: Fission of a covalent bond, Types of electronic effects- inductive effect, mesomeric effect , Reaction intermediates, their stabilities, Types of reagents- electrophilic, nucleophilic reagents, Mechanisms of nucleophilic substitution($SN^1$and SN^2) , addition (electrophilic, nucleophilic and free radical) reactions .

Polymers: Introduction -Types of polymerization reactions-addition, condensation , Mechanism of free radical, cationic and anionic addition polymerization, Thermo-setting and thermo plastic resins, Conducting polymers and their applications.

Text Books:

1. Jain and Jain, *Engineering Chemistry*, 16th ed. Dhanpat Rai Publishing Company, 2012.

Reference Books:

1. J.C.Kuriacose and J.Rajaram, *Chemistry in Engineering and Technology(vol.I & vol.II)*, Tata Mc. Graw-Hills Education Pvt. Ltd., 2010.
2. Shashi Chawla, *Text book of Engineering Chemistry*, 3rd ed., Dhanpat Rai Publishers, 2003.
3. S.S. Dara, S S. Umare, *A Text book of Engineering Chemistry*, 12th ed., S.Chand & Company Ltd., 2010.

Course Learning Outcomes(COs):

On completion of this course, students will be able to ...

CO1: discuss the concepts of electro chemistry and electrochemical cells

CO2: apply the materials in the field of engineering and phase rule in the study of material science, select suitable fuels for I/C engines.

CO3: determine molecular parameters using spectroscopic techniques and quality parameters of water sample, discuss softening methods of hard water.

CO4: appraise the concepts of organic chemistry, polymerization reactions and applications of polymers.

Course Articulation Matrix (CAM): U18CH103 ENGINEERING CHEMISTRY

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	U18CH103.1	2	2	1	1	1	-	1	-	1	-	-	-	-	-
CO2	U18CH103.2	2	1	2	2	-	1	1	-	2	-	-	-	-	-
CO3	U18CH103.3	2	1	1	2	-	1	-	-	2	-	-	-	-	-
CO4	U18CH103.4	1	-	1	2	-	1	-	-	2	-	-	-	-	-
U18CH103		1.75	1.33	1.25	1.75	1.00	1	1	-	1.75	-	-	-	-	-

U18ME104 , ENGINEERING DRAWING

Class: B. Tech. I- Semester
B.Tech. II-Semester

Branch(s): CE, EEE, ECE, ECI, CSAIML, DS
ME, CSE, CSN, IT, CSIoT

Teaching Scheme:

L	T	P	C
2	-	4	4

Examination Scheme:

Continuous Internal Evaluation	:	40 marks
End Semester Exam	:	60 marks

Course Learning Objectives (LOs):
This course will develop students' knowledge in/on...
LO1: projections of points and straight lines-I
LO2: projections of straight lines-II and planes
LO3: projections of solids and sections of solids
LO4: isometric and orthographic projections

UNIT – I (6+12)

Introduction: Importance of Engineering Drawing, instruments- uses; Layout of drawing sheets, Types of Lines, Lettering and dimensioning, Construction of regular polygons **Projection of Points**: Introduction to orthographic projections-Vertical Plane, Horizontal plane; Views-Front view, Top view and Side view; Projection of Points-different quadrants

Projection of Straight lines - I: Line parallel to both the planes, Line parallel to one plane and perpendicular to the other reference plane, Line parallel to one plane and inclined to the other reference plane

UNIT – II (6+12)

Projection of Straight Lines – II: Line- inclined to both the planes and Traces

Projection of Planes: Planes - Perpendicular and Oblique planes; Projections of planes - parallel to one of the reference planes, inclined to one of the reference plane and perpendicular to the other; Projections of oblique planes

UNIT – III (6+12)

Projection of Solids: Types-prisms, pyramids, cylinder and cone; Simple Positions-axis parallel to a reference plane and perpendicular to the other plane, axis parallel to one plane and inclined to other reference plane; axis inclined to both the reference planes

Sections of Solids: Types-prisms and pyramids; Section planes, Sectional views and true shape of a section

UNIT – IV (6+12)

Orthographic projections: Conversion of isometric views into orthographic views

Isometric Projections: Isometric axis, Isometric Planes, Isometric View, Isometric projection, Construction of isometric view from orthographic views

AutoCAD: Introduction to AutoCAD, DRAW tools, MODIFY tools, TEXT, DIMENSION, PROPERTIES tool bar, Standard tool bars, LAYERS; drawing of orthographic and isometric projections in AutoCAD.

Textbook:

[1] Bhatt N.D., *Elementary Engineering Drawing*, Anand: Charotar Publishing House India, 2017.

Reference Books:

[1] Dhananjay A Jolhe, *Engineering Drawing*, Tata Mc Graw- hill, 2008.

[2] Venugopal K., *Engineering Graphics with Auto CAD*, Hyderabad: New Age International Publishers Ltd., 2012.

[3] W J Luzadder and J M Duff, *Fundamentals of Engineering Drawing*, Prentice-Hall of India, 1995.

Course Outcomes (COs):

On completion of this course, students will be able to…

CO1: develop projections of points & straight lines-I.

CO2: develop projections of straight lines-II & planes.

CO3: construct projection of solids and analyze internal details of an object through sectional views.

CO4: construct 2D orthographic views from 3D isometric views and develop 3D isometric views from 2D views.

Course Articulation Matrix (CAM): U18ME104 ENGINEERING DRAWING												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	U18ME104.1	2	1	1	-	-	-	-	-	-	1	-	1
CO2	U18ME104.2	2	1	1	-	-	-	-	-	-	1	-	1
CO3	U18ME104.3	2	1	1	-	-	-	-	-	-	1	-	1
CO4	U18ME104.4	2	1	1	-	1	-	-	-	-	1	-	1
U18ME104		**2**	**1**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**1**

U18CE105 ENGINEERING MECHANICS

Class: B.Tech. I-Semester
B.Tech. II-Semester

Branch(s): CE, EEE, ECE, ECI, CSAIML, DS
ME, CSE, CSN, IT, CSIoT

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on/in...

LO1: force systems and their applications

LO2: concepts and application of friction, analysis of plane trusses

LO3: centroid and moment of inertia of geometric and composite areas

LO4: dynamics of a particle and its applications

UNIT – I (9+3)

Laws of Mechanics: Parallelogram law of forces, triangle law of forces, Newton's law of gravitation, law of superposition and transmissibility of forces.

Force Systems: Types of forces, co-planar, concurrent and parallel forces, moment and couple, free body diagram, resultant of force systems, resolution of forces, composition of forces, equilibrium equations of forces, Lami's theorem, Varignon's theorem, moment equilibrium equations, types of supports, beams and loadings, statically determinate structures, resultant and equilibrium of general force system.

UNIT –II (9+3)

Friction: Introduction, classification, laws of friction, coefficient of friction, angle of friction, ladder friction and wedge friction.

Plane Trusses: Rigid truss, stability and determinacy conditions, basic assumptions for a perfect truss, analysis of trusses by method of joints and method of sections of a cantilever and simply supported statically determinate pin-jointed trusses.

UNIT– III (9+3)

Centroid: Centroid of one dimensional figures, centroid of simple figures from first principles, centroid of composite sections.

Moment of Inertia: Moment of inertia of plane sections from first principles, theorems of moment of inertia – parallel axis theorem and perpendicular axis theorem, moment of inertia of standard sections and composite sections.

UNIT - IV (9+3)

Kinematics: Introduction to dynamics, rectilinear motion of a particle – displacement, velocity and acceleration, motion with uniform acceleration and motion with variable acceleration, curvilinear motion- rectangular components, components, acceleration of normal and tangential acceleration, projectile motion.

Kinetics: Rectilinear motion-equations of rectilinear motion, equations of dynamic equilibrium, D'Alembert's principle, curvilinear motion-equations of motion in rectangular components, tangential and normal components, equations of dynamic equilibrium, applications of work-energy, impulse –momentum principles of rectilinear motion and curvilinear motion.

Text Books:

1. Tayal A.K., *Engineering Mechanics: Statics and Dynamics*, 14th ed. New Delhi: Umesh Publishers, 2014.

Reference Books:

1. Timoshenko S., Young D.H., Rao J.V., and Sukumar Pati, *Engineering Mechanics in SI units*, 5th ed. New Delhi: McGraw Hill Education Pvt. Ltd., 2013.
2. Vijaya Kumar Reddy K., Suresh Kumar J. *Singer's, Engineering Mechanics Statics and Dynamics*, 3rd ed. (SI Units), 8th Reprint , New Delhi: BS Publications / BSP Books, 2014.
3. Bhavikatti S.S., *Engineering Mechanics*, 4th ed. New Delhi: New Age International, 2013 (reprint).
4. Basudeb Bhattacharyya, *Engineering Mechanics*, 9th ed. New Delhi: Oxford University Press, 2013.

Course Learning Outcomes (COs):

On completion of this course, the student will be able to...

CO1: articulate various force systems and their applications

CO2*: demonstrate concepts of friction and analyze plane trusses*

CO3: calculate centroid and moment of inertia of geometric and composite areas

CO4: analyze dynamics of a particle and its applications

Course Articulation Matrix (CAM): U18CE105 ENGINEERING MECHANICS

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	U18CE105.1	1	2	-	-	-	-	-	-	-	-	-	1	1	-	-	1
CO2	U18CE105.2	1	2	-	-	-	-	-	-	-	-	-	1	1	-	-	1
CO3	U18CE105.3	1	2	-	-	-	-	-	-	-	-	-	1	1	-	-	1
CO4	U18CE105.4	1	2	-	-	-	-	-	-	-	-	-	1	1	-	-	1
	U18CE105	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**1**

U18CS107 PROGRAMMING FOR PROBLEM SOLVING USING C LAB

Class: B.Tech. I- Semester

Branch(s): ME, CSE, CSN, IT, CSIoT
CE, EEE, ECE, ECI, CSAIML, DS

Teaching Scheme :

L	T	P	C
-	-	2	1

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on

LO1*: operators and decision making statements*

LO2: *loop techniques and array operations for problem solving*

LO3: *string functions and modular programming approach for problem solving*

LO4: *structures, unions, pointers and files*

LIST OF EXPERIMENTS

1. Programs using input output functions, operators (arithmetic, relational and conditional)
2. Programs using operators (bit-wise, logical, increment and decrement)
3. Programs using conditional control structures: if, if-else, nested if
4. Programs using else if ladder, switch and goto
5. Programs using loop control structures: while
6. Programs using loop control structures: do-while and for
7. Programs on one dimensional array and two dimensional arrays
8. Programs on string handling functions
9. Programs on different types of functions, parameter passing using call-by-value, call- by-reference, recursion and storage classes
10. Programs using structures, unions, pointers to arrays and pointers to strings
11. Programs using array of pointers and pointers to structures
12. File operations and file handling functions for sequential file

Laboratory Manual:

1. Programming in C Lab Manual, Dept. of CSE, KITSW.

Reference Books:

1. E. Balagurusamy, Programming in ANSIC, 6th ed, New Delhi: Tata McGraw Hill, 2012
2. Kerninghan and Ritchie, The C Programming Language, 2nd ed, New Delhi: Prentice Hall of India, 1988
3. Yaswanth Khanetkar, Let Us C, 13th Ed. Bangalore: BPB Publications, 2012

Course Learning Outcomes (COs):

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

CO1: *develop programs using operators and decision making statements*

CO2: *apply the loops and array operations for logical programming*

CO3: *implement string programs and apply modular programming techniques*

CO4: *develop programs using structures, unions, pointers and files*

Course Articulation Matrix (CAM): U18CS107 PROGRAMMING FOR PROBLEM SOLVING USING C LAB																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18CS107.1	1	1	1	1	-	-	-	1	1	1	-	1	**2**	**1**	**1**
CO2	U18CS107.2	1	2	2	1	-	-	-	-	1	1	-	1	**2**	**2**	**2**
CO3	U18CS107.3	1	2	2	1	-	-	-	-	1	1	-	1	**2**	**2**	**2**
CO4	U18CS107.4	1	2	2	2	1	-	-	-	1	1	-	1	**2**	**2**	**2**
U18CS107		**1**	**1.75**	**2.25**	**1.25**	**1**	-	-	1	1	1	-	**1**	**2**	**1.75**	**1.75**

U18CH108 ENGINEERING CHEMISTRY LABORATORY

Class: B.Tech. I -Semester
B.Tech. II -Semester

Branch(s): CE, EEE, ECE, ECI, CSAIML, DS
ME, CSE, CSN, IT, CSIoT

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Examination	60 Marks

Course Learning Objectives (LOs):

This course will develop students knowledge in /on..

LO1: water analysis techniques
LO2: determination of metals from their ores, concepts of adsorption
LO3: instrumentation methods of chemical analysis
LO4: saponification/acid value of an oil

LIST OF EXPERMENTS

1. Determination of alkalinity of test sample of water
2. Estimation of available chlorine in test sample of bleaching powder
3. Determination of hardness of water by using complexometric method
4. Determination of calcium in lime stone / dolomite
5. Estimation of cupric ions in the test solution
6. Adsorption of an acid on charcoal -applicability of adsorption isotherm
7. Synthesis of a polymer
8. Conductometric titrations
9. Potentiometric titrations
10. Colorimetric analysis-verification of Lambert-Beer's law
11. Estimation of metal ion using ion-exchange resin
12. Determination of saponification / acid value of an oil

Laboratory Manual:

1. *Manual for Engineering Chemistry Laboratory* prepared by the Department of Physical Sciences/Chemistry, KITSW

Course Learning Outcomes (COs):

On completion of this course, students will be able to...

CO1: determine water quality parameters - alkalinity, hardness
CO2: assess metals present in their ores, apply Freundlich adsorption isotherm
CO3: handle analytical instruments for chemical analysis
CO4: measure saponification /acid value of an oil

Course Articulation Matrix (CAM): U18CH108 ENGINEERING CHEMISTRY LABORATORY														
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	U18CH108.1	2	-	1	3	-	1	2	-	2	-	-	-	-	-
CO2	U18CH108.2	2	-	1	3	-	-	2	-	2	-	-	-	-	-
CO3	U18CH108.3	2	-	1	3	-	-	3	-	2	-	-	-	-	-
CO4	U18CH108.4	2	-	1	3	-	-	1	-	2	-	-	-	-	-
U18CH108		2	-	1	3	-	1	2	-	2	-	-	-	-	-

U18CH109 ENVIRONMENTAL STUDIES

Class: B.Tech. I -Semester
B.Tech. II -Semester

Branch(s):CE, EEE, ECE, ECI,CSAIML, DS
ME, CSE, CSN, IT, CSIoT

Teaching Scheme

L	T	P	C
2	-	-	-

Examination Scheme:

Continuous Internal	40 marks
End Semester	60 marks

Course Learning objectives (LOs):
This course will develop students' knowledge in/on...
LO1: *necessity to use natural resources more equitably*
LO2 : *concepts of ecosystem and the importance of biodiversity conservation*
LO3 : *causes, effects and control measures of various environmental issues*
LO4 : *issues involved in enforcement of environmental legislation*

UNIT-I(6)

Introduction - The multidisciplinary nature of environmental studies - definition, scope and importance.

Natural Resources: Forest Resources - Use and over–exploitation of forests, deforestation, timber extraction, mining, dams - their effects on forests and tribal people; **Water Resources** - Use and over-utilization of surface and ground water, floods, drought, conflicts over water; **Mineral Resources** - Environmental effects of extracting and using mineral resources; **Agricultural Land** - Land as a resource, land degradation, soil erosion and desertification; **Food Resources** - World food problems, effects of modern agriculture, fertilizer-pesticide problems, water logging and salinity; **Energy Resources** - Renewable and non-renewable energy sources, use of alternate energy sources.

UNIT-II(6)

Ecosystem and Biodiversity: Ecosystem - Concepts of an ecosystem, food chain, food webs, ecological pyramids, energy flow in the ecosystem and ecological succession;

Biodiversity and its Conservation – Introduction, definition, genetic, species and ecosystem diversity, value of biodiversity, biodiversity in India, hot spots of biodiversity, man-wildlife conflicts endangered and endemic species of India, in-situ and ex-situ conservation.

UNIT-III(6)

Environmental Pollution: Global climatic change, green house gases, effects of global warming, ozone layer depletion; International conventions/protocols - Earth summit, Kyoto protocol and Montreal protocol; causes and effects of air, water, soil, marine and noise pollution with case studies; solid and hazardous waste management, effects of urban industrial and nuclear waste; natural disaster management - flood, earthquake, cyclone and landslides.

UNIT-IV(6)

Social Issues and the Environment: **Role of Individual and Society** - Role of individual in prevention of pollution, water conservation, Rain water harvesting and watershed management; **Environmental Protection / Control Acts** - Air (Prevention and control of Pollution) Act- 1981, water (Prevention and Control of Pollution) Act-1974, water Pollution Cess Act-1977, Forest conservation Act (1980 and 1992), wildlife Protection Act 1972 and environment protection Act 1986, issues involved in enforcement of environmental legislations; **Human Population and Environment** - Population growth, family welfare programmes, women and child welfare programmes, role of information technology in environment and human health.

Text Book:

1. Erach Bharucha, *Text Book of Environmental Studies for Under Graduate Courses,* 2nd ed . Universities Press (India) Pvt. Ltd, 2013.

Reference Books:

1. Y. Anjaneyulu, *Introduction to Environmental Science* , B.S. Publications, 2004.
2. Gilbert M. Masters, *Introduction to Environmental Engineering & Science* , 3 rd ed. Prentice Hall of India ,1991.
3. Anubha Kaushik, C.P. Kaushik, *Environmental Studies*, 4th ed. New Age International Publishers, 2014.
4. R.Rajagopalan, *Environmental Studies from crisis to cure, Oxford University Press,* 2nd ed. 2011.

Course Learning Outcomes(COs):

On completion of this Course, the student will be able to...

CO1 : *investigate any environmental issue using an interdisciplinary framework*

CO2 : *formulate an action plan for sustainable alternatives and conserving biodiversity that integrates science, humanist, social and economic perspective*

CO3 : *identify and explain the complexity of issues and processes which contribute to an environmental problem*

CO4 : *participate effectively in analysis and problem-solving through knowledge in environmental legislations*

Course Articulation Matrix (CAM): U18CH109 ENVIRONMENTAL STUDIES

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	U18CH109.1	2	1	2	1	-	2	1	-	1	-	-	-		
CO2	U18CH109.2	-	-	2	-	-	1	2	-	1	-	-	-		
CO3	U18CH109.3	1	2	1	-	-	1	1	1	1	-	-	-		
CO4	U18CH109.4	-	-	1	-	-	1	2	-	1	-	-	-		
U18CH109		1.5		1.5	1	-	1.25	1.5	1	1	-	-	-		

U18EA110 EAA: SPORTS/YOGA/NSS

Class: B. Tech. I -Semester
B. Tech. II -Semester

Branch(s): ME, CSE, CSN, IT, CSIoT
CE, EEE, ECE, ECI, CSAIML, DS

Teaching Scheme :

L	T	P	C
-	-	-	-

Examination Scheme :

Continuous Internal Evaluation	
End Semester Exam	

I. SPORTS

Course Learning objectives (LOs):
The objectives of the Sports is to..
LO1: to perform and engage in a variety of physical activities
LO2 : to develop and maintain physical health and fitness through regular participation in physical activities
LO3: to demonstrate positive self esteem, mental health and physiological balance through body awareness and control
LO4 : to exhibit the spirit of fair play, team work and sportsmenship

Activities related to:

1. Physical Fitness
2. Games & Sports

II. NATIONAL SERVICE SCHEME (NSS)

Course Learning objectives (LOs):
The objectives of the NSS is to..
LO1: arouse the social consciousness of the students
LO2 : provide them with opportunity to work with people in villages and slums
LO3 : expose them to the reality of life
LO4 : bring about a change in their social perceptions
LO5 : develop competence required for responsibility sharing and team work

List of Activities:

1. Shramadanam
2. Tree Plantation
3. General Medical camps in Villages
4. Awareness on Eye Donation
5. Awareness on "Child Labour and Child Marriages"
6. Awareness programs on " Literacy, Good Health Practices, etc."
7. Safe Riding Program
8. Awareness program on "RTI Act"
9. Awareness on Blood Donation

Course Learning Outcomes (COs):
After completion of the course, the student will be able to..
CO1: develop his/her personally through community service rendered
CO2 : apply their education to find solutions to individual and community problems
CO3 : acquire capacity to meet emergencies and natural disasters
CO4 : acquire a democratic attitude, leadership qualities and practice national integration

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (NETWORKS)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)

URR-18R22

SCHEME OF INSTRUCTION & EVALUATION
II-SEMESTER OF 4-YEAR B. TECH DEGREE PROGRAM

[5Th+4P+1MC]

Sl. No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	BSC	U18MH201	Engineering Mathematics – II	3	1	-	4	10	30	40	60	100
2	ESC	U18CS202R1	Data Structures through C	3	-	-	3	10	30	40	60	100
3	BSC	U18PH203	Engineering Physics	3	1	-	4	10	30	40	60	100
4	HSMC	U18MH204	English for Communication	2	-	2	3	10	30	40	60	100
5	ESC	U18EE205	Basic Electrical Engineering	3	1	_	4	10	30	40	60	100
6	ESC	U18EE206	Basic Electrical Engineering Laboratory	-	-	2	1	40	-	40	60	100
7	ESC	U18CS207R1	Data Structures through C Laboratory	-	-	2	1	40	-	40	60	100
8	BSC	U18PH208	Engineering Physics Laboratory	_	_	2	1	40	-	40	60	100
9	ESC	U18ME209	Workshop Practice	-	_	2	1	40	-	40	60	100
10	MC	U18EA210	EAA: Sports/Yoga/NSS*	-	-	2	-	100	-	100	-	100
Total:				14	3	12	22	310	150	460	540	1000

[L= Lecture, T = Tutorials, P = Practicals & C = Credits] EAA: Extra Academic Activity * indicates mandatory non-credit course

Total Contact Periods/Week: 29
Total Credits: 22
Stream-I: ME, CSE, IT, CSN,CSE(IOT)
Stream-II: CE, EIE, EEE, ECE, ECI,CSE(AI&ML)

Internships: All students should plan for mandatory 6-8 weeks internship, from end of II semester to commencement of VII semester at industry/R&D organizations/industries of national importance (IITs/IIITs/NITs). As part of Internship Evaluation in VII Semester, students are expected to submit a well-documented internship report and give an informative ppt presentation in VII semester.

U18MH201 ENGINEERING MATHEMATICS- II

Class: B.Tech. II-Semester

Branch(s): ME, CSE, IT, CSN, CSIOT
CE, EEE, ECE, ECI,CSAIML, DS

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in

LO1: various methods of solving system of linear equations and eigen value problems

LO2: double integral, triple integral and their applications.

LO3: vector differential calculus with few engineering applications.

LO4*: integration of vector valued functions with few engineering applications*

UNIT-I (9+3)

Matrices: Elementary transformations on a matrix. To find inverse of a matrix using elementary transformations- Rank of matrix, Normal form of a matrix, Solution of system of homogenous and non homogeneous linear equations, Linear dependence and independence of vectors.

Eigen values and Eigen vectors of a matrix- Cayley Hamilton's theorem, Reduction of a matrix to diagonal form, Reduction of a quadratic form to canonical form.

UNIT-II (9+3)

Multiple Integrals and Applications: Double integral, change of order of integration, Double integration in polar coordinates, Triple integrals, Applications: Area enclosed by plane curves, Volumes of solids, Calculation of mass, Center of gravity, Moment of Inertia of plane lamina.

Beta and Gama functions and their relations. Evaluation of improper integrals in terms of Beta and Gamma functions.

UNIT-III (9+3)

Vector Differential Calculus: Vector functions - Derivative of a vector function of a scalar variable, Velocity and acceleration, Curves in Space, Tangent, Principal normal, Binormal, Curvature, Torsion of a given curve and Frenet -Serret Formulae.

Scalar and vector point functions, Vector operators – Gradient of a scalar field, Directional derivative, angle between two surfaces.

Divergence of a vector field, Curl of a vector field and their physical interpretations. Irrotational fields & Solenoidal fields. to find scalar potential of a conservative vector field.

UNIT-IV (9+3)

Vector Integration: Integration of vector valued functions of a scalar variable, Application to find velocity and displacement of a particle. Line integral of scalar point and vector point functions, Applications: Work done by a force, Circulation; Surface Integral & Volume integral.

Green's theorem in plane, and area of a plane region using Green's theorem. Stokes theorem & Gauss divergence theorems (without proof)

Text Books:

[1] Grewal, B.S., Higher Engineering Mathematics, 43/e, Delhi, *Khanna Publishers* ,2014.

Reference Books:

[1] Kreyszig E, Advanced Engineering Mathematics,9th edition, Inc, U.K, John wiely *& sons*, 2013.

[2] Spiegel M., Vector Analysis -Schaum Series", McGraw Hill

[3] S.S. Sastry, Engineering Mathematics 3/e, Vol.II, Prentice Hall of India,2014

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: *demonstrate matrix theory in solving system of linear equations and Eigen value problems*

CO2: *apply basic concepts of multiple integrals in evaluating physical quantities of real life engineering problems*

CO3: *apply differential operators on vector and scalar point functions and their few applications in the field of engineering*

CO4: *solve line, surface, volume integrals and corelate these with applications of Green, Stoke and Gauss divergence theorems*

Course Articulation Matrix (CAM): U18 MH201 ENGINEERING MATHEMATICS- II

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**U18MH201.1**	3	2	1	--	--	--	--	--	--	--	--	1	-	-
CO2	**U18MH201.2**	3	3	2	--	--	--	--	--	--	--	--	-	-	-
CO3	**U18MH201.3**	3	2	2	--	--	--	--	--	--	--	--	1	-	-
CO4	**U18MH201.4**	3	2	2	--	--	--	--	--	--	--	--	-	-	-
U18MH201		**3**	**2.25**	**1.75**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**		

U18CS202R1 DATA STRUCTURES THROUGH C

Class: B. Tech II-Semester

Branch(s): ME, CSE, CSN, IT, CSIoT
CE, EEE, ECE, ECI, CSAIML, DS

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on

LO1*: fundamental data structures and their usage with arrays*

LO2*: representing the linear data structures with stacks and queues*

LO3*: arranging the data using various sorting techniques and representing the data using linked lists*

LO4*: representing non-linear data structures with trees and graphs*

UNIT – I (9)

Introduction to Data Structures: Basic terminology, classification of data structures, operations on data structures

Arrays: Operations on arrays-traversing an array, inserting an element in an array, deleting an element from an array, searching an element using binary search

Dynamic Memory Allocation: Memory allocation functions, dynamic memory allocation for single and two dimensional arrays

UNIT – II (9)

Stacks: Introduction to stacks, array representation of stacks, operations on a stack– push and pop; applications of stacks- recursion, evaluation of expressions (infix to postfix conversion, evaluation of postfix expression)

Queues: Introduction to queues, array representation of queues, circular queues

UNIT - III (9)

Linked Lists: Basic terminologies, linked list versus arrays, memory allocation and deallocation for a linked list, singly linked list operations- traversing, searching, inserting, deleting, reversing; representing stack and queue using linked list

Sorting Techniques: bubble sort, selection sort, quick sort

UNIT – IV (9)

(Concepts and algorithms only)

Trees: Introduction, types of trees. **Binary Tree:** Creating a binary tree, traversing a binary tree- preorder, inorder, postorder recursive traversals.

Binary Search Tree: Operations- searching for a node in binary search tree, inserting an element into binary search tree.

Graphs: Introduction, graph terminology, representation of graphs, graphs traversal methods- breadth first search, depth first search

Text Book:

1. Reema Thareja, Data Structures Using C, *2nd ed.* Hyderabad: Oxford University Press, 2014.

Reference Books:

1. E.Balagurusamy, Programming in ANSI-C, 6th ed. *Tata McGraw Hill*, 2012.
2. Debasis Samanta, Classic Data Structures, 2nd ed. New Delhi: *Prentice Hall India*, 2009.
3. E Balagurusamy, Data Structure Using C, New Delhi: McGraw Hill Education, 2017.
4. Richard F. Gilberg and Behrouz A. Forouzan, Data Structures: A Pseudocode Approach with 2nd ed. Singapoor: Cengage Learning, 2007.

Course Learning Outcomes(COs):

After completion of this course, students' will be able to,

CO1*: implement programs using static & dynamic arrays*

CO2*: apply the linear data structures with stacks and queue*

CO3*: arrange the data with the help of various sorting techniques and linked lists*

CO4*: organize the data using non-linear data structures with trees and graphs*

Course Articulation Matrix (CAM): U18CS202R1 DATA STRUCTURES THROUGH C

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18CS202R1.1	1	1	-	-	-	-	-	-	-	1	-	1	2	1	1
CO2	U18CS202R1.2	1	2	2	2	-	-	-	-	-	1	-	1	2	2	2
CO3	U18CS202R1.3	1	2	2	2	-	-	-	-	-	1	-	1	2	2	2
CO4	U18CS202R1.4	1	2	2	2	1	-	-	-	-	1	1	1	2	2	2
U18CS202R1		1	1.75	2	2	1	-	-	-	-	1	1	1	2	1.75	1.75

U18PH203 ENGINEERING PHYSICS

Class: B.Tech. I– Semester
B.Tech. II-Semester

Branch(s): ME, CSE, CSN, IT, CSIoT
CE, EEE, ECE, ECI, CSAIML, DS

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Examination	60 Marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on...

LO1: different types of oscillations with illustrations by mechanical and electrical examples, high frequency sound waves and their applications in various fields

LO2: concepts of interference, diffraction and polarization of light waves and their applications

LO3: concepts and working principles of lasers, fiber optics and their applications in various fields

LO4: basic concepts of quantum mechanics, modern materials and their applications

UNIT-I (9+3)

Oscillations: Physical examples of simple harmonic motion: Torsional pendulum, Physical pendulum; Spring-mass systems; Loaded beams; two body oscillations; Qualitative treatment of free, damped and forced oscillations- resonance; Series and parallel resonant circuits, Q-factor.

Ultrasonics: Properties of ultrasonics; Production of ultrasonic waves: Magnetostriction method and Piezo-electric method; Detection of ultrasonic waves; Acoustic grating- Determination of wavelength of ultrasonics; Applications of ultrasonic waves- Pulse echo NDT technique (reflection mode).

UNIT-II (9+3)

Interference: Superposition principle; coherence; phase change on reflection; Interference of reflected light from uniform thin films; anti reflection coating; Newton's rings in reflected light- applications: determination of wavelength of a monochromatic light and refractive index of a liquid; Michelson's Interferometer- applications: determination of wavelength of a monochromatic light, thickness and refractive index of a thin transparent sheet;

Diffraction: Distinction between Fresnel and Fraunhofer class of diffraction; Fraunhofer diffraction at a single slit (phasor method) and a circular aperture- Rayleigh's criterion for resolution; Diffraction grating (qualitative)- Dispersive power and resolving power of a diffraction grating; determination of wavelength of a monochromatic light using diffraction grating.

Polarisation: Polarised light; double refraction; geometry of calcite crystal; Nicol prism; Huygen's explanation (positive and negative crystals); quarter and half wave plates; Production and detection of plane, circularly and elliptically polarized light; Applications- Optical activity, LCDs.

UNIT-III (9+3)

Lasers (Qualitative): Difference between conventional and laser light; Absorption; Spontaneous and stimulated emission; Relation among Einstein coefficients; Basic principles - Population inversion, pumping methods, optical resonator; Types of lasers- Ruby, Nd-YAG, He-Ne and CO_2 Laser; Applications of lasers: Holography- introduction, formation and reconstruction of a hologram; Applications of holography.

Fiber Optics(Qualitative): Introduction- Total internal reflection; Fiber construction; Numerical aperture and acceptance angle; Types of optical fibers- Step index and graded index; V-number; Fiber drawing- Double crucible technique; Splicing- Fusion & Mechanical; Power losses in optical fibers- Attenuation, dispersion, bending; Fiber optic communication system; Applications of optical fibers - endoscope; Fiber optic sensors (temperature and displacement).

UNIT-IV (9+3)

Elements of Quantum Mechanics: de-Broglie concept of matter waves- de-Broglie wavelength, properties of matter waves; Schrodinger time-independent wave equation (one dimension); Physical significance of wave function (Max Born interpretation); Particle in a box (one dimension)- energy quantization; Uncertainty principle - illustration and application to the non- existence of free electron in the nucleus.

Modern Materials (Qualitative):

Magnetic Materials: Introduction- Origin of magnetic moment; Bohr magneton; Permeability; Magnetization; susceptibility; Classification of magnetic material; Applications of magnetic materials: Magnetic recording and Magnetic memories.

Superconducting Materials: Superconductivity; Meissner effect; Transition temperature; Isotope effect; London's penetration depth; Type-I and Type-II superconductors; High T_c superconductors; Applications of superconductors.

Nanomaterials: Introduction- Classification of nanomaterials; Surface area to volume ratio; Quantum confinement; Properties of nanomaterials- Physical, chemical, electrical, optical, magnetic and mechanical properties; Applications of nanomaterials (in brief); Synthesis of nanomaterial: Bottom up approach (sol-gel method) and Top down approach (ball milling method).

Text Books:

1. Bhattacharya and Bhaskaran, *Engineering Physics*, Oxford University Press, 1/e, 2013.
2. V. Rajendran, *Engineering Physics*, Mc Graw Hill, 2013.

Reference Books:

1. David Halliday, Robert Resnick & Krane, *Physics Volume I & II*, Wiley India Limited, 5/e, *2014.*
2. R.K. Gaur and S.L.Gupta, *Engineering Physics*, Dhanpath Rai and Sons, 2013.
3. P.K. Palanisamy, *Engineering Physics*, Scitech Publishers, 3/e, 2013.
4. M. Avadhanulu and Kshirsagar, *A Text Book of Engineering Physics*, S. Chand & Company Ltd, 10/e. 2013.

Course Learning Outcomes (COs):

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

CO1: determine the time period and frequency of SHM oscillatory system and know the principles and applications of ultrasonics in different fields

CO2: appraise the concepts of interference, diffraction and polarization phenomena in accurate determination of wavelengths, thicknesses, narrow slit widths, optical activity, etc

CO3: interpret the characteristics and working of lasers, optical fibers and their applications in various fields

CO4: categorize the properties of magnetic, superconducting and nanomaterials and know their engineering applications

Course Articulation Matrix (CAM): U18PH203 ENGINEERING PHYSICS															
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	U18PH203.1	2	1	-	-	1	1	-	-	1	-	-	-	-	-
CO2	U18PH203.2	2	1	1	1	-	1	1	-	1	-	-	-	-	-
CO3	U18PH203.3	3	1	1	1	2	1	1	-	1	-	-	-	-	-
CO4	U18PH203.4	3	-	1	1	1	2	1	-	1	-	-	-	-	-
	U18PH203	2.5	1	1	1	1.33	1.25	1	-	1	-	-	-	-	-

U18MH204 ENGLISH FOR COMMUNICATION

Class: B.Tech. I-semester
B.Tech.II-Semester

Branch (s): ME, CSE, CSN, IT, CSIo
CE, EEE, ECE, ECI, CSAIML, DS

Teaching Scheme :

L	T	P	C
2	–	2	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in...

LO1: accuracy in and familiarity with various sentence structures to communicate correctly and effectively

LO2: judicious and situational use of vocabulary to bring effectiveness to communication

LO3: various reading skills to comprehend the text

LO4: writing strategies, academic writing, pre-planning before writing and maintenance of coherence while writing a paragraph

UNIT-I (6)

Grammar:

Clause Analysis - Types of Clauses: Noun Clause - Relative Clause - Adverb Clause.

Transformation: Simple, Complex, Compound Sentences.

Errors-Nouns-Pronouns-Adjectives-Adverbs-Prepositions-Tenses-Articles-Subject-Verb Agreement

Reading

"In Banaras"- from "The Stories of My Experiments with Truth-An Autobiography of Mahathma Gandhi"

UNIT-II (6)

Vocabulary:

Vocabulary-Antonyms-Synonyms-Prefixes-Suffixes-Phrasal Verbs-One Word Substitutes-Word Pairs

Reading

"Education Provides a Solid Foundation"- from Wings of Fire –An Autobiography of APJ Abdul K

UNIT-III (6)

Reading Skills:

"An Astrologer's Day" by R.K.Narayan
"On Saying Please" by A. G. Gardiner

UNIT-IV (6)

Writing Skills:

Precis Writing
Essay Writing
Report Writing

Text Books:

1."Work Book on English for Communication" (Unit 1, 2, 3, 4) by the faculty of English, Kakatiya Institute of Technology and Science, Warangal

Reference Books:

1. Harper Collins, "Cobuild English Grammar" Third Edition, *Harper Collins Publishers Ltd.*
2. Sanjay Kumar & Pushp Lata, "Communication Skills" Second Revised Edition,2015, *Oxford University Press Ltd.*
3. R.K. Narayan," Malgudi Days" Indian Thought Publications,1943
4. APJ Abdul Kalam, "Wings of Fire" An Autobiography, Universities Press,1999
5. Mahatma Gandhi," The Story of My Experiments with Truth" An Autobiography, Global Vision Press,2013.

Course Learning Outcomes (COs):

On completion of this course, students will be able to...

CO1: Speak and write with accuracy a variety of sentence structures.

CO2: Build vocabulary through contextual clues from the text

CO3: Apply appropriate reading strategies to summarize and paraphrase the text by understanding the main ideas.

CO4: Write well organized paragraphs with accuracy contextually suitable vocabulary.

Course Articulation Matrix (CAM): U18MH204 ENGLISH FOR COMMUNICATION

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	U18MH204.1	-	1	-	1	1	1	1	1	1	3	2	1		
CO2	U18MH204.2	1	1	-	--	--	--	1	--	3	2	--	3		
CO3	U18MH204.3	-	1	-	--	--	--	--	--	2	2	2	3		
CO4	U18MH204.4	-	1	1	1	--	--	1	--	3	2	1	3		
U18MH204		1	1	1	1	1	1	1	1	2.2	2.25	1.7	2.5		

ENGLISH LANGUAGE LAB

Listening Skills (3×2):

Listening to Sounds, Stress and Intonation

Listening for Information

Life Skills (3×2)

Etiquette

Goal Setting

Body Language

Speaking Skills & Writing Skills (6×2)

a. ***Presentation Techniques:***

Self Introduction

JAM (Just A Minute)

Group Discussion

Debate

Description

Interview Skills

b. ***Assignment:***

Students have to present PPT on the topics given in the English Laboratory

Writing Skills

a) planning
b) coherence
c) accuracy

U18EE205 BASIC ELECTRICAL ENGINEERING

Class: B.Tech. I- Semester
B.Tech. II-Semester

Branch(s): ME, CSE, CSN, IT, CSIoT
CE, EEE, ECE, ECI, CSAIML, DS

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40
End Semester Examination	60

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on

LO1: network elements and analysis of simple electrical DC circuits

LO2: DC network theorems

LO3: fundamentals of 1- and 3- AC circuits

LO4: working principles and applications of DC & AC machines, concepts of earthing, fuses, lighting sources, MCB & batteries

UNIT – I (9+3)

DC circuits: Introduction, network elements, Ohm's law, electric power, electrical energy, Kirchhoff's laws, resistances in series-voltage divider rule, resistances in parallel-current divider rule, series & parallel circuits, mesh analysis, nodal analysis (T & π networks only)

UNIT – II (9+3)

DC network theorems (Independent sources only): Introduction, superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem (T and π networks only)

UNIT – III (9+3)

1- AC circuits: Phasor representation of sinusoidal quantities, average and R.M.S values of sinusoidal wave form, AC through resistor, inductor, capacitor and series R-L-C circuit

3-f AC circuits: Production of 3-f voltages, voltage & current relationships of line and phase values for balanced star and delta connections

UNIT – IV (9+3)

Introduction to electrical machines (Qualitative treatment): Construction, principle of operation &applications of 1-f transformer, 3-f induction motor, 1-f induction motor and DC motor

Electrical earthing, fuses & lighting sources: Basic concepts of earthing, fuses and lighting sources-incandescent, fluorescent, CFL & LED lamps, Miniature Circuit Breaker(MCB), types of batteries

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Text Book:

1. K. Uma Rao, *Basic Electrical Engineering*, New Delhi: Pearson Education, 2011.

Reference Books:

1. B.L.Thereja, A.K.Thereja, *Electrical Technology Vol. I & II*,23rd ed., New Delhi: S.Chand& Company Ltd, 2005.
2. Edward Hughes, *Electrical & Electronics Technology*, 10th ed., New Delhi: Pearson Education,2010.
3. D. P. Kothari and I. J. Nagrath, *Basic Electrical Engineering*, New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2010.
4. Chakravarthy A, Sudhipanath and Chandan Kumar, *Basic Electrical Engineering*, Tata McGraw Hill Education (India) Pvt. Ltd., 2009.

Course Outcomes (COs):

On completion of the course, the students will be able to...

CO1: determine voltage, current & power in electrical circuits using mesh & nodal analysis

CO2: apply suitable DC network theorems to analyze T & π networks

CO3: find current, voltage & power in 1-phase& 3 -phase AC circuits

CO4: explain construction, working principle & applications of electrical machines; electrical earthing, fuses, lighting sources, MCB & batteries

Course Articulation Matrix: U18EE205 BASIC ELECTRICAL ENGINEERING													
CO		PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	U18EE205.1	2	1	-	-	-	-	-	-	-	-	-	-
CO2	U18EE205.2	2	2	-	-	-	-	-	-	-	-	-	-
CO3	U18EE205.3	3	3	1	1	1	-	1	-	-	1	-	-
CO4	U18EE205.4	3	3	1	1	1	1	1	1	-	1	-	-
U18EE205		**2.5**	**2.25**	**1**	**1**	**1**	**1**	**1**	**1**	-	**1**	-	-

U18EE206 BASIC ELECTRICAL ENGINEERING LABORATORY

Class: B.Tech. I-Semester
B.Tech. II-Semester

Branch(s): ME, CSE, CSN, IT,CSIoT
CE, EEE, ECE, ECI, CSAIML, DS

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40
End Semester Examination	60

Course Learning Objectives (LOs):
This laboratory course will develop students' knowledge in/on
LO1: domestic wiring & basic electrical installations
LO2: network elements and analysis of electrical circuits
LO3: 1-phase and 3-phase AC circuits
LO4: measurement of illumination

LIST OF EXPERIMENTS

1. Verification of Kirchhoff's Laws
2. Verification of voltage divider rule and current divider rule
3. Verification of Thevenin's theorem
4. Verification of Norton's theorem
5. Verification of Superposition theorem
6. Verification of Maximum power transfer theorem
7. Determination of internal parameters of a choke coil
8. Impedance calculations and phasor representation of R-L series circuit
9. Impedance calculations and phasor representation of R-C series circuit
10. Load test on 1-phase transformer
11. Voltage and current relationships between line & phase quantities for balanced 3-phase star & delta connections
12. Measurement of illumination for various lighting sources

** DEMONSTRATION OF ELECTRICAL INSTALLATIONS **
[Wires, Cables, Fuse, MSB, Batteries, Earthing]

Text Books:

1. *Basic Electrical Engineering Laboratory Manual*, Department of EEE, KITSW

Course Outcomes (COs):
On completion of this course, the students will be able to…
CO1: handle basic electrical equipment
CO2: understand the concepts of network elements and theorems
CO3: understand fundamental concepts of 1-phase and 3-phase AC circuits
CO4: determine illumination of various lighting sources

Course Articulation Matrix (CAM): U18EE206 BASIC ELECTRICAL ENGINEERING LABORATORY

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	U18EE206.1	2	2	1	1	1	1	-	-	2	2	1	2
CO2	U18EE206.2	2	1	-	1	-	1	-	-	2	1	1	1
CO3	U18EE206.3	2	2	2	2	1	1	1	-	2	1	2	1
CO4	U18EE206.4	2	1	1	2	1	1	1	-	2	1	1	1
U18EE206		**2**	**1.5**	**1.33**	**1.5**	**1**	**1**	**1**	**-**	**2**	**1.25**	**1.25**	**1.25**

U18CS207R1 DATA STRUCTURES THROUGH C LABORATORY

Class: B. Tech II-Semester

Branch(s): ME, CSE, CSN, IT, CSIoT
CE, EEE, ECE, ECI, CSAIML, DS

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

List of Experiments

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on

LO1*: implementing array operations*
LO2*: organizing the data using stacks and queues*
LO3*: different types of sorting techniques*
LO4*: memory and data management using linked list*

Experiment-I

1. Program to implement initialization of array and traversal operation
2. Program to implement insertion operation on array

Experiment-II

3. Program to implement searching operations on array
4. Program to implement deletion operations on array

Experiment-III

5. Program to display the count of occurrences of every number in an array
6. Program to represent and display the sparse matrix

Experiment-IV

7. Program to implement initialization of arrays and traversal operation with DMA
8. Program to implement matrix addition and subtraction with DMA

Experiment-V

9. Program to implement matrix multiplication with DMA
10. Program to implement stack operations

Experiment-VI

11. Program to convert infix expression into postfix
12. Program to evaluate given postfix expression

Experiment-VII

13. Program to implement queue operations using arrays

Experiment-VIII

14. Program to create single linked list and implement its operations
    i) insert ii) traversal iii) search

Experiment-IX

15. Program to create single linked list and implement its operations
    i) delete ii) reversal

Experiment-X

16. Program to implement stack operations using linked list
17. Program to implement queue operations using linked list

Experiment-XI

18. Program to implement bubble sort
19. Program to implement selection sort

Experiment-XII

20. Program to implement quick sort

Laboratory Manual:

1. 'Data Structures Using C' laboratory manual, Dept. of CSE, KITSW.

Reference Books:

1. Reema Thareja, Data Structures Using C, *2nd ed.* Hyderabad: Oxford University Press, 2014.
2. E.Balagurusamy, Programming in ANSI-C, 6th ed. *Tata McGraw Hill*, 2012.
3. Richard F. Gilberg and Behrouz A. Forouzan, Data Structures: A Pseudocode Approach with C, 2nd ed. Singapoor: Cengage Learning, 2007.

Course Learning Outcomes (COs):

After completion of this course, students will be able to,

CO1*: implement the fundamental data structures using C-language*

CO2*: deveCourse Learning Objectives (LOs):*

CO3*: implement programs for arranging the data using various sorting techniques*

CO4*: develop program using linked representation*

Course Articulation Matrix (CAM): U18CS207R1 DATA STRUCTURES THROUGH C LABORATORY

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18CS207R1.1	1	1	-	-	-	-	-	-	1	1	-	1	**2**	**2**	**2**
CO2	U18CS207R1.2	1	2	2	2	-	-	-	-	1	1	-	1	**2**	**2**	**2**
CO3	U18CS207R1.3	1	2	2	2	-	-	-	-	1	1	-	1	**2**	**2**	**2**
CO4	U18CS207R1.4	1	2	2	2	1	-	-	-	1	1	1	1	**2**	**2**	**2**
U18CS207R1		**1**	**1.75**	**2**	**2**	**1**	-	-	-	1	1	1	**1**	**2**	**2**	**2**

U18PH208 ENGINEERING PHYSICS LABORATORY

Class: B.Tech. I– Semester
B.Tech. II-Semester

Branch(s): ME, CSE, CSN, IT, CSIoT
CE, EEE, ECE, ECI, CSAIML, DS

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This laboratory course will develop students' knowledge in/on...

LO1: determination of various properties like rigidity modulus, moment of inertia, acceleration due to gravity and other elastic properties from SHMs

LO2: determination of the wavelengths, diameters of thin wires, limit of resolution and optical activity with high degree of accuracy from interference, diffraction and polarization phenomena using conventional light

LO3: determination of the wavelengths, slit widths with high degree of accuracy from diffraction phenomena using laser light

LO4: determination of optical fiber characteristics

LIST OF EXPERIMENTS

1. Determination of (a) rigidity modulus of a given wire and (b) moment of inertia of a ring using torsional pendulum
2. Acceleration due to gravity (g) by compound pendulum
3. Determination of force constant of a spiral spring using static method
4. Determination of wavelengths in mercury light using diffraction Grating- Normal incidence method
5. Determination of wavelength of He-Ne laser using reflection grating
6. Resolving power of a telescope
7. Determination of slit width using He-Ne laser
8. Dispersive power of a prism using spectrometer
9. Determination of wavelength of a monochromatic light using Newton's rings
10. Determination of thickness of thin wire using wedge method
11. Determination of specific rotation of sugar solution using Polarimeter (Saccharimeter)
12. Numerical aperture of an optical fiber

Laboratory Manual:

1. *Manual for Engineering Physics Laboratory* prepared by the Department of Physical Sciences/Physics, KITSW

Reference Book:

1. C.V. Madhusudhana Rao and V. Vasanth Kumar, *Engineering Lab Manual*, Scitech publications India Pvt. Ltd, 3/e, 2012.

Course Learning Outcomes (COs):

After completion of this course, students will be able to …

CO1: determine precisely the values of elastic properties, moments of inertia, acceleration due to gravity, etc

CO2: assess precise measurements of wavelengths, diameter of thin wires, limit of resolution and optical rotation from light phenomena (Interference, diffraction and polarization)

CO3: evaluate the wavelengths, slit widths from diffraction patterns using laser light

CO4: estimate the numerical aperture, acceptance angle and fiber losses of optical fibers

Course Articulation Matrix (CAM): U18PH208 ENGINEERING PHYSICS LABORATORY															
CO		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	U18PH208.1	1	-	-	3	-	-	2	-	2	-	-	-	-	-
CO2	U18PH208.2	1	-	-	3	-	-	2	-	2	-	-	-	-	-
CO3	U18PH208.3	1	-	-	3	-	-	2	-	2	-	-	-	-	-
CO4	U18PH208.4	2	-	1	3	-	-	2	-	2	-	-	-	-	-
U18PH208		1.25	-	1	3	-	-	2	-	2	-	-	-	-	-

U18ME209 WORKSHOP PRACTICE

Class: B. Tech. I & II Semesters **Branch(s):** ME, CSE, CSN, IT, CSIoT, CE, EEE, ECE, ECI, CSAIML, DS

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives (LOs):
This course will develop students' knowledge in/on...
LO1: tools and development of joints in carpentry
LO2: mould cavity using single and two piece pattern
LO3: tools and development of joints using fitting and plumbing
LO4: principle and operation of arc welding, gas welding and soldering

LIST OF EXPERIMENTS

Carpentry:
1. Prepare a cross half lap joint
2. Prepare a half lap dovetail joint
3. Prepare mortise and tenon joint

Foundry:
1. Prepare a sand mould using single piece pattern-bracket
2. Prepare a sand mould using two piece pattern-dumbbell

Fitting:
1. Prepare a square fit.
2. Prepare a half round fit.

Plumbing:
1. Prepare a PVC Pipe joint using elbows & tee
2. Prepare a PVC Pipe joint using union & coupling

Welding:
1. Prepare a single V – Butt Joint using Arc welding
2. Preparation of pipe joint using gas welding
3. Soldering and de-soldering of Resistor in PCB.

Laboratory Manual:
[1] Workshop Practice Manual, Dept. of ME, KITSW.

Reference Book:
[1] Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy., *Elements of Workshop Technology*, Vol-I-2008 &Vol-II-2010, Media Promoters and publishers Pvt. Ltd, India.

Course Learning Outcomes (COs):
On completion of the course, the student will be able to...
CO1: identify and apply suitable tools to produce cross, half lap, mortise & tenon joints in carpentry trade
CO2: apply basic gating system and produce a mould cavity for single & split pattern
CO3: identify and apply suitable tools to make various joints in fitting & plumbing trade
CO4: adapt suitable welding process and build joints in welding trade

Course Articulation Matrix (CAM): U18ME209 WORKSHOP PRACTICE

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	U18ME209.1	2	1	1	-	-	1	-	-	-	1	-	1
CO2	U18ME209.2	2	1	1	-	-	1	-	-	-	1	-	1
CO3	U18ME209.3	2	1	1	-	-	1	-	-	-	1	-	1
CO4	U18ME209.4	2	1	1	-	-	1	-	-	-	1	-	1
U18ME209		**2**	**1**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**1**	**-**	1

U18EA210 EAA: SPORTS/YOGA/NSS

Class: B. Tech. I -Semester
B. Tech. II -Semester

Branch(s): ME, CSE, CSN, IT, CSIoT
CE, EEE, ECE, ECI, CSAIML, DS

Teaching Scheme :

L	T	P	C
-	-	-	-

Examination Scheme :

Continuous Internal Evaluation	
End Semester Exam	

I. SPORTS

Course Learning objectives (LOs):
The objectives of the Sports is to..
LO1: to perform and engage in a variety of physical activities
LO2 : to develop and maintain physical health and fitness through regular participation in physical activities
LO3: to demonstrate positive self esteem, mental health and physiological balance through body awareness and control
LO4 : to exhibit the spirit of fair play, team work and sportsmenship

Activities related to:

1. Physical Fitness
2. Games & Sports

II. NATIONAL SERVICE SCHEME (NSS)

Course Learning objectives (LOs):
The objectives of the NSS is to..
LO1: arouse the social consciousness of the students
LO2 : provide them with opportunity to work with people in villages and slums
LO3 : expose them to the reality of life
LO4 : bring about a change in their social perceptions
LO5 : develop competence required for responsibility sharing and team work

List of Activities:

1. Shramadanam
2. Tree Plantation
3. General Medical camps in Villages
4. Awareness on Eye Donation
5. Awareness on "Child Labour and Child Marriages"
6. Awareness programs on " Literacy, Good Health Practices, etc."
7. Safe Riding Program
8. Awareness program on "RTI Act"
9. Awareness on Blood Donation

Course Learning Outcomes (COs):
After completion of the course, the student will be able to..
CO1: develop his/her personally through community service rendered
CO2 : apply their education to find solutions to individual and community problems
CO3 : acquire capacity to meet emergencies and natural disasters
CO4 : acquire a democratic attitude, leadership qualities and practice national integration

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING(NETWORKS)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)

URR-18R22

SCHEME OF INSTRUCTION & EVALUATION
III-SEMESTER OF 4-YEAR B. TECH DEGREE PROGRAM

[7Th+2P]

S.No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	BSC	U18MH301	Engineering Mathematics – III	3	1	-	4	10	30	40	60	100
2	HSMC	U18MH302	Soft and Inter personal Skills	_	_	2	1	100	-	100	-	100
3	PCC	U18AI303	Object Oriented Programming through JAVA	3	1	-	4	10	30	40	60	100
4	PCC	U18AI304	Operating Systems	3	-	-	3	10	30	40	60	100
5	PCC	U18AI305	Computer Organization and Architecture	3	-	-	3	10	30	40	60	100
6	PCC	U18AI306R22	Advanced Data Structures	3	-	-	3	10	30	40	60	100
7	PCC	U18AI307	Formal Languages and Automata Theory	3	-	-	3	10	30	40	60	100
8	PCC	U18AI310	Object Oriented Programming through Java Laboratory	-	-	2	1	40	-	40	60	100
9	PCC	U18AI311R22	Advanced Data Structures Laboratory	_	_	2	1	40	-	40	60	100
			Total:	18	2	6	23	240	180	420	480	900

[L= Lecture, T = Tutorials, P = Practicals & C = Credits] Total Contact Periods/Week : 26Total Credits: 23

Stream-I: ME, CSE, IT, CSN,CSE(IOT) Stream-II: CE, EIE, EEE, ECE, ECI,CSE(AI&ML)

U18MH301 ENGINEERING MATHEMATICS-III

Class: B.Tech. III-Semester **Branch:** Common to all branches

Teaching Scheme

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives (LOs):
This course will develop students' knowledge in /on
LO1: Laplace transform and its use to find the solutions of certain initial and boundary value problems occur in engineering
LO2: Fourier series and its importance.
LO3: functions of complex variables and the property of analyticity of a function of complex variable and their applications.
LO4: integration of a function of complex variable, and evaluation of certain real integrals using complex analysis.

UNIT-I (9+3)

Laplace Transforms: Integral transforms, Kernel of a transform, Laplace transform of a function, Inverse Transform-Existence and uniqueness of Laplace Transforms, S- plane and regionofconvergence(ROC),LaplaceTransformofsomecommonlyusedsignals-Dirac-delta (impulse) function$[\delta(t)]$,step$[u(t)]$,ramp $[tu(t)]$,parabolic $[t^2u(t)]$,real exponential $[e^{at}u(t)]$, complex exponential$[e^{j\Omega t}u(t)]$,sine and cosine functions, damped sine and cosine functions, hyperbolic sine and cosine functions, damped hyperbolic sine and cosine functions, rectangular pulse and triangle. Properties of Laplace Transforms- Linearity, First shifting theorem (Frequency shift property), Laplace transforms of derivatives and integrals, time scaling property, time reversal property, Laplace Transform of Heaviside unit step function, Second shifting theorem (time shift property), Initial value and final value theorems, Laplace transform of periodic functions- Convolution theorem.

Operational Calculus: Transfer functions, Solution of ordinary differential equations with constant coefficients and system of ordinary differential equations with constant coefficients using Laplace Transforms. Application of Laplace transforms to the first order and second order system subjected to impulse, step, periodic, rectangular, square, ramp, triangular and sinusoidal functions.

UNIT-II (9+3)

Fourier Series: Periodic functions, orthogonal and orthonormal functions and systems of orthogonal functions, representation of a function as Trigonometric Fourier series (FS) in a range of length 2π, Euler formulae, Conditions for the existence of Fourier series (Dirichlet's conditions), FS for typical wave forms-square wave, pulse train, impulse train(comb function), periodic rectangular wave, triangle, saw tooth, half wave rectified signal, full wave rectified signal, plotting FS coefficients - line spectrum (magnitude and Phase spectra), Fourier series on an arbitrary period, effects of symmetry of function on FS coefficients, half range series – half range cosine and sine series expansions, exponential FS.

UNIT-III (9+3)

Complex Variables: Functions of complex variables, Limit, Continuity, Differentiability, Analytic Functions, Cauchy-Riemann Equations in Cartesian and Polar coordinates. Elementary functions, Harmonic Functions, Construction of Analytic functions. Applications to find velocity potential and stream function of a flow. Conformal mapping and bilinear transformation.

UNIT-IV (9+3)

Complex Integration: Line integration in complex plane, integral of a non analytic function, dependence on path of integration, *ML*-Inequality, Cauchy's integral theorem, Cauchy's integral formula, series expansion of complex functions: Taylor's series and Laurent's series, zeros and singularities, residues, Residue Theorem- Applications of Residue theorem to the properly chosen integrals around a unit circle and semicircle.

Text Book:

1. Grewal, B.S., "Higher Engineering Mathematics", *Khanna Publishers,* Delhi, 43/e, 2014.

Reference Books:

1. Kreyszig E., "Advanced Engineering Mathematics", *John Wiley & Sons, Inc.,* U.K 9/e,2013.
2. Churchill R.V., "Complex Variable and its Applications", McGraw Hill, New York, 9/e,2013.

Course Code: **U18MH301** Course Name: **ENGINEERING MATHEMATICS-III**		
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18MH301.1**	*find the Laplace transform of a given function and apply Laplace transforms to solve and certain differential equations whose solutions cannot be computed using classical methods.*
CO2	**U18MH301.2**	*describe a given function as Fourier series in an interval and understand its importance in engineering.*
CO3	**U18MH301.3**	*understand the concept of a function of complex variable and verify whether a function is analytic or not, construct analytic function when real/imaginary part of the function is known; find velocity potential and stream function of a fluid flow using complex analytical methods.*
CO4	**U18MH301.4**	*represent a given function in Taylor's and Laurent's series and evaluate certain real integrals using integral theorems.*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course code:**U18 MH301** Course Name: **Engineering Mathematics-III**															
CO Code	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
U18MH301.1	2	2	-	--	--	--	--	--	--	--	--	1	1	--	1
U18MH301.2	2	2	-	--	--	--	--	--	--	--	--	1	1	--	1
U18MH301.3	2	2	-	--	--	--	--	--	--	--	--	1	1	--	1
U18MH301.4	2	1	-	--	--	--	--	--	--	--	--	1	1	--	1
U18MH301	**2**	**1.75**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**	**1**

U18TP302 SOFT AND INTERPERSONAL SKILLS

Class: B.Tech. III-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	100 marks
End Semester Exam	-

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on….

LO1: logical construction of speech appropriate for the occasion and exhibiting team work

LO2: acquiring spontaneity, presence of mind for effective communication

LO3: identifying, analyzing the theme of the topic and understanding presentation skills

LO4: communicating professionally and developing strategies in selecting career objectives in line with industry expectations

LIST OF ACTIVITIES

Introduction

Activity 1	Team interaction
Activity 2	SWOT analysis
Activity 3	Debate
Activity 4	Group Discussion

Activity 5	Presentations through PPTs
Activity 6	Video Synthesis
Activity 7	Resume Writing
Activity 8	Email Etiquette

Activity9 : My interview Plan: Self Introduction &FAQs
Activity1 :"My Career Plan" Oralpresentation
} Comprehensive Presentation

Text Books:

- Developing Communications Skills – Krishna Mohan & MeeraBenerji
- Soft Skills -Alex.K
- Soft skills Cornerstone of Professional success – Raman &Meenakshi

References:

- https://onlinecourses.nptel.ac.in/noc19_hs20/preview
- https://onlinecourses.nptel.ac.in/noc18_hs30/preview

Course Outcomes (COs):

Course code: **U18TP302/U18TP402** Course Name: **Soft and Interpersonal Skills**		
CO	**CO code**	*Upon completion of this course, the student will be able to…*
CO1	**U18TP302.1**	*introspect to convert strengths into opportunities, identify weaknesses, bypass threats*
CO2	**U18TP302.2**	*present views on various issues confidently in a group*
CO3	**U18TP302.3**	*make effective PPT presentations, synthesize videos*
CO4	**U18TP302.4**	*prepare a professional resume, communicate effectively to attain better opportunities*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course code: **U18TP302**									Course Name: **Soft and Interpersonal Skills**							
CO	**CO Code**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO2**
CO1	**U18TP302.1**	-	-	-	-	-	-	-	-	2	3	-	-	1	1	1
CO2	**U18TP302.2**	-	-	-	-	-	-	-	2	3	3	-	-	1	1	1
CO3	**U18TP302.3**	-	-	-	-	-	-	-	-	2	3	-	-	1	1	1
CO4	**U18TP302.4**	-	-	-	-	-	-	-	1	2	3	-	-	1	1	1
	U18TP302	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.5**	**2.25**	**3**	**-**	**-**	**1**	**1**	**1**

U18AI303 OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Class: B.Tech. III- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):
This course will develop students' knowledge in / on…
LO1: programming paradigms and java basics
LO2: classes, methods and strings
LO3: types of inheritance, dynamic method dispatch, interfaces and packages
LO4: streams (I/O), exception handling and multi-threading

UNIT-I (9+3)

Programming Paradigms: Procedural programming, Modular programming, Object oriented programming (OOP), Generic programming
Java Basics: History and evolution of Java, An overview of java, Data types, Variables and arrays, Operators, Control statements
Introducing Classes: Structures in C, Class fundamentals, Objects, Methods, Object reference variables

UNIT-II (9+3)

Classes and Methods: Overloading methods, *this* keyword, Passing and returning objects, Recursion, Variable length arguments, Constructors, Overloading constructors, Garbage collection, Static variables, Static blocks, Static methods, Nested and inner classes, Command line arguments, Wrapper classes
Strings: Exploring String, String Buffer, StringBuilder and String Tokenizer classes

UNIT-III (9+3)

Inheritance: Inheritance basics, Types of inheritance, *super* keyword, Method overriding, Order of constructors calling, Dynamic method dispatch, Abstract classes, *final* with inheritance, Object class
Interfaces: Defining an interface, Implementing interfaces, Nested interfaces, Interfaces can be extended
Packages: Packages, Packages and Member Access, Importing packages

UNIT-IV (9+3)

Using I/O: I/O basics, Reading, Writing and copying files using byte and character streams
Exception Handling: Fundamentals, Exception types, Uncaught exceptions, Using *try* and *catch*, Multiple catch clauses, Nested try statements, *throw*, *throws*, *finally*
Multithreading: Creating a thread, Creating multiple threads, Thread priorities, Synchronization, Interthread communication

Text Book:

[1] Herbert Schildt, *Java The Complete Reference*, 11th ed., New Delhi: McGraw-Hill Education, 2019.

Reference Books:

[1] Kathy Sierra, Bert Bates, *Head First Java*, 2nd ed., Boston: O'Reilly Publications, 2005.

[2] Uttam K. Roy, *Advanced JAVA Programming*, England: Oxford Publications,2013.
[3] Balaguruswamy, *Programming with Java: A Primer*, 6th ed., New Delhi: McGraw-Hill Education India Pvt. Ltd, 2019.
[4] TanweerAlam, *Internet and Java Programming*, New Delhi: Khanna Publishing House, 2010.

Course Research Papers: Research papers (Indexed Journal/Conference papers) relevant to the course content by the course faculty in Course Web page

Course Patents: Patents relevant to the course content will be posted by the course faculty in Course Web page

Course Projects: Course project is an independent project carried out by the student during the course period, the supervision of course faculty. Course faculty will post few course projects titles in Course Webpage. Students are encouraged to come up and experiment with the ideas that interest them

Course Learning Outcomes (COs):

On completion of this course, students' will be able to…

CO1: distinguish various programming paradigms and develop java fundamental programs
CO2: develop java programs using classes, constructors and various string concepts
CO3: make use of reusability concepts like inheritance, dynamic method dispatch, interfaces and packages to build java programs
CO4: *develop java programs using streams (I/O), exception handling and multithreading concepts*

Course Articulation Matrix (CAM):U18AI303 OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI303.1	2	1	1	1	1	1	-	1	1	1	-	2	2	1	2
CO2	U18AI303.2	2	2	2	2	1	1	-	1	1	1	-	2	2	1	2
CO3	U18AI303.3	2	2	2	2	2	1	-	1	1	1	-	2	2	2	2
CO4	U18AI303.4	2	2	2	2	2	1	-	1	1	1	-	2	2	2	2
U18AI303		2	1.75	1.75	1.75	1.5	1	-	1	1	1	-	2	2	1.5	2

U18AI304 OPERATING SYSTEMS

Class: B.Tech.III-Semester **Branch:** Computer Science and Engineering (AI&ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on…

LO1: basics of operating system, system structure and process
LO2: cpu scheduling, process synchronization and deadlocks
LO3: main memory, virtual memory and mass-storages
LO4: protectiontechniques and advantages of distributed system

UNIT – I (9)

Introduction: What operating systems do, Computer system architecture, Operating system operations, Process management, Memory management, Storage management, Protection and security, Computing environments

Operating System Structures: Operating system services, System calls, Types of system calls, System programs, Operating system structure, System boot

Processes: Process concept, Process scheduling, Interprocess communication

Case study: The Linux System

UNIT - II (9)

CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms– First come first served, Shortest job first, Priority, Round robin, Multilevel queue, Multilevel feedback queue

Process Synchronization: Background, The critical section problem, Petersons' solution, Synchronization hardware, Mutex locks, Semaphores, Classic problems of synchronization, Monitors

Deadlocks: System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock

UNIT - III(9)

Main Memory: Background, Swapping, Contiguous memory allocation, Segmentation, Paging

Virtual Memory: Background, Demand paging, Page replacement, Allocation of frames, Thrashing

Mass-Storage Structure: Overview of mass storage structure, Disk structure, Disk scheduling

UNIT - IV (9)

File-System Interface: File concept, Access methods, Directory and Disk Structure

File-System Implementation: Allocation methods, Free-space management

Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix

Distributed Systems: Advantages of distributed systems, Types of network-based operating systems, Communication structure, Robustness

Text Book:

[1] Abraham Silberschatz, Peter B Galvin, Gerg Gagne, *Operating System Concepts*, 9th ed., United States of America: Wiley, 2016.

Reference Books:

[1] EktaWalia, *Operating Systems*, 2nd ed., New Delhi: Khanna Publishing House, 2019.
[2] William Stalling, *Operating Systems*, 9th ed., United States of America: Person, 2018.

[3] Dhananjay M. Dhamdhere, *Operating Systems A Concept-Based Approach*, 3rd ed., New Delhi: McGraw Hill, 2017.
[4] Andrew S. Tanenbaum, Herbert BOS, *Modern Operating Systems*, 4th ed., United States of America: Person, 2016.

Course Research Papers: Research papers (Indexed journals/conference papers) relevant to the course content will be posted by the course faculty in Course Web page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in Course Web page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in Course Web page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students' will be able to…

CO1: apply the fundamental concepts of operating system and processes to solve the essential problems related to operating systems
CO2: analyzecpu scheduling, process synchronization and deadlocks for effective management of processes
CO3: analyze the page replacement and disk scheduling algorithms for effective allocation of the memory
CO4: design the secured distributed systems using the concepts of protection methods and distributed systems

Course Articulation Matrix (CAM): U18AI304 OPERATING SYSTEMS																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18AI304.1	2	2	2	2	-	-	-	1	1	1	-	2	2	2	2
CO2	U18AI304.2	2	2	2	2	-	-	-	1	1	1	-	2	2	2	2
CO3	U18AI304.3	2	2	2	2	-	-	-	1	1	1	-	2	2	2	2
CO4	U18AI304.4	2	2	2	2	-	-	-	1	1	1	-	2	2	2	2
U18AI304		2	2	2	2	-	-	-	1	1	1	-	2	2	2	2

U18AI305 COMPUTER ORGANIZATION AND ARCHITECTURE

Class: B. Tech. III – Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Examination	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):
This course will develop students' knowledge in/on…
LO1: functional units of a computer, principle components and instruction set architecture
LO2: processing unit and computation of arithmetic operations
LO3: memory unit and data transfer between processor, memory & I/O
LO4: operations of high performance computing systems and GPU Computing

UNIT-I (9)

Basic Structure of Computers: Functional units, Basic operational concepts, Performance
Instruction Set Architecture: Memory locations and addresses, Memory operations, Instructions and instruction sequencing, Instruction formats, Addressing modes, Assembly language-Assembler directives

UNIT-II (9)

Basic Processing Unit: Fundamental concepts, Instruction execution, Hardware components, Instruction fetch and execution steps, Control signals, Hard-wired control, CISC-style processors
Arithmetic: Addition and subtraction of signed numbers, Multiplication of unsigned numbers, Multiplication of signed numbers, Fast multiplication, Integer division, Floating-point numbers and operations

UNIT-III (9)

The Memory System: Basic concepts, Semiconductor RAM memories-Internal organization of memory chips, Static memories, Dynamic RAMs; Read-only memories, Memory hierarchy, Cache memories, Performance considerations, Secondary storage
Input-Output Organization: Input-output interface- I/O bus and interface modules, I/O vs. memory bus, Isolated vs. memory-mapped I/O; Asynchronous data transfer- Strobe control, Handshaking, Asynchronous serial transfer

UNIT-IV (9)

Modes of Transfer: Modes of transfer, Priority interrupt, Direct memory access, Interconnection standards
Pipeline and Vector Processing: Parallel processing, Pipelining, Arithmetic pipeline, Instruction pipeline, Vector processing
Multi Processors: Characteristics of multiprocessors, Interconnection structures
GPU Computing: History, graphics processors, graphics processing units, GPGPUs. Clock speeds, CPU vs. GPU comparisons

Text Books:

[1] Carl Hamacher, ZvonkoVranesic, SafwatZaky, NaraigManjikian, *Computer Organization and Embedded Systems*, 6th ed., New Delhi: McGraw-Hill Education, 2012. *(Chapters 1, 2, 5, 7-9)*

[2] M. Morris Mano, *Computer System Architecture*, Revised 3rd ed., New Delhi: Pearson Education, 2019. *(Chapters 9, 10, 11, 12, 14)*

[3] David B. Kirk and Wen-mei W. Hwu, *Programming Massively Parallel Processors A Hands-on Approach*, 2nd ed., USA: Morgan Kaufmann is an imprint of Elsevier, 2013. *(Chapters 1, 2)*

Reference Books:

[1] B Ram, Sanjay Kumar, *Computer Fundamentals: Architecture and Organization*, 5th ed., New Delhi: New Age International Publishers, 2018.

[2] W. Stallings, *Computer Organization and Architecture - Designing for Performance*, 7th ed., New Delhi: Pearson Education, 2009.

[3] John P. Hayes, *Computer Architecture and Organization,* 3rd ed., New Delhi: McGraw-Hill Education, 1998.

[4] Vincent P. Heuring, Harry F. Jordan, *Computer Systems Design and Architecture*, 2nd ed., United States: Pearson Education, 2004.

Course Research Papers: Research papers (Journals/conference papers) relevant to the coursecontent will be posted by the course faculty in Course Web page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in Course Web page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in Course Web page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students' will be able to…

CO1: analyze instruction formats and addressing modes of assembly language

CO2: *classify hardwired & CISC style processors and solve arithmetic operations using signed and unsigned integers*

CO3: *categorize cache memory mapping techniques and examine data transfer between processor, memory & I/O*

CO4: *analyze different modes of data transfer, classify interconnection structures and distinguish CPU vs. GPU architectures & computations*

Course Articulation Matrix (CAM): U18AI305 COMPUTER ORGANIZATION AND ARCHITECTURE

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI305.1	2	2	2	1	-	1	1	1	-	1	-	1	1	1	1
CO2	U18AI305.2	2	2	2	2	-	1	1	1	-	1	-	1	1	1	1
CO3	U18AI305.3	2	2	2	2	-	1	1	1	-	1	-	1	2	1	1
CO4	U18AI305.4	2	2	2	2	-	1	1	1	-	1	-	1	2	1	1
U18AI305		2	2	2	1.75	-	1	1	1	-	1	-	1	1.5	1	1

U18AI306R22 ADVANCED DATA STRUCTURES

Class:B. Tech III-Semester **Branch:** Computer Science & Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on

LO1: organizing and retrieving the data using binary tree, binary search trees.
LO2: organizing and retrieving the data using AVL trees, B-Trees, Red black trees and Splay trees.
LO3: organizing and retrieving the data using Interval tree, Hash tree, Tries, sorting and searching.
LO4: organizing and retrieving the data using graphs and spanning trees.

UNIT – I (9)

Trees: Introduction, types of trees.
Binary Tree: Creating a binary tree, traversing a binary tree: preorder, inorder, postorder and spiral order recursive traversals.
Binary Search Tree: Operations- Insertion, deletion, search, recursive and non-recursive traversal. Threaded binary trees.

UNIT – II (9)

AVL Trees: AVL trees operations–Insertion, Deletion and Traversal.
Multiway Search Trees: Introduction tom-way search trees. Operations on B-Trees-Insertion, deletion, search. B+-trees.
Red-Black Trees: Properties, operations, applications.splay trees.

UNIT - III (9)

Interval Tree, Hash tree.
Tries: Trie structure. Operations on Tries, Applications of Tree indexing.
Searching and Internal Sorting: Fibonacci search, quick sort, merge sort, heap sort, bitonic generator sort; time complexities of above searching and sorting techniques.

UNIT – IV (9)

Graphs: Introduction, graph terminology, representation of graphs.
Application of Graph Structures: Topological sorting. Minimum Spanning Trees**:** Prim's algorithm, Kruskal's algorithm. Graphs traversal methods- breadth first search, depth first search. Kosaraju's algorithm.
String manipulations, String compression -Run Length Encoding.
String Matching Algorithms-Naive Algorithm, (Knuth Morris Pratt) Algorithm, Boyer Moore Algorithm, Rabin Karp Algorithm.

Text Book(s):

[1] Debasis Samanta, *Classic Data Structures*, 2nd ed., New Delhi: Prentice Hall India, 2009.

Reference Books:

[1] Reema Thareja, *Data Structures Using C,* 2nded., New Delhi: Oxford University Press,2014.

[2] Richard F. Gilberg and Behrouz A. Forouzan, *Data Structures: A Pseudo code Approach with C*, 2nd ed., New Delhi: Cengage Learning 2007.
[3] Adam Drozdek, *Data Structures and Algorithms in* C++,3rd ed., New Delhi, Thomson, 2006.
[4] Samir Kumar Bandyopadhyay Kashinath Dey, Data Structures Using C, Pearson India,2008.

Course Research Paper (CRP): Research papers (Indexed journal/conference papers) relevant to the course content by the course faculty in Course Web page. Students have to write a twopage summary on CRP and submit as part of special assignment.

Course Patent (CP): Patents relevant to the course content will be posted by the course faculty in Course Web page. Students have to write a twopage summary on CP and submit as part of special assignment.

Course Projects: Course project is an independent project carried out by the student during the course period, the supervision of course faculty. Course faculty will post few course projects titles in Course Webpage. Students are encouraged to come up and experiment with the ideas that interest them

Course Learning Outcomes (COs):

On completion of this course, students' will be able to

CO1: develop programs using binary trees, binary search trees to optimize database queries.

CO2: utilize balanced search trees such as B-trees, B+-trees, red black and Splay trees in solving the problems on Database management.

CO3: organize and retrieve the data using Interval tree, Hash tree, Tries, sorting and searching in solving the problems like auto-complete.

CO4: organize and retrieve the data using Graphs and different types of spanning trees used for GPS navigation.

Course Articulation Matrix (CAM):U18AI306R22 ADVANCED DATA STRUCTURES																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18AI306R22.1	2	2	2	2	1	1	-	1	1	1	-	1	2	2	2
CO2	U18AI306R22.2	2	2	2	2	1	1	-	1	1	1	-	1	2	2	2
CO3	U18AI306R22.3	2	2	2	2	1	1	-	1	1	1	-	2	2	2	2
CO4	U18AI306R22.4	2	2	2	2	1	1	-	1	1	1	-	2	2	2	2
U18AI306R22		2	2	2	2	1	1	-	1	1	1	-	1.5	2	2	2

U18AI307 FORMAL LANGUAGES AND AUTOMATA THEORY

Class:B.Tech. III-Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on/in…

LO1: formal notation for languages, finite automata and regular expressions
LO2: closure properties of regular languages, types of grammars and simplification of context-free grammar
LO3: normal forms for context-free grammars and equivalence of pushdown automata
LO4: turing machine, undecidable problems about turing machines and post's correspondence problem

UNIT – I (9)

Automata Theory: Introduction to finite automata, Structural representations and the central concepts of automata theory

Finite Automata: Deterministic finite automata, Non deterministic finite automata, Finite automata with epsilon transitions, Finite automata with output

Regular Expressions and Languages: Regular expressions, Finite automata and regular expressions, Applications of regular expressions, Optimization of deterministic finite automata based pattern matchers

UNIT – II (9)

Properties of Regular Languages: Proving languages not to be regular, Closure properties of regular languages, Equivalence and minimization of automata

Context-free Grammars and Languages: Chomsky classification of languages, Writing grammars, Context free grammars, Parse trees, Construction of syntax trees, Applications of context-free grammars, Ambiguity in grammars and languages, Using ambiguity grammars, Simplification of context-free grammars

UNIT – III (9)

Properties of Context-free Languages: Normal forms for context free grammars, Pumping lemma for context free languages, Closure properties of context free languages, Decision properties of context free languages

Pushdown Automata: Definition of the pushdown automaton, Deterministic pushdown automata, Languages of pushdown automata, Equivalence of pushdown automata and context free grammar

UNIT – IV (9)

Introduction to Turing Machines: Turing machine, Programming techniques for Turing machines, Extensions to the basic Turing machine

Undecidability:A language that is not recursively enumerable, An undecidable problem that is recursively enumerable, Undecidable problems about turing machines, Post's correspondence problem

Text Book:

[1] John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, *Introduction to Automata Theory, Languages and Computation*, 3rd ed., Hong Kong: Pearson Education Asia, 2013.

Reference Books:

[1] Mishra K. L. P, Chandrasekaran N, *Theory of Computer Science: Automata, Languages and Computation*, 3rd ed., New Delhi: PHI, 2012.

[2] Harry R. Lewis, Christos H. Papadimitriou, *Elements of the Theory of Computation*, 2nd ed., Hong Kong: Pearson Education Asia, 1998.

[3] Michael Sipser, *Introduction to the Theory of Computation*, 3rd ed., Boston: Cengage Learning, 2012

[4] John Martin, *Introduction to Languages and the Theory of Computation*, 3rd ed., New York: McGraw-Hill, 2007.

Course Research Papers: Research papers (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in Course Web page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in Course Web page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in Course Web page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students' will be able to…

CO1: design finite automata and regular expressions

CO2: distinguish the given language is not regular and construct parse tree to simplify the grammar

CO3: examine the possible ways to convert the given context-free grammar into chomsky normal form or greibach normal form and design pushdown automata for the given language

CO4: designturing machine and examine possible solution for post's correspondence problem

Course Articulation Matrix (CAM): U18AI307 FORMAL LANGUAGES AND AUTOMATA THEORY

Course Outcome		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI307.1	3	3	2	2	-	-	-	1	1	1	-	2	2	1	2
CO2	U18AI307.2	2	2	2	2	-	-	-	1	1	1	-	2	2	1	2
CO3	U18AI307.3	3	2	3	3	-	-	-	1	1	1	-	3	3	1	3
CO4	U18AI307.4	3	3	3	3	-	-	-	1	1	1	-	3	3	1	3
U18AI307		2.75	2.5	2.5	2.5	-	-	-	1	1	1	-	2.5	2.5	1	2.5

U18AI310 OBJECT ORIENTED PROGRAMMING THROUGH JAVA LABORATORY

Class: B.Tech. III- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in / on…

LO1: fundamentals of java
LO2: classes, methods and strings concepts
LO3: inheritance, dynamic method dispatch, interface and package concepts
LO4: streams (I/O), exception handling and multi-threading concepts

List of Experiments

Experiment-I (Unit-I)

1. Write a program to demonstrate different operators in java
2. Write a program to demonstrate control structures
3. Write a program to demonstrate switch statement

Experiment-II (Unit-I)

1. Write a program to read an array and display them using for-each control. Finally display the sum of array elements
2. Write a program to read a matrix and display whether it is an identity matrix or not. Use civilized form of break statement
3. Write a program to define a two-dimensional (2D) array where each row contains different number of columns. Display the 2D-array using for-each

Experiment-III (Unit-II)

1. Write a program to demonstrate class concept
2. Write a program to demonstrate *this* keyword
3. Write a program to demonstrate object reference variable
4. Write a program to demonstrate overloading of methods
5. Write a program to demonstrate passing and returning objects

Experiment-IV (Unit-II)

1. Write a program to demonstrate variable length argument (using array and ellipsis notation)
2. Write a program to demonstrate constructors and garbage collection
3. Write a program to demonstrate nested and inner classes
4. Write a program to demonstrate static variables, static methods, and static blocks

Experiment-V (Unit-II)

1. Read at least five strings from command line argument and display them in sorted order
2. Write a program to demonstrate wrapper class by reading N number of integers from command line and display their sum
3. Write a program to demonstrate wrapper class by reading N floating point numbers from command line and display their average

Experiment-VI (Unit-II)

1. Write a program to accept a string, count number of vowels and remove all vowels
2. Write a program to accept a string, count number of vowels and remove all vowels using String Buffer class
3. Write a program to accept a line of text, tokenize the line using String Tokenizer class and print the tokens in reverse order

Experiment-VII (Unit-III)

1. Write a program to demonstrate single level-inheritance
2. Write a program to demonstrate multilevel-inheritance using super
3. Write a program to demonstrate method overriding

Experiment-VIII (Unit-III)

1. Write program to demonstrate dynamic method dispatch
2. Write a program to demonstrate use of abstract class
3. Write a program to demonstrate the use of overriding equals() method of an Object class

Experiment-IX (Unit-III)

1. Write a program to implement interfaces
2. Write a program to extend the interfaces
3. Write a program to demonstrate implementation of nested interfaces

Experiment-X (Unit-III)

1. Write a program to create a package, and demonstrate to import the package into any java program (Consider the behavior of all access specifiers)

Experiment-XI (Unit-IV)

1. Write a program to demonstrate try-catch-finally block
2. Write a program to demonstrate throw clause
3. Write a program to demonstrate throws clause
4. Write a program to demonstrate re-throw an exception, and finally block

Experiment-XII (Unit-IV)

1. Write a program to demonstrate read/write/copy a file using byte stream
2. Write a program to demonstrate read/write/copy a file using character stream
3. Write a program to create a thread (using Thread class or Runnable interface)
4. Write a program to demonstrate synchronization of threads
5. Write a program to demonstrate Inter thread communication

Laboratory Manual:

[1] *Object Oriented Programming through Java Laboratory Manual*, Dept. of CSE (AI & ML), KITSW.

Text Book:

[1] Herbert Schildt, *Java The Complete Reference*, 11th ed., New Delhi: McGraw-Hill Education,2019.

Reference Books:

[1] Kathy Sierra, Bert Bates, *Head FirstJava*, 2nd ed., Boston: O'Reilly Publications, 2005.
[2] Uttam K. Roy, *Advanced JAVA Programming*, England: Oxford Publications,2013.
[3] Balaguruswamy, *Programming with Java: A Primer*, 6th ed., New Delhi: McGraw-Hill Education India Pvt. Ltd, 2019.
[4] Tanweer Alam, *Internet and Java Programming*, New Delhi: Khanna Publishing House, 2010.

Course Learning Outcomes (COs):

On completion of this course, students' will be able to…

CO1: develop java fundamental programs using operators, control structures and arrays
CO2: develop java programs using classes, constructors and various string concepts
CO3: make use of reusability concepts like inheritance, dynamic method dispatch, interfaces and packages to build java programs
CO4: *develop java programs using, streams (I/O), exception handling and multithreading concepts*

Course Articulation Matrix (CAM): U18AI310 OBJECT ORIENTED PROGRAMMING THROUGH JAVA LABORATORY

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI310.1	2	1	1	1	1	1	-	1	2	1	-	2	2	1	2
CO2	U18AI310.2	2	2	2	2	1	1	-	1	2	1	-	2	2	1	2
CO3	U18AI310.3	2	2	2	2	2	1	-	1	2	1	-	2	2	2	2
CO4	U18AI310.4	2	2	2	2	2	1	-	1	2	1	-	2	2	2	2
U18AI310		2	1.75	1.75	1.75	1.5	1	-	1	2	1	-	2	2	1.5	2

U18CS311R22 ADVANCED DATA STRUCTURES LABORATORY

Class: B. Tech III-Semester **Branch:** Computer Science & Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on

LO1: organizing and retrieving the data using binary tree, binary search trees
LO2: organizing and retrieving the data using AVL trees, B-Trees, Red black trees and Splay trees.
LO3: organizing and retrieving the data using Interval tree, Hash tree, Tries, sorting and searching.
LO4: organizing and retrieving the data using graphs and spanning trees

List of Experiments

Experiment-I

1. Program to perform following binary treeoperations.
   i) creation ii) traversal using recursion.

Experiment-II

2. Program to perform following binary search tree operations.
   i)insertion ii) deletion of a node iii) traversal using recursion.

Experiment III

3. Program to perform following binary search tree traversal operations without recursion.
   i) Inorder ii) Preorder iii) Postorder iv) Spiral order

Experiment-IV

4. Program to implement AVL tree construction.

Experiment-V

5. Program to implement B-tree construction.

Experiment-VI

6. Program to implement search and insert operationson Trie.
7. Program to implement Fibonacci search.

Experiment-VII

8. Program to implement Quick sort.
9. Program to implement Merge sort.

Experiment-VIII

10. Program to implement heap sort.
11. Program to implement Bitonic generator sort.

Experiment-IX

12. Program to implement Topological sort.
13. Program to implement the following graph traversal techniques.
14. a) Prim's algorithm b) Kruskal's algorithm

Experiment-X

15. Program to implement the following graph traversal techniques.
    a) Depth first search b) Breadth first search.
16. Program to implement Kosaraju's algorithm.

Experiment-XI

17. Program to implement Naive Algorithm.
18. Program to implement Knuth - Morris – Pratt(KMP) Algorithm.

Experiment-XII

19. Program to implement Boyer Moore Algorithm.
20. Program to implement Rabin Karp Algorithm.

Laboratory Manual:

[1] 'Advanced Data Structures' laboratory manual, *prepared byfaculty of Dept. of Computer Science &Engineering.*

Reference Books:

[1] DebasisSamanta, *Classic Data Structures*, 2nd ed., New Delhi: Prentice Hall India, 2009.

[2] Reema Thareja, *Data Structures Using C,* 2nded., New Delhi: Oxford University Press, 2014.

[3] Richard F. Gilberg and Behrouz A. Forouzan, *Data Structures: A Pseudo code Approach with C,* 2nd ed., New Delhi: Cengage Learning 2007.

[4] Adam Drozdek, *Data Structures and Algorithms in C++,*3rd ed., New Delhi, Thomson, 2006.

[5] Samir Kumar Bandyopadhyay Kashinath Dey, *Data Structures Using C,* Pearson India,2008.

Course Learning Outcomes (COs):

Upon completion of this course, students will be able to

CO1: develop programs using binary trees, binary search trees.

CO2: utilize balanced search trees such as B-trees, B+-trees, red black and Splay trees in solving the problems.

CO3: organize and retrieve the data using Interval tree, Hash tree, Tries, sorting and searching.

CO4: organize and retrieve the data using Graphs and different types of spanning trees.

Mapping of the Course Learning Outcomes with Program Outcomes:

U18AI311R22ADVANCED DATA STRUCTURES LABORATORY																
Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI311R22.1	1	1	3	1	1	1	1	1	-	1	-	2	1	1	3
CO2	U18AI311R22.2	1	1	2	2	1	1	1	1	-	1	-	2	1	1	2
CO3	U18AI311R22.3	1	1	3	3	2	1	1	1	-	1	-	3	1	1	3
CO4	U18AI311R22.4	1	1	3	2	3	2	2	2	-	2	-	3	1	1	3
U18AI311R22		1	1	2.75	2	1.75	1.25	1.25	1.25	-	1.25	-	2.5	1	1	2.75

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING(NETWORKS)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)

URR-18R22

SCHEME OF INSTRUCTION & EVALUATION
IV-SEMESTER OF 4-YEAR B. TECH DEGREE PROGRAM

Sl. No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	OE	U18OE401	Open Elective-II	3	1	-	4	10	30	40	60	100
2	HSMC	U18TP402	Professional English	-	-	2	1	100	-	100	-	100
3	OE	U18OE403	Open Elective-I	3	-	-	3	10	30	40	60	100
4	PCC	U18AI404	Artificial Intelligence	3	-	-	3	10	30	40	60	100
5	PCC	U18AI405	Database Management Systems	3	1	-	4	10	30	40	60	100
6	PCC	U18AI406	Python Programming	3	-	-	3	10	30	40	60	100
7	PCC	U18AI407	Database Management Systems Laboratory	-	-	2	1	40	-	40	60	100
8	PCC	U18AI408	Python Programming Laboratory	-	-	2	1	40	-	40	60	100
9	OE	U18OE411	Open Elective-I based Laboratory	_	_	2	1	40	-	40	60	100
10	MC	U18MH415	Essence of Indian Traditional Knowledge	2	-	-	-	10	30	40	60	100
			Total:	17	2	8	21	280	180	460	540	1000
11	MC	U18CH416	Environmental Studies*	2	_	_	_	10	30	40	60	100

[L= Lecture, T = Tutorials, P = Practicals & C = Credits] Total Contact Periods/Week: 27 Total Credits: 21

Open Elective-I:	Open Elective-II:	Open Elective-I based Lab:
U18OE403A: Object Oriented Programming (CSE) U18OE403B: Fluid Mechanics & Hydraulic Machines (CE) U18OE403C: Mechatronics (ME) U18OE403D: Web Programming (IT) U18OE403E: Microprocessors (ECE) U18OE403F: Strength of Materials (ME)	U18OE401A: Applicable Mathematics (MH) U18OE401B: Basic Electronics Engineering (ECE) U18OE401C: Elements of Mechanical Engineering (ME) U18OE401D: Measurements & Instrumentation (EIE) U18OE401E: Fundamentals of Computer Networks (CSE) U18OE401F: Renewable Energy Sources (EEE) U18OE401G: Essential Mathematics and Statistics for Machine Learning (MH)	U18OE411A: Object Oriented Programming Laboratory (CSE) U18OE411B: Fluid Mechanics & Hydraulic Machines Laboratory (CE) U18OE411C: Mechatronics Laboratory (ME) U18OE411D: Web Programming Laboratory (IT) U18OE411E: Microprocessors Laboratory (ECE) U18OE411F: Strength of Materials Laboratory (CE)

.

U18OE401A APPLICABLEMATHEMATICS

Class: B.Tech. IV-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives (LOs):
This course will develop students' knowledge in /on
LO1*: application of Fourier series to solve wave equation, heat conduction equation and Laplace equation*
LO2**:** *the methods of fitting curves by the method of least squares, statistical methods and probability distributions with applications to engineering disciplines.*
LO3**:** *finite difference operators; the concept of interpolation and numerical integration.*
LO4**:** *numerical methods and application to find numerical solutions of differential equations.*

UNIT-I (9+3)

Applications of Partial Differential Equations: Basic concepts of partial differential equations, classification of second order partial differential equations, solution of a partial differential equation, solution through the method of separation of variables.
Vibrating String: Wave equation and its solution by the method of separation of variables, D'Alembert's solution of wave equation, solutions of various boundary value problems based on vibrating string.
One Dimensional Heat Flow: Transient heat flow equation, heat flow through a bar of finite length with homogeneous and non homogeneous boundary conditions, heat flow through a bar with insulated ends.
Two Dimensional Heat Flow: Equation of two dimensional heat flow (Laplace's equation) under steady state / the electrostatic potential of electrical charges in any region that is free of these charges (problems based on Trigonometric FS only), solution of Laplace's equation in Cartesian and polar form, heat flow through infinite rectangular plates, finite square plate and semi circular and circular plates.

UNIT-II (9+3)

Statistics: Statistical data: Review of measures of central tendency and measures of dispersion, correlation coefficient, rank correlation, regression – Linear regression equations.
Curve Fitting: Method of least squares –fitting of (i) Straight line (ii) Second degree parabola (iii) Exponential curves, most plausible solution of a system of linear algebraicequations.
Probability: Review of the concepts of probability, random variables, Discrete and continuous probability distributions, mean and variance of a distribution, Binomial distribution, Poisson distribution, and Normal distribution, fitting of these probability distributions to the given data.

UNIT-III (9+3)

Numerical Analysis: Finite differences and difference operators.
Interpolation: Newton's forward and backward interpolation formulae. Lagrange interpolation
Numerical Differentiation: First and second derivatives using forward and backward interpolation polynomials at the tabulated points.
Numerical Integration: Gaussian quadrature formula, Trapezoidal rule, Simpson's 1/3rdrule and Simpson's 3/8thrule.

UNIT-IV (9+3)

Solution to System of Linear Equations: Gaussian elimination method, Jacobi Method and Guass-Siedel Iteration Method.

Numerical Solution of Algebraic and Transcendental Equations: Bisection method, Regula-Falsi method and Newton Raphson's method.

Numerical Solution of Ordinary Differential Equations: Taylor's method, Picard's method, Euler's method and Runge - Kutta methods of second and fourth order**.**

Text Book:

1. Grewal, B.S., "Higher Engineering Mathematics", *Khanna Publishers,* Delhi, 43/e,2014.

Reference Books:

1. Gupta and Kapoor, "Fundamentals of Mathematical Statistics", *Sulthan Chand and & sons,* New Delhi, 11thedition, 2010.
2. KreyszigE.," Advanced Engineering Mathematics", *John Wiley & sons, Inc., U.K.* ,9th edition,2013.
3. Sastry S.S, "Introduction to numerical Analysis", *Prentice Hall of India Private Limited*, New Delhi.4th edition, 2005.

Course Outcomes (COs):

Course Code: **U18OE401A** Course Name: **APPLICABLE MATHEMATICS**		
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18OE401A.1**	*solve wave equation, heat conduction equation and Laplace equation using Fourierseries*
CO2	**U18OE401A.2**	*find correlation regression coefficients, fit curves using method of least squares forgiven data and apply theoretical probability distributions in decision making*
CO3	**U18OE401A.3**	*estimate value of a function by applying interpolation formulae*
CO4	**U18OE401A.4**	*apply numerical methods to solve simultaneous algebraic equations, differential equations, find roots of algebraic and transcendental equations*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course Code: **U18OE401A** Course Name: **APPLICABLEMATHEMATICS**															
CO Code	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
U18OE401A.1	2	2	--	--	--	--	--	--	--	--	--	1	2	2	2
U18OE401A.2	2	2	--	--	--	--	--	--	--	--	--	1	2	2	2
U18OE401A.3	2	2	--	--	--	--	--	--	--	--	--	1	2	2	2
U18OE401A.4	2	2	--	--	--	--	--	--	--	--	--	1	2	2	2
U18OE401A	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**2**	**2**

U18OE401B BASIC ELECTRONICS ENGINEERING

Class:B.Tech.IV Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives:
This course will develop student's knowledge on/in…

LO1: to *introduce the basic concepts of semiconductors and conductivity in semiconductors*
LO2: to *impart the knowledge on working of semiconductor diode as Rectifier*
LO3: to *make the students to understand the basic concepts of BJT &DC biasing concepts*
LO4: to *introduce the fundamental concepts and basic principles of special semiconductor devices.*

UNIT-I (9+3)

Introduction to Electronics:
Analog Signals (DC & AC), Sources (DC & AC), Digital Signals
Semiconductors:
Energy bands in solids, Concept of forbidden gap, Insulator, Metals and Semiconductors, Transport phenomenon in semiconductors: Mobility and conductivity, Intrinsic semiconductor, Donor and Acceptor impurities, Fermi level, Drift currents and Diffusion currents, Temperature dependence of conductivity, Hall Effect

UNIT-II (9+3)

Semiconductor Diode: Junction, Band diagram, Depletion layer, V-I characteristics of P-N Diode, Diode resistance and capacitance, Avalanche and Zener break down mechanisms
Diode Circuits:
Rectifier circuits – Half wave, Full wave & Bridge rectifiers, Ripple factor with and without filters, Voltage regulation using Zener diode, Block diagram of DC adapter.

UNIT-III (9+3)

Bipolar Junction Transistor:
Physical structure, Transistor current components, CE, CB & CC configurations and their Input & Output characteristics
DC Analysis of BJT Circuits:
DC load line, Need for biasing, Transistor biasing techniques for CE configuration, Basic transistor applications: Switch and Amplifier.

UNIT-IV(9+3)

Field Effect Transistor:
Physical **s**tructure, Operation and Characteristics of a Junction Field Effect Transistor (JFET), MOSFET, DMOSFET, EMOSFET.
Special Semiconductor Devices:
Operation and Characteristics- Tunnel Diode, Schottky diode, Photo Diode, Photo Transistor, PIN Diode, LED, LASER, UJT.
Text Books:

1. Bhargava and Kulashresta, "Basic Electronics and Linear Circuits", *TTTI, TMH, India.*
2. S. Salivahanan and N. Suresh Kumar, "Electronic Devices and Circuits", *Tata McGraw Hill Education (India) Private* Ltd, 2nd Edition,2009.

Reference Books:

1. Jacob Millman, Christos C Halkias, "Electronic Devices and Circuits", 3/e, *TMH,*India.
2. David.A.Bell, "Electronic Devices and Circuits", *Oxford University Press,* New Delhi, India.
3. Neil storey, "Electronics: A systems Approach", *4/e-Pearson Education Publishing company Pvt. Ltd*, India

Course Outcomes (COs)

Course Code: **U18EC401B** Course Name: **BASIC ELECTRONICS ENGINEERING**		
CO	**CO Code**	Upon completion of this course, the student will be able to..
CO1	**U18EC401B.1**	*Analyze the behavior of semiconductor devices*
CO2	**U18EC401B.2**	*Design half wave and full wave rectifier circuits with filters*
CO3	**U18EC401B.3**	*Characterize BJT configurations with input output characteristics and biasing techniques*
CO4	**U18EC401B.4**	*Acquire knowledge of new emerging areas of science and technology in differentiating semiconductor devices..*

Course Articulation Matrix (Mapping of COs with POs and PSOs)

Course Code:**U18EC401B** Course Name: **BASIC ELECTRONICS ENGINEERING**															
CO Code	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
U18EC401B.1	2	2	1	2	-	-	-	-	-	-	-	-	2	-	1
U18EC401B.2	2	2	2	2	-	-	-	-	-	-	-	-	-	-	-
U18EC401B.3	2	2	2	2	-	-	-	-	-	-	-	-	-	-	-
U18EC401B.4	2	2	1	2	-	-	-	-	-	-	-	2	2	-	1
U18EC401B	**2**	**2**	**1.5**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**	**1**

U18OE401C ELEMENTS OF MECHANICAL ENGINEERING

Class:B.Tech., IV-Semester **Branch:** Common to all branches

Teaching Scheme :

L		T	P	C
3		1	-	4

Examination Scheme

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):
This course will develop students' knowledge in/on
LO1*: types of materials, design methodology and elements of power transmission*
LO2: *different manufacturing processes and their applications.*
LO3: *laws of thermodynamics and types of systems*
LO4: *principle and applications of SI & CI engines.*

UNIT- I (12)

Engineering Materials: Classification, properties and applications
Design Criterion: Discrete steps in engineering design process
Power Transmission: Classification; flat belt drives - length of open and cross belts, belt tensions and power transmitted; Gears-types and applications; spur gear-nomenclature
Bearings: Types – sliding& rolling contact bearings and applications;

UNIT- II (12)

Manufacturing Processes: Classification; Foundry- steps in sand casting process; pattern-types, materials and allowances, mould cross section, moulding sand-composition and properties; Machining: lathe machine-line diagram and operations; Welding-classification; principle of arc welding- AC and DC welding, principle of gas welding, principle of brazing and soldering;
Metal forming process: forging, rolling, extrusion.

UNIT- III (12)

Thermodynamics: System-types, state, property, process and cycle; Energy-property; Zeroth law, thermodynamic equilibrium, laws of perfect gases.
Law of Thermodynamics: First law- applied to a cycle, change of state, Internal energy, Enthalpy; Work and Heat in closed systems- Isobaric, Isochoric, Isothermal, Adiabatic and Polytropic; PMM-I, limitations of first law of thermodynamics.

UNIT- IV (12)

Second Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their equivalence; Carnot cycle, Carnot theorem, heat engine, heat pump and refrigerator; working principle of domestic air conditioner-line diagram.
IC Engines: Classification; working principle of four and two stroke SI and CI engines.

Text Book:

1. Mathur, Mehta and Tiwari, "Elements of Mechanical Engineering", *Jain Brothers*, New Delhi,2017.

Reference Books:

1. Hazra Chowdary. S. K and Bose, "Basic Mechanical Engineering", *Media Promoters and Publishers Pvt. Ltd,* India,2010.
2. P. K. Nag, "Engineering Thermodynamics", *Tata McGraw Hill*, New Delhi.
3. Hazra Chowdary. S. K and Bose, "Workshop Technology, Vol. I & II", *Media Promoters and publishers Pvt Ltd,* India.

Course Outcomes (COs):

Course Code: **U18OE401C**		Course Name: **Elements of Mechanical Engineering**
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18OE401C.1**	*explain mechanical properties of an engineering materials and learn the steps in design methodology.*
CO2	**U18OE401C.2**	*describe the principles of manufacturing processes*
CO3	**U18OE401C.3**	*apply first law of thermodynamics to various processes to calculate work and heat for a closed system.*
CO4	**U18OE401C.4**	define *second law of thermodynamics and demonstrate the working principle of IC engines.*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course code:**U18OE401C** Course Name: **Elements of Mechanical Engineering**															
CO Code	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
U18OE401C.1	2	2	-	-	-	-	-	-	-	-	-	-	1	1	1
U18OE401C.2	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-
U18OE401C.3	2	2	-	-	-	-	-		-	-	-	-	1	1	-
U18OE401C.4	2	2	-	-	-	-	-	-	-	-	-	-	1	1	-
U18OE401C	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**1**

U18OE401D FUNDAMENTALS OF MEASUREMENTS & INSTRUMENTATION

Class: B.Tech., IV-Semester

Branch: Common to all Branches

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):
This course will develop students' knowledge on / in
LO1: working principle of DC measuring instruments; DC, AC bridge circuits and their applications LO2: principle of operation of Q meter, DVM, DMM, CRO, DSO and display devices
LO3: working principle of various transducers and their applications
LO4: working principle of seismic transducers, piezoelectric accelerometer, sound level meter, level transducer, flow meter and data acquisition system

UNIT–I (9+3)

DC measuring instruments (principle of operation): Measurement system – block diagram and example; performance characteristics – accuracy, precision, resolution, threshold, span, % error and fidelity; DC meters (working principle) – PMMC mechanism, shunt type ammeter, series type voltmeter, shunt type ohmmeter; DC potentiometers - Crompton's DC potentiometer, calibration of meters (ammeter, voltmeter & wattmeter) using DC potentiometer

DC & AC bridges: General bridge balance equation, bridge calibration, applications of bridges, Wheatstone bridge, Maxwell bridge, Schering bridge, Wien's bridge

UNIT – II (9+3)

Electronic instruments (principle of operation): Q-meter – basic Q-meter circuit; digital meter – characteristics (resolution & count), DC & AC attenuators, block diagram of dual slope type digital voltmeter, block diagram of digital multimeter (DMM); oscilloscopes – working principle of cathode ray tube (CRT), block diagram of cathode ray oscilloscope (CRO), block diagram of digital storage oscilloscope (DSO); display devices – working principle of LED & LCD types

UNIT – III (9+3)

Transducers (principle of operation): Transducer - classification, examples and ideal requirements; sensors – cantilever beam & proving ring types of load cells, bourdon tube & diaphragm type pressure sensors; resistive transducers – piezo-resistive effect of strain gauge (SG), gauge factor, SG type force transducer, SG type pressure transducer and RTD; thermocouple type temperature transducer, LVDT type inductive transducer, differential type capacitive transducer, piezoelectric type transducer; photoelectric type transducer

UNIT – IV (9+3)

Transducers (principle of operation): Seismic transducers – displacement transducer, velocity pickup and accelerometer, piezoelectric accelerometer, sound level meter (block diagram), capacitive microphone, capacitive type level transducer (double electrode type), ultrasonic flow meter and electromagnetic flow meter; introduction to data acquisition (DAQ)system

Text Books:

1 P. Pruthviraj, B. Bhudaditya, S. Das and K. Chiranjib, "Electrical and Electronic Measurement and Instrumentation", McGraw-Hill Education, 2nd edition, 2013, New Delhi. (*Chapters 1 to 3, 8 to 10 and 13 to 15*)

2 Arun K. Ghosh, "Introduction to Transducers", *PHI*, 4th edition, 2015, New Delhi. (*Chapters 1 to7*)

Reference Books:

1 A.K. Sawhney, "Electrical and Electronics Measurements and Instrumentation", *Dhanpatrai* & Co., 2015, New Delhi.

2 Helfrick. A.D and Cooper W.D., "Modern Electronic Instrumentation and Measurement Techniques", *Pearson India Edn.*, 2nd edition, 2016, New Delhi.

3 B.C. Nakra, K.K Choudhry, "Instrumentation Measurement and Analysis", *TMH*, 4th edition, 2008, New Delhi.

4 D.V.S. Murthy, "Transducers and Instrumentation", *Prentice Hall of India*, 2nd edition, 2012, New Delhi

Course Outcomes (COs):

Course Code: **U18EI401D** Course Name: **FUNDAMENTALS OF MEASUREMENTS & INSTRUMENTATION**		
CO	**CO Code**	*Upon completion of this course, students will be able to…*
CO1	**U18EI401D.1**	explain about working principle of measurement system, PMMC based meters and applications of DC & AC bridge circuits
CO2	**U18EI401D.2**	describe the principle of operation of Q-meter, DVM, DMM, CRO, DSO and display devices
CO3	**U18EI401D.3**	elaborate on the working principle of resistive, inductive, capacitive and piezo electric ransducers and their applications
CO4	**U18EI401D.4**	explain about seismic transducers, sound level meter, level transducer, flow meters and block diagram of data acquisition system

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course Code: **U18EI401D** Course Name: **FUNDAMENTALS OF MEASUREMENTS &INSTRUMENTATION**															
CO Code	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO6**	**PO7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
U18EI401D.1	2	1	1	1	-	-	1	-	-	-	-	1	1	1	1
U18EI401D.2	2	1	1	1	-	-	1	-	-	-	-	1	1	1	-
U18EI401D.3	2	1	1	1	-	-	1	-	-	-	-	1	1	1	-
U18EI401D.4	2	1	1	1	-	-	1	-	-	-	-	1	1	1	-
U18EI401D	**2**	**1**	**1**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**1**

U18OE401E FUNDAMENTALS OF COMPUTERNETWORKS

Class:B.Tech. IV- Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives (LO) :

This course will develop students' knowledge in/on

LO1: network topologies, network reference models, network architecture and data transmission

LO2: design issues and protocols of data link layer, error detection and correction, MAC protocols and ethernet standards

LO3: principles and design issues of network layer and internet protocols LO4: transport layer design issues, protocols and application layer services

UNIT - I (9)

Introduction: History of Computer Networks and The Internet, Principles of Computer Network Design, Network Architecture, Network Types.

Physical Layer: Factors Affecting Data Transmission, Data Transmission, Data Transmission Codes: Non-return to Zero, Manchester Encoding, Digital modulation & Modems, Transmission Media.

UNIT- II (9)

Data Link Layer: Functions of Data Link Layer, Framing Techniques, Error Detection and Correction, Elementary Data Link Layer Protocols for Flow Control.

Local Area Networks: Medium Access Protocols, LAN Protocol Stack, Ethernet Protocols, IEEE 802.11 LAN Standard: IEEE 802.11 Protocol Stack, Wireless LAN Topologies, Frames in IEEE 802.11.

UNIT - III (9)

The Network Layer: Network Layer Services, Packet Switching Networks, The Internet Protocol(IP): IP Header in IPv4, IP Addressing in IPv4, Subnet addressing and Classless Inter-Domain Routing (CIDR), Address Resolution Protocol, Dynamic Host Configuration Protocol, Internet Layer Protocols, Fragmentation and Reassembly, IP Version 6: Motivation for IPv6 Development, Features of IPv6, IPv6 Address Representation.

Routing Protocols: Elements of Routing Protocol Performance, Flooding, Distance-Vector and Link State Routing Protocols, Hierarchical Routing.

UNIT - IV (9)

The Transport Layer: User Datagram Protocol, Transmission Control Protocol, TCP State Transition Diagram, Other TCP Timers, TCP Congestion Control.

The Application Layer: World Wide Web, Domain Name System, Electronic Mail.

Network Security: Threats and Vulnerabilities in Computer Networks, Cryptographic Algorithms, Data Encryption Standard.

Text Book:

1. Mayank Dave, "Computer Networks", Second Edition, Cengage Learning, ISBN-13:978-81-315-0986-9, 2014.

Reference Books:

1. Forouzan, "Data Communication and Networking", Fifth Edition, *TMH*, *ISBN*978-0-07-296775- 3, 2012.
2. William Stallings, "Data and Computer Communications", Ninth Edition, *Prentice-Hall India*, ISBN-81-203-1240-6,2011.
3. Andrew S.Tanenbaum , David J. Wetherall, "Computer Networks", Fifth Edition, *Pearson Education*, ISBN-13: 978-0-13-212695-3,2011.

Course Outcomes (COs):

Course Code: **U18OE401E** Course Name: **Fundamentals of ComputerNetworks**		
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18OE401E.1**	*describe various network topologies, architecture and techniques for data transmission modes*
CO2	**U18OE401E.2**	*outline various design issues in data link layer and develop protocols to handle data link layer operation*
CO3	**U18OE401E.3**	*describe various design issues and develop protocols for network Layer.*
CO4	**U18OE401E.4**	*explain various design issues, protocols of transport layer & application layer services*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course Code: **U18OE401E** Course Name: **Fundamentals of Computer Networks**															
CO Code	**PO1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
U18OE401E.1	2	1	-	1	-	1	-	-	-	-	-	1	2	3	1
U18OE401E.2	3	3	2	1	1	1	-	-	-	-	-	1	3	3	1
U18OE401E.3	3	3	2	2	1	1	-	-	-	-	-	1	3	3	1
U18OE401E.4	3	3	2	2	1	1	-	-	-	-	-	1	3	3	1
U18OE401E	**2.75**	**2.5**	**2**	**1.5**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**2.75**	**3**	**1**

U18OE401F RENEWABLE ENERGY SOURCES

Class: B.Tech, IV Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
3		-	3

ExaminationS cheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs) :

This course will develop student's knowledge in/on

LO1 *different renewable energy sources and principle of solar energy systems*

LO2 *wind energy, geothermal energy and MHD power generation systems*

LO3 *harnessing energy from oceans and biomass*

LO4 *working of fuel cells and different energy storage systems*

UNIT-I (9)

Introduction: Conventional and non-conventional sources of energy – Brief Description of different Renewable energy sources

Solar Energy: Introduction to prospects of solar photovoltaic (SPV) systems, principle of a PV cell, large scale SPV systems, economic considerations of SPV systems, PV cell technology, merits and limits of SPV systems, applications of SPV systems-street lighting, domestic lighting, Battery charging, SPV pumping systems

UNIT-II (9)

Wind Energy: Principles of wind power- Operation of a wind turbine- Site Characteristics.
Geothermal Energy: Origin and types of geothermal energy- Operational Difficulties- Vapor dominated systems- Liquid dominated systems- Petro- thermalsystems.
Magneto-Hydro Dynamic (Mhd) Power Generation: MHD system- Open and Closed systems- Advantages of MHD systems.

UNIT-III (9)

Energy from Oceans: Ocean temperature differences, ocean waves-Wave motions and tides- Energy from the waves; Introduction of tidal power, basic principle of tidal power, components of tidal power plants, advantages and disadvantages

Bio-Energy: Introduction-bio-mass conversion, technologies-wet process, dry process, photo synthesis; Biogas generation- biogas from power plant wastes, methods of maintaining biogas production, utilization of biogas, biogas gasification, applications ofgasifiers

UNIT-IV (9)

Chemical Energy Sources: Introduction of fuel cells, Principle of Operation of fuel cell, Classification of Fuel cells, Advantages and disadvantages of fuel cells.

Types of Energy Storage Systems: Introduction, Different types of Batteries, Ultra Capacitors, Flywheels, Super Conducting Magnetic storage

TEXT BOOKS:

1. Rai G.D "*Non-Conventional Energy Sources*", Khanna Publishers, NewDelhi
2. Felix A. Farret, M. Godoy Simoes, —Integration of Alternative Sources of Energy, John Wiley & Sons, 2006
3. Bansal N.K, Kaleeman and M.Miller, "Renewable *Energy Sources and Conversion Technology*", TATA Mc Graw-Hill, NewDelhi

REFERENCE BOOKS:

1. EL-Wakil M.M, "Power Plant Technology", Mc Graw-Hill, NewYork
2. Duffie and Beckman, "Solar Energy Thermal Process", John Wiley & Sons, NewYork

Coursecode:**U18OE401F**		Course Name: **Renewable Energy Sources**
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18OE401F.1**	*compare conventional and non-conventional energy resources; explain the working principle of solar energy harnessing and its applications*
CO2	**U18OE401F.2**	*explain the working principles of wind energy, geothermal energy and MHD power generation systems*
CO3	**U18OE401F.3**	*describe the harnessing of electric power from oceans and biomass*
CO4	**U18OE401F.4**	*explain the principle of operation of fuel cells and different types of energy storage systems*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course code:**U18OE401F**							Course Name: **Renewable Energy Sources**								
CO Code	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
U18OE401F.1	3	-	-	-	-	-	1	-	-	-	-	-	3	-	-
U18OE401F.2	3	-	-	-	-	-	1	-	-	-	-	-	3	-	-
U18OE401F.3	3	-	-	-	-	-	1	-	-	-	-	-	3	-	-
U18OE401F.4	3	-	-	-	-	-	1	-	-	-	-	-	3	-	-
U18OE401F	**3**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

U18OE401G ESSENTIAL MATHEMATICS AND STATISTICS FOR MACHINE LEARNING

Class: B.Tech. IV-Semester

Branch: Computer Science and Engineering (AI&ML)

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on…

LO1: linear algebra, matrix decompositions, multivariate calculus and its applications

LO2: Baye's theorem, random variables and theoretical probability distributions

LO3: various statistical measures, fitting of curves using method of least squares, applications of sampling distributions in testing of hypothesis

LO4: dimensionality reduction with principal component analysis (PCA), unconstrained and constrained optimization Techniques

UNIT-I(9+3)

Linear algebra: Introduction to vectors, Vector space and subspace, linear combination and span, linear independence and dependence, basis vectors, linear transformations, null space and range of linear map and Rank-nullity theorem.

Matrix decompositions: LU decomposition, Gram Schmidt process, QR decomposition, Singular value decomposition and properties, Norms and Matrix approximations.

Multivariate calculus: Partial differentiation and gradient, Jacobian matrix, gradients of matrices, Hessian matrix, convex sets, convex functions and multivariate Taylor series.

UNIT-II(9+3)

Probability: Basic rules and axioms, dependent and independent events, conditional probability, Baye's theorem.

Random variables: Discrete and continuous random variables, expectation and variance

Distributions: Binomial, Poisson and Normal distributions.

Joint probability distributions: Joint probability mass and density functions, Marginal probability mass and density functions and Covariance.

UNIT-III(9+3)

Statistics: Measures of Central tendency, Measures of dispersion, Skewness, Kurtosis, Correlation-Coefficient of correlation, Linear Regression, Curve fitting and Method of least squares.

Sampling: Types of Sampling, Population, Sample, Parameter, statistics, Sampling distribution of means (σ-known) and **E**stimation.

Test of hypothesis: Procedure for testing of hypothesis, Test of significance of a single mean and difference of means- Large samples, Test of significance of a single Mean and difference of means-Small samples, Paired Sample t-test, F-test, F-test for equality of population variances, chi square test, Chi-square test for goodness of fit and One-way ANOVA.

UNIT-IV(9+3)

Dimensionality Reduction with Principal Component Analysis: Problem setting, Maximum Variance Perspective, Projection Perspective, Eigenvector Computation and Low-Rank Approximations, PCA in High Dimensions, Key Steps of PCA in Practice and Latent Variable Perspective.

Optimization: Optimization problem, unconstrained optimization and constrained optimization.

Unconstrained optimization: Gradient Descent method, Conjugate gradient method, Newton's method and Penalty function method.

Constrained optimization: Lagrange's method and Kuhn-Tucker conditions.

Text Books:

[1] Bernard Kolman and David R. Hill., *Introductory Linear Algebra: An Applied First Course*, United States: Pearson Education, 2006. (UNIT-I)

[2] S. C. Gupta V. K. Kapoor, *Fundamentals of Mathematical Statistics*, 10th ed., New Delhi: Sultan Chand & Sons Educational Publishers, 2010. *(*UNIT-II & UNIT-III*)*

[3] Marc Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong., *Mathematics for Machine Learning*, New Delhi: Cambridge University Press, 2020. (UNIT-I & UNIT-IV)

[4] S. S. Rao, *Engineering Optimization theory and practice*, 4th ed., New Jersey: John Wiley & Sons, Inc., 1984. (UNIT-IV)

Reference Text Books:

[1] G. Strang, *Introduction to Linear Algebra,* 5th ed., Wellesley-Cambridge Press, 2016.

[2] S. P. Gupta, *Statistical Methods*, 46th ed., New Delhi: Sultan Chand & Sons Educational Publishers, 2019.

[3] J. C. Pant, *Introduction To Optimization (Operations Research*), 7th ed., Jain Brothers, 2015.

[4] L.S.Prakasa Rao, A first course in Probability and statistics, New Jersey: Cambridge University Press

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be postedby the course faculty in Course Web page

Course Patents: Patents relevant to the course content will be posted by the course faculty in Course Web page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in Course Web page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

on completion of this course, students will be able to…

CO1: *apply linearalgebra, matrix decompositions and multivariate calculus in solving engineering problems.*

CO2: *analyze Baye's theorem, probability distributions, marginal and conditional distributions.*

CO3: *apply sampling distributions intesting of hypothesis and one-way ANOVA in real world problems.*

CO4: *analysedimensionality reduction with principal component analysis and optimize the function using various methods of optimization*

Course Articulation Matrix (CAM):U18OE401G:
ESSENTIAL MATHEMATICS AND STATISTICS FOR MACHINE LEARNING

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18OE401G.1	2	2	--	-	-	-	-	-	-	1	-	1	-	-	-
CO2	U18OE401G.2	2	2	-	-	-	-	-	-	-	1	-	1	-	-	-
CO3	U18OE401G.3	2	2	-	-	-	-	-	-	-	1	-	1	-	-	-
CO4	U18OE401G.4	2	2	-	-	-	-	-	-	-	1	-	1	-	-	-
U18OE401G		2	2	-	-	-	-	-	-	-	1	-	1	-	-	-

U18MH402 PROFESSIONAL ENGLISH

Class: B.Tech III Semester **Branch:** Common to all branches

L	T	P	C
-	-	2	1

Continuous Internal Evaluation :	100 marks
End Semester Exam :	-

Course Learning Objectives (LOs):
This course will develop the student's knowledge in/on
LO1: reading skill and sub skills to comprehend the text
LO2: vocabulary and using it appropriately to describe situations LO3: using phrasal verbs in speech and writing
LO4: grammar and improve language ability to write effectively

Week	Topic Name
I	**I. Reading Comprehension-** Significance of Reading Skimming **II. Verbal Ability-**Synonyms **III. Grammar-**Articles
II	**I. Reading Comprehension-**Scanning **II. Verbal Ability-**Antonyms **III. Grammar-**Articles
III	**I. Reading Comprehension-** Critical Reading **II. Verbal Ability-** Sentence completion with correct alternative word/group **III. Grammar-**Prepositions
IV	**I. Reading Comprehension-** Intensive Reading **II. Verbal Ability-** Sentence completion with correct alternative word/group **III. Grammar-** Reported Speech
V	**I. Reading Comprehension-** Intensive Reading **II. Verbal Ability-** Jumbled Sentences **III. Grammar-** Error Detection
VI	**I. Reading Comprehension-** Inferential Reading **II. Verbal Ability-** Jumbled Sentences **III. Grammar-** Error Detection
VII	**I. Reading Comprehension-** Lexical Reading **II. Verbal Ability-** Phrasal Verbs **III. Grammar-** Tenses, Structures
VIII	**I. Reading Comprehension-** Read to Interpret **II. Verbal Ability-** Single Word Substitutes **III. Grammar-** Tenses, Uses
IX	**I. Reading Comprehension-** Read to Analyze **II. Verbal Ability-**Collocations **III. Grammar-** Tenses, Uses
X	**I. Reading Comprehension-** Read to Summarize **II. Verbal Ability-**Spellings **III. Grammar,** Agreement between Subject & verb (concord)

Text Book:

1. Professional English *Manual prepared by the faculty of English, KITSW*
2. Arun Sharma & Meenakshi Upadhyay, "Verbal Ability and Reading Comprehension for CAT & Other Management Examinations",8thEdition *McGraw Hill Education (India) Private Ltd*, Chennai,2018

Reference Books:

1. Nishit K. Sinha, " Verbal Ability and Reading Comprehension for the CAT", 3rdEdition Pearson India Education Services Pvt. Ltd., Chennai
2. Harper Collins, "Collins COBUILD English Grammar" Third Edition, *Harper Collins Publishers Ltd.*
3. Rosemary & Courtney, "Longman-English-Chinese Dictionary of Phrasal Verbs"

Course Outcomes (COs):

Course Code: U18MH302/402		**Course Name: Professional English**
CO	**CO Code**	*Up on completion of this course, the students will be able to…*
CO1	**U18MH302.1**	analyze the passage using skill and sub skill to solve different types of questions related to reading comprehension
CO2	**U18MH302.2**	identify grammatical errors in the given sentences and correct them
CO3	**U18MH302.3**	select correct synonyms/antonyms/phrasal verbs and complete sentences with suitable words or phrases
CO4	**U18MH302.4**	keep the given jumbled sentences in proper sequence to make a coherent paragraph

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course Code: U18MH302									**Course Name: Professional English**						
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO2**	**PS03**
U18MH302.1	-	-	-	-	-	-	-	-	1	2	-	1	1	1	1
U18MH302.2	-	-	-	-	-	-	-	-	1	2	-	1	1	1	1
U18MH302.3	-	-	-	-	-	-	-	-	1	2	-	1	1	1	1
U18MH302.4	-	-	-	-	-	-	-	-	1	2	-	1	1	1	1
U18MH302	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**-**	**1**	**1**	**1**	**1**

U18OE403A OBJECT ORIENTED PROGRAMMING

Class: B. Tech IV-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LOs):
This course will develop students' knowledge in/on…
LO1: fundamentals of object oriented and java programming.
LO2: classes, objects and inheritance for implementing object oriented concepts.
LO3: polymorphism, interfaces and packages for realizing object oriented programming.
LO4: manage Exceptional and I/O operations in application developments.

UNIT- I (9)

Fundamentals of Object Oriented Programming: Programming paradigms, Basic concepts of Object Oriented paradigm (OOP), benefits and applications of OOP.
Basics of Java Language: Java language Features, Java Programming Structure, Java Tokens, JVM, Constants, Variables, Data types, Scope of variable, Type Casting, Operators and Expressions, Branching and looping statements, Arrays.

UNIT – II (9)

Classes and Objects: Defining a class, Field declaration, Method declaration, Creating object, Accessing Class Members, Constructors, garbage collection, Static members, Nested and inner classes, Command line arguments, Wrapper classes.
Inheritance: Extending a class, Defining subclasses, Subclass constructor, Multilevel inheritance, Hierarchical inheritance, Access controls, *this*and*super* keywords.

UNIT-III (9)

Polymorphism: Overloading methods, Overloading constructors, Overriding Methods, Dynamic method dispatch, Abstract classes, Final Keyword.
Interfaces: Defining an interface, Implementing interfaces, Nested Interfaces, Variables in interfaces, Extending interfaces
Packages: Packages, java API packages, Using System Packages, Naming Conventions, Creating Packages, Accessing Packages, Adding a class to package, Hiding classes, Static Import.

UNIT – IV (9)

Exception handling: Fundamentals, Exception types, Uncaught exceptions, Using try and catch, Multiple catch clauses, Explicit exceptions with *throw, throws* and *finally* keywords.
String Handling: String constructors, String length, String operations, Character extraction, String comparison, Searching string, Modifying string, Changing string cases, Joining strings**.**
Using I/O: I/O Basics, Reading console Input, Writing console output, Reading and writing files.

Text Books:

1. Herbert Schildt,"JAVA The Complete Reference", 9th Edition, McGraw-Hill Education India Pvt.Ltd , ISBN: 9781259002465,2014.
2. E.Balgurusamy, "Programming with JAVA a primer", 5e Edition, McGraw-Hill Publication Ltd, ISBN: 9351343200,2014.

References Books:

1. P Radha Krishna, "Object Oriented Programming through JAVA", Universities Press, ISBN: 9788173715723,2011.
2. Herbert Schildt,"JAVA The Complete Reference", McGraw-Hill Education India Pvt.Ltd , 9th Edition, ISBN: 9781259002465,2011.
3. Kathy Sierra, Bert Bates, "Head First Java", O'Reilly Publictions, 2nd Edition, ISBN-13: 978- 0596009205.
4. UttamK.Roy, "Advanced JAVA Programming", Oxford Publications; First edition, ISBN- 13: 978-0199455508.

CourseCode: **U18OE403A** Course Name: **Object OrientedProgramming**		
CO	**CO code**	*Upon completion of this course, the student will be able to…*
CO1	**U18OE403A.1**	*demonstrate object oriented concepts and java programming features.*
CO2	**U18OE403A.2**	*solve computing problems using object orientation and inheritance concepts.*
CO3	**U18OE403A.3**	*use polymorphism, interfaces and Packages for effective object oriented programming*
CO4	**U18OE403A.4**	*handle Exceptions and I/O operations in application development.*

Mapping of the Course Learning Outcomes with Program Outcomes:

Course Code: **U18OE403A** Course Name: **Object Oriented Programming**															
CO/PO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
U18OE403A.1	2	2	2	1	2	1	-	1	2	1	2	1	2	2	2
U18OE403A.2	2	2	2	1	2	1	-	-	2	1	2	1	2	2	2
U18OE403A.3	2	2	2	1	2	1	-	-	2	1	2	1	2	2	2
U18OE403A.4	2	2	2	1	2	1	1	1	2	1	2	1	2	2	2
U18OE403	**2**	**2**	**2**	**1**	**2**	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**2**	**2**	**2**

U18OE403B FLUID MECHANICS AND HYDRAULIC MACHINES

Class: B.Tech.IV-Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):
This course will develop students' knowledge in /on
LO1*: various Properties of fluids and fluid statics*
LO2*: application of Bernoulli's equation and dimensional analysis*
LO3*: flow through pipes and working principles of hydraulic turbines*
LO4*: performance of reciprocating and centrifugal pumps*

UNIT-I(9)

Fluid fundamentals: Classification of fluids, fluid properties - density, specific weight, specific gravity, specific volume, viscosity, capillarity, vapor pressure, compressibility, surface tension, cohesion and adhesion.

Fluid statics:Pascal's Law, hydrostatic Law, measurement of pressure, manometers, Piezometer, U- tube differential manometer, inverted differential manometer, hydrostatic forces on submerged plane and curved surfaces, buoyancy, metacenter, stability of floating and submerged bodies

UNIT-II (9)

Fluid dynamics: Classification of fluid flow, continuity equation in one, two and three dimensional flow, velocity potential and stream function, forces causing motion, Euler's equation of motion, Bernoulli's Equation, applications of Bernoulli's equation, venturi meter, orifice meter, pitot tube, linear momentum equation, application of linear momentum equation to forces on pipe bend.

Dimensional analysis: Dimensional analysis by Rayleigh's method and Buckingham π's theorem, dimensionless numbers and model laws, Reynolds law and Froude's law.

UNIT-III(9)

Flow through pipes: Loss of head in pipes, expression for head loss due to major and minor losses in pipes, HGL and TEL lines, pipes in series and parallel, equivalent pipe.

Hydraulic turbines: Concept of impact jets, classification, head, losses and various efficiencies, Pelton turbines, components, velocity triangles, power and efficiencies, reaction turbines, Francis and Kaplan turbines, efficiencies and characteristics, unit quantities, specific speed, draft tube theory.

UNIT-IV (9)

Reciprocating pumps: Working of single and double acting pumps, work done and efficiencies, slip, negative slip, performance characteristics of pumps, air vessel.

Centrifugal pumps: Principle, components, work done and efficiency, pumps in series and in parallel, multi stage pumps, characteristics, cavitation and priming.

Text Books:

1. P.N.Modi and S.M. Seth, "*Hydraulics and Fluid Mechanics Including Hydraulic Machines*", Standard Book House, Rajsons Publications Private Limited, 21thedn.,2017

Reference Books:

1. R.K.Bansal, "*Fluid Mechanics and Hydraulic Machines*", Periodicals PrivateLtd.,2018
2. Victor Streeter and E. Benjamin Wylie, "*Fluid Mechanics*", McGraw Hill, Singapore, 9thedn.,2017.
3. Frank M. White, "*Fluid Mechanics*", Special Indian Edition, Tata McGraw Hill, New Delhi,2011.
4. A.K. Jain, "*Fluid Mechanics Including Hydraulic Machines*", Khanna Publications,12thedn,2018.

Course Outcomes (COs):

Course Code: **U18OE303B** Course Name: **Fluid Mechanics and Hydraulic Machines**		
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18CE403B.1**	*summarize fluid properties using fundamental laws of fluid statics.*
CO2	**U18CE403B.2**	*analyse fluid flows using Bernoulli's equation and model laws.*
CO3	**U18CE403B.3**	*estimate losses in pipes and characterize hydraulic turbines.*
CO4	**U18CE403B.4**	*discuss the working principle and characteristics of pumps.*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course Code: **U18OE303B** Course Name: **Fluid mechanics and hydraulic machines**															
CO Code	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSC1**	**PSC2**	**PSO3**
U18CE403B.1	2	1	-	-	-	-	-	-	1	1	-	1	1	-	-
U18CE403B.2	2	1	-	1	-	-	-	-	1	1	-	1	1	-	-
U18CE403B.3	2	1	-	1	-	-	-	-	1	1	-	1	1	-	-
U18CE403B.4	2	1	-	1	-	1	-	-	1	1	-	1	1	-	-
U18CE403B	**2**	**1**	**-**	**1**	**-**	**1**	**-**	**-**	**1**	**1**	**-**	**1**	**1**	**-**	**-**

U18OE403C MECHATRONICS

Class: B.Tech. IV-Semester **Branch:** Common to all branches

Teaching Scheme : **Examination Scheme:**

L	T	P	C
3	-	-	3

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Outcomes (LOs):
This course will develop students' knowledge in /on
LO1: *role of mechatronics based technology, sensors and transducers used in industry*
LO2: *various types of actuation systems, working principles and their applications*
LO3: *mathematical models for various types of systems*
LO4: *various transfer functions and control modes*

UNIT-I (9)

Introduction to Mechatronics: Measuring system, Control systems, Microprocessor based controllers. Mechatronics approach.

Sensors and Transducers: Performance, terminology. displacement, position, proximity, velocity and motion.

UNIT-II (9)

Actuation Systems: working principles of pneumatic and hydraulic systems, directional control valves, pressure control valves, process control valves and rotary actuators.

Electrical Actuation Systems: working principles of electrical system, mechanical switches, solid-state switches solenoids, DC motors, AC motors and stepper motors.

UNIT-III (9)

Basic Models: Mathematical models, mechanical system building blocks, electrical system building blocks, fluid system building blocks and thermal system building blocks.

System Models: Engineering system, rotational-translational system and electro- mechanical systems and hydraulic-mechanical system.

UNIT-IV (9)

System Transfer functions: Transfer function, first order system, second order system, system in series and systems with feedback loops.

Closed Loop Controllers: Continuous and discrete processes. Control modes. Two step mode and proportional mode. Derivative control, integral control, PID controller, digital controllers, velocity controllers and adaptive control.

TEXT BOOK:

1. Bolton W., Mechatronics, *Pearson Publications*, 6/e, ISBN: 9788131732533, 2015.

REFERENCE BOOKS:

1. Nitaigour Premchand Mahalik, Mechatronics: Principles Concepts and Applications, *Tata McGraw Hill, 2/e,* ISBN-13: 978-0070483743,2017.
2. HMT, Mechatronics, *Tata McGraw-Hill, ISBN*9788415700272 New Delhi,2000.
3. Devdas Shetty, Richard and Kilk, Mechatronics System and Design, *Cenage Learning*, Inc. 2/e, ISBN-13: 978-1439061985,2010.

Course Outcomes (COs):

Course Code: **U18OE403C** Course Name: **MECHATRONICS**		
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18OE403C.1**	*apply the mechatronics approach ad select suitable sensors and transducers for a given application.*
CO2	**U18OE403C.2**	*explain working principles of mechanical, hydraulic, pneumatic and electrical actuators and their applications.*
CO3	**U18OE403C.3**	*develop basic building blocks for mechanical, electrical, fluid and thermal systems and build mathematical models and analyze.*
CO4	**U18OE403C.4**	*explain various system transfer functions and select an appropriate closed loop controller for a given application*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course Code: **U18OE403C**								Course Name: **MECHATRONICS**							
CO Code	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO 3**
U18OE403C.1	2	2	1	-	2	2	-	-	-	1	-	1	1	-	1
U18OE403C.2	2	2	1	-	2	-	-	-	-	1	-	1	1	-	1
U18OE403C.3	2	2	1	3	2	-	-	-	-	1	-	1	1	-	-
U18OE403C.4	2	2	1	1	2	-	-	-	-	1	-	1	1	-	1
U18OE403C	2	2	1	2	2	2	-	-	-	1	-	1	1	-	1

U18OE403D WEB PROGRAMMING

Class : B. Tech. IV – Semester **Branch : Common to all branches**

Teaching Scheme :

L	T	P	C
3		-	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in / on

LO1: designing static webpage using HTML Tags, CSS properties, interactivity with JavaScript

LO2: creating dynamic webpage using JSP.

LO3: developing server-side scripts for web applications using PHP.

LO4: building databases applications using PHP, MYSQL and XML.

UNIT-I (9)

HTML: Document Structure, Basic Tags, Creating Headings, Working with Links, Creating Paragraph, Working with Images, Tables, Frames. Introduction to Forms and Controls: Creating HTML Form, Specifying Action URL and Method to Send the Form, Using HTML Controls.

CSS: *CSS* (Cascading style sheet) rules and properties, Types: Inline, External and Internal Style Sheets, Style Classes, Multiple Styles.

JAVASCRIPT: JavaScript syntax, Embedding JavaScript in HTML Page. Usage of variables, Working with Operators, Control-Flow Statements, Functions and Array, Creating Objects, Handling Events.

UNIT-II (9)

JSP: Syntax and Semantics, JSP Development Model, Components of JSP page: Directives, Comments, Expressions, Scriptlets, Declarations, Implicit Objects, Standard Actions, Tag Extensions, A Complete JSP Example. Session and Thread Management: Session Tracking, Session API, Thread Management. Application Event Listeners.

JDBC: Database access with JDBC, Overview, JDBC drivers, connecting to database with Driver Manager, Statement Interfaces: Statement, Prepared statement, Callable statement, Result Sets.

UNIT-III (9)

Introduction to PHP: Overview of PHP, Advantages of PHP over scripting languages, Creating and running a PHP script, handling errors. Working with Variables and Constants: Variables, Data Types and Operators. Controlling Program Flow: Conditional Statements, Looping Statements, Break, Continue and Exit Statements. Working with Functions, Arrays, Files and Directories.

Working with Forms: Web Forms and Form Elements, Processing a Web Form, Validating a Web Form.

UNIT-IV (9)

Database using PHP: Exploring Relational Database Model, Records and Primary Keys. Working with SQL Statements. Using PHP and MySql: Checking Configuration, Connecting to Database, Selecting a Database, Adding and Altering a Table in a Database, Inserting and modifying Data in a Table, Retrieving Data from a Table.

XML : Introduction to XML, XML Basics: Syntax, Declaration, Elements, Attributes, Valid XML Documents, Viewing XML, XML Parser, XML Technologies, Document Object Model(DOM).

Text Books:

1. Kogent, "Web Technologies HTML, CSS, JavaScript, ASP.NET, Servlets, JSP, PHP, ADO.NET, JDBC and XML", *1st Edition, Dreamtech Press (Black Book),* ISBN-13:9789351192510,2013.
2. Phil Hanna, "JSP: The Complete Reference", *2nd Edition, McGraw-Hill,* ISBN: 007-212768-6,2001.

Reference Books:

1. Ivan Bayross, "Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP", *4th Edition, BPB Publications,* ISBN-13: 978-8183330084,2009,
2. UttamK.Roy, "Web Technologies", *7th Edition, Oxford Higher Education,* ISBN-10: 0-19-806622-8, ISBN-13: 978-0-19-806622-4,2010
3. Luke Welling, Laura Thomson,"PHP and MySQL Web Development", *3rd Edition, Sams Publications,* ISBN: 0-672-32672-8,2005
4. Jayson Falkner, Kevin Jones, "Servlets and Java Server Pages", *1st Edition, Pearson,* ISBN: 0-321- 13649-7, 2003

Course Outcomes (COs):

Course Code: **U18OE403D**		Course Name: **Web Programming**
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18OE403D.1**	*create static web pages using HTML Tags, CSS properties and Java scripts*
CO2	**U18OE403D.2**	*create dynamic web pages using java server page concepts.*
CO3	**U18OE403D.3**	*develop web server side applications using PHP concepts*
CO4	**U18OE403D.4**	*develop enterprise databases for web-based applications using PHP and MySQL.*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course Code: **U18OE403D** Course Name: **Web Programming**															
CO Code	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
U18OE403D.1	2	2	2	1	2	1	-	1	2	1	2	1	2	2	2
U18OE403D.2	2	2	2	1	2	1	-	1	2	1	2	1	2	2	2
U18OE403D.3	2	2	2	1	2	1	-	1	2	1	2	1	2	2	2
U18OE403D.4	2	2	2	1	2	1	1	1	2	1	2	1	2	2	2
U18OE403D	2	2	2	1	2	1	1	1	2	1	2	1	2	2	2

U18OE403E MICROPROCESSORS

Class: B.Tech., IV-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation:	40 marks
End Semester Exam:	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on

LO1*: architectural issues of 8086 Microprocessor*

LO2*: programming concepts of 8086 Microprocessor*

LO3*: interfacing of 8086 microprocessor to various I/O subsystems.*

LO4: *serial data communication types and standards like RS232, IEEE 488 Bus.*

UNIT – I(9)

Review of 8085 MPU Architecture

8086 Family Architecture: Organization of 8086 CPU, Concept of Memory Segmentation, Segment Registers, Physical and Logical Addressing, Addressing Modes and Instruction Formats, Instruction Set**.**

UNIT – II(9)

Assembly Language Programming: Assembler Directives, Simple Programming of 8086, Arithmetic, Logical and Data Processing Programs; Implementation of Control Loops, Structures, Strings, Procedures, Macros.

Pin Configuration, Minimum / Maximum Modes, Timing Diagrams, Delay Subroutines.

UNIT – III(9)

Interfacing with 8086: 8086 Interrupts, Interrupt Service Routines, Programmable Interrupt Controller 8259, Programmable Peripheral Interface 8255, Interfacing of Switches, Keyboards, LEDs, Stepper Motor, ADCs and DACs.

UNIT – IV(9)

DMA Controller 8257, Programmable Timer/Counter 8254.

Serial Data Communication through 8086: Types of Serial Communication, Synchronous and Asynchronous Communication, Serial Data Communication through USART 8251, Serial Data Communication Standards, RS-232, IEEE 488 Bus (GPIB).

Text Books:

1. D.V.Hall, "Microprocessors and Interfacing: Programming & Hardware", 2nd Edition, *Tata McGraw Hill*, New Delhi, 1992. (Chapter 3 to 10)
2. Yuchang Liu, Glen A. Gibson," Microcomputer Systems. The 8086/8088 Family, Architecture, Programming and Design", *2nd Edition, PHI*, New Delhi, 1995. (Chapter 2 to 11)

Reference Books:

1. Kenneth J. Ayala,Ayala Kenneth," The 8086 Microprocessor: Programming and Interfacing The PC", *West Pub*., 1994.
2. Barry B. Brey," The Intel Microprocessors: Architecture, Programming and Interfacing", 2nd Edition, *PHI, New Delhi,* 1998.

Course Outcomes (COs):

Course Code: **U18OE403E** Course Name: **MICRO PROCESSORS**		
CO	**CO Code**	Upon completion of this course, the student will be able to…
CO1	**U18OE 403E.1**	*describe the architecture of 8086 microprocessor and explain instructions with suitable examples*
CO2	**U18OE 403E.2**	*write Assembly Language Programs (ALPs) to perform a given task*
CO3	**U18OE 403E.3**	*design 8086 microprocessor based system for given specifications with memory mapping*
CO4	**U18OE 403E.4**	*explain serial communication modes and discuss it standards*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course code:**U18OE403E**													Course Name: **MICROPROCESSORS**		
CO Code	**PO 1**	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
U18OE 403E.1	3	3	2	1	--	--	--	--	--	--	--	--	2	2	1
U18OE 403E.2	3	2	2	1	--	--	--	--	--	--	--	--	2	2	1
U18OE 403E.3	3	3	2	1	--	--	--	--	--	--	--	--	2	2	1
U18OE 403E.4	3	3	2	1	--	--	--	--	--	--	--	1	2	2	1
U18OE 403E	3	2.75	2	1	--	--	--	--	--	--	--	1	2	2	1

U18OE403F STRENGTH OF MATERIALS

Class: B.Tech.IV-Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):
This course will develop students' knowledge in /on
LO1*: behaviour of bodies subjected to various types of stresses and strains*
LO2*: shear force and bending moment for determinate beams*
LO3*: bending and shearing stresses for beams in flexure*
LO4*: behaviour of circular shafts, springs and thin cylinders*

UNIT-I(9)

Simple stresses and strains: Types of stresses, strains, stress–strain diagram, elastic limit, Hooke's law, bars of varying sections, uniformly tapering circular and rectangular sections, elongation of bars due to self weight, temperature stresses in uniform bars.

Elastic modulii: Elastic constants, longitudinal strain, lateral strain, Poisson's ratio, complimentary shear stress, state of simple shear, modulus of elasticity (E), modulus of rigidity (N), bulk modulus (K), relation between E, N & K, strain energy, resilience, impact loading.

UNIT-II (9)

Principal stresses: Definition, normal and shear stress, principal stresses, principal planes and their graphical representation by Mohr's circle.

Shear force and bending moment: Types of supports, classification of beams, concept of shear force and bending moment, shear force diagram and bending moment diagram for simply supported, cantilever and overhanging beams, loading from shear force and bending moment diagram, principle of superposition.

UNIT-III(9)

Bending stresses in beams: Assumptions, theory of simple bending, application of bending equation and calculation of bending stresses in beams of homogeneous and flitched beam material, beams of uniform strength.

Shearing stresses in beams: Shearing stress due to bending, variation of flexural shear stress distribution across rectangular, triangular, circular, flanged section, shear resilience.

UNIT-IV (9)

Circular shafts and springs: Theory of pure torsion in solid and hollow circular shafts, shear stresses, angle of twist, power transmitted by shaft, close-coiled and open-coiled helical spring subjected to axial load and axial twist, springs in series and parallel.
Thin cylinders: Analysis of thin walled pressure vessels, hoop stress, longitudinal stress.

Text Books:

1. Rajput R.K., "*Strength of Materials*", 7th*Edition,* S Chand and Company.
2. Gunneswara Rao T. D., Mudimby Andal, "*Strength of Materials", 1st edn.2018*, Cambridge University Press.

Reference Books:

1. Timoshenko and Gere, "*Mechanics of Materials", 1st Edition* Mc Graw Hill International.
2. Punmia B.C., Arun K. Jain, Ashok K. Jain, "*Mechanics of Materials", 2nd Edition,* Laxmi Publications, New Delhi.

3. Subramanian R., "*Strength of Materials*", *3rd Edition,* Oxford UniversityPress.
4. Ramamrutham S., "*Strength of Materials*", *2nd Edition,* Dhanpat Rai & Sons, New Delhi.

Course Outcomes (COs):

Course Code: **U18OE303F** Course Name: **Strength of Materials**		
CO	**CO code**	*Upon completion of this course, the student will be able to…*
CO1	**U18CE403F.1**	*estimate various types of stresses and strains*
CO2	**U18CE403F.2**	*construct Mohr's circle, shear force and bending moment diagrams for determinate beams*
CO3	**U18CE403F.3**	*determine the bending and shearing stresses for beams subjected to pure bending*
CO4	**U18CE403F.4**	*analyze stresses in thin cylinders, circular shafts and springs by theory of pure torsion*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Coursecode: **U18OE303F**				Course Name: **Strength of Materials**											
CO Code	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
U18CE403F.1	2	2	1	1	-	-	-	-	-	1	-	2	1	-	-
U18CE403F.2	2	2	1	-	-	-	-	-	-	1	-	1	1	-	-
U18CE403F.3	2	2	1	1	-	-	-	-	-	-	-	1	-	-	-
U18CE403F.4	2	2	1	2	-	-	-	-	-	1	-	1	1	-	-
U18CE403F	**2**	**2**	**1**	**1.33**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1.25**	**1**	**-**	**-**

U18AI404 ARTIFICIAL INTELLIGENCE

Class: B.Tech. IV- Semester **Branch:** Computer Science and Engineering(AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on…

LO1: *fundamentals of Artificial Intelligence, agents, problem solving approaches & searching techniques*
LO2: *local search algorithms, game playing, solution searching using min-max and CSP problems*
LO3: *prepositional logic syntax & semantics, inference procedure, first order logic, acting logically according to planning*
LO4: *decision theory, making simple & complex decisions and robot hardware, software motion and*

UNIT – I (9)

Introduction: Introduction to AI, The foundations & history of AI
Intelligent Agents: Agents and environments, Nature of environments, Structure of agents
Problem Solving: Problem-solving agents, Example problems searching for solutions, Uninformed and informed search strategies, Heuristic functions

UNIT – II (9)

Classical Search:Local search algorithms & optimization problems, Local search in continuous space, searching in nondeterministic actions, Partial observations
Adversarial Search: Game playing, The Mini-max search procedure, Alpha-Beta pruning, cutoffs and Additional refinements
Constraint Satisfaction Problems (CSP): Constraint propagation, Backtracking search for CSPs

UNIT – III (9)

Logical Agents: Knowledge based agents, Wumpus world, Propositional logic
First Order Logic (FOL): Syntax & Semantics, Using FOL, Knowledge engineering, Inference in FOL, Forward chaining, Backward chaining, Resolution
Planning: Definition, Algorithm for planning state space search, Planning graphs, classical planning approaches, Analysis of planning, Time schedule and resources, Hierarchical planning, Planning in non deterministic planning

UNIT – IV (9)

Quantifying Uncertainty: Acting under uncertainty, Inference using full joint distribution, Bayes' rule
Probabilistic Reasoning Over Time: Time and uncertainty, Inference in temporal models, Hidden Markov models, Kalman filters, Dynamic Bayesian networks
Making Simple and Complex Decisions: Combining beliefs and desires under uncertainty, The basis of utility theory, Utility functions, Sequential decision problems, Value iteration and Policy iteration
Robotics: Robotic hardware, Perception, Planning and control, Application domains

Text Book:

[1] Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, 3rd ed., New Delhi: Prentice Hall Series in AI, 2010. (*Chapters 1-7, 9, 11, 14, 15, 16, 17, 25*)

Reference Books:

[1] Elaine rich and Kevin knight, *Artificial Intelligence*, 2nd ed., New Delhi: Tata McGraw-Hill, 2002.

[2] Mark Stefik, *Introduction to Knowledge Systems*, San Francisco: Morgan Kaufman, 1995.

[3] Winston, Patrick Henry, *Artificial Intelligence*, 3rd ed., California: Addison Wesley, 1995.

[4] Dan W. Patterson, *Introduction to Artificial Intelligence and Expert Systems*, 2nd ed., New Delhi, Prentice Hall of India, 1997.

Course Research Papers: Research papers (Indexed journals/conference papers) relevant to the course content will be posted by the course faculty in Course Web page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in Course Web page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in Course Web page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students' will be able to…

CO1: *apply fundamentals of artificial intelligence for various engineering problem-solving approaches*

CO2: *analyze search algorithms, game playing and constraint satisfying problem & solutions for designing effective artificial intelligence solutions*

CO3: *develop effective decision making artificial intelligent systems using prepositional logic, fist order logic and planning concepts*

CO4: *apply decision theory for simple & complex problems and illustrate the software & hardware used in robotics*

Course Articulation Matrix (CAM): U18AI404 ARTIFICIAL INTELLIGENCE

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI404.1	2	2	2	2	1	1	-	1	1	1	-	2	2	1	2
CO2	U18AI404.2	2	3	3	2	1	1	-	1	1	1	-	2	3	1	1
CO3	U18AI404.3	2	3	3	2	1	1	-	1	1	1	-	2	3	1	1
CO4	U18AI404.4	2	2	2	3	1	1	-	1	1	1	-	2	3	1	1
U18AI404		2	2.5	2.5	2.25	1	1	-	1	1	1	-	2	2.75	1	1.25

U18AI405 DATABASE MANAGEMENT SYSTEMS

Class: B.Tech. IV- Semester
Branch: Computer Science and Engineering (AI &ML)

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives(LOs):

This course will develop student's knowledge in/on…

LO1: diverse issues involved in the design and implementation of a database management system
LO2: study the physical and logical database designs and different database models
LO3: distinct normalization techniques on database systems and query optimization techniques
LO4: database structure and build up essential DBMS concepts like database security, data integrity and concurrency control

UNIT – I (9+3)

Databases and Database Users: Introduction, Characteristics of the database approach, Actors on the scene, Workers behind the scene, Advantages of using a DBMS, When not to use a DBMS
Database System Concepts and Architecture: Data models, Schemas and instances, Three-schema architecture and data independence, Database languages and interfaces, The database system environment, Classification of database management systems
The Relational Data Model, Relational Database Constraints: Relational model concepts, Relational constraints and the relational database schemas, Update operations and dealing with constraint violations
Basic SQL: SQL Data definition and data types, Specifying constraints in SQL, Basic retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL
NOSQL Databases: Introduction to NOSQL systems

UNIT - II (9+3)

Data Modeling using the Entity-Relationship Model: Using high-level conceptual data models for database design, Entity types, Entity sets, Attributes and keys, Relationships types, Relationship sets, Roles and structural constraints, Weak entity types, ER diagrams
Enhanced Entity-Relationship: Sub classes, Super classes and Inheritance, Specialization and generalization, Constraints and characteristics of specialization and generalization hierarchies, Modeling of union types using categories
Relational Database Design by ER and EER-to-Relational Mapping: Relational database design using ER-to-Relational mapping, Mapping EER model constructs to relations

UNIT - III (9+3)

Database Design Theory and Normalization: Informal design guidelines for relation schemas, Functional dependencies, Normal forms based on primary keys, General definitions of second and third normal forms, Boyce-Codd normal form, Algorithms for relational database schema design, Multivalued dependency and fourth normal form , Join dependencies and fifth normal form
The Relational Algebra and Relational Calculus: Basic relational algebra operations, Examples of queries in relational algebra, The tuple relational calculus, The domain relational calculus
Query Processing and Optimization: Translating SQL queries into relational algebra, Using heuristics in query optimization

UNIT - IV (9+3)

Introduction to Transaction Processing Concepts and Theory: Introduction to transaction processing, Transaction and system concepts, Desirable properties of transactions, Characterizing schedules based recoverability, Characterizing schedules based on serializability

Concurrency Control Techniques: Two-Phase locking techniques for concurrency control, Concurrency control based on timestamp ordering

Database Recovery Techniques: Recovery concepts, NO-UNDO/REDO Recovery Based on Deferred Update, Recovery techniques based on immediate update, Shadow paging

Database Security and Authorization: Introduction to database security issues, Discretionary access control based on granting and revoking privileges, Mandatory access control and role-Based access control for multilevel security

Text Books:

[1] RamezElmasri, Shamkanth B. Navathe, *Fundamentals of Database Systems*, 7th ed., New Delhi: Pearson Education, 2017

Reference Books:

[1] Raghu Ramakrishnan, Johannes Gehrke, *Database Management Systems*, 4th ed., New Delhi: Mc-Graw Hill, 2014

[2] Abraham Siberschatz, Henry F. Korth, and S. Sudarshan, *Database System Concepts*, 6th ed., New Delhi: McGraw-Hill, 2011

[3] R. P. Mahapatra, Govind Verma, *Database Management Systems*, 1st ed., New Delhi: Khanna publications, 2016

[4] Thomas Connolly, Carolyn Begg, *Database Systems*, 3rd ed., Chennai: Pearson Education, 2003

Course Research Papers: Research papers (Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students' will be able to…

CO1: analyze the schemata, illustrate the relational data model and consistency constraints effectively, and develop effective queries

CO2: design the database with an ER and EER models

CO3: apply the normalization on database to eliminate redundancy and query optimization techniques to determine the most efficient way to execute a query plans

CO4: apply multi-level security, correctness of data and control over access on database

Course Articulation Matrix (CAM): U18AI405 DATABASE MANAGEMENT SYSTEMS

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI405.1	2	2	2	2	1	1	-	1	1	1	-	2	2	1	2
CO2	U18AI405.2	3	3	3	3	1	1	-	1	1	1	-	3	3	1	3
CO3	U18AI405.3	3	3	3	3	1	1	-	1	1	1	-	3	2	1	2
CO4	U18AI405.4	2	2	2	2	1	1	-	1	1	1	-	2	3	1	2
U18AI405		2.5	2.5	2.5	2.5	1	1	-	1	1	1	-	2.5	2.5	1	2.25

U18AI406 PYTHON PROGRAMMING

Class: B.Tech. IV-Semester **Branch:** Computer Science & Engineering (AI & ML)

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: basics of python programming, operators, control statements & functions in Python
LO2: namespaces, modules, collections, string handling methods & regular expressions
LO3: object oriented programming, inheritance, polymorphism, files& database connectivity using SQLite
LO4: Numpy, Pandas and Matplotlib libraries of Python

UNIT-I (9)

Introduction: Features of Python, The future of Python, Writing and executing Python programs

Python Preliminaries: Literal constants, Variables and identifiers, Data types, Input operation, Comments, Reserved words, Indentation, Operators, Expressions in Python, Type conversion

Decision Control Statements: Selection/Conditional branching statements, Loop structures/ iterative statements, Nested loop, the continue statement, the pass statement, the else statement used with loops

Functions: Function definition, Function call, Variable scope and lifetime, the return statement, Advances in defining in functions, Lambda functions, Recursive functions

UNIT-II (9)

Modules and Name Spaces: The from…import statement, Naming module, the dir() function, Packages in Python, Standard library modules, globals(), locals(), and reload(), Function redefinition

Python Strings: String operations, String formatting operator, Built-in string methods and functions, slice operation, ord() and Chr() Functions, in and not in operators, Comparing strings, Regular expressions and meta characters

Data Structures: Sequences, Lists, Tuple, Sets, Dictionaries

UNIT-III (9)

Python Object Oriented Programming: Classes and objects, Class method and self-argument, The __init__() method, Class variables and object variables, The __del__() method, Public and private data members, Private methods, Calling a class method from another class method, Built-in class attributes, Class methods, Static methods, Inheritance and polymorphism, Error and Exception handling

Files: Opening and closing files, Reading and writing files, File positions, Renaming and deleting files, Directory methods

Database Connectivity: Database browser for SQLite, Creating a database table, Insert and retrieve data from database

Case Study: Twitter spidering

UNIT-IV (9)

NumPy: The basics of NumPy arrays, Array indexing, Array slicing, Reshaping of array, Concatenation and splitting arrays, Introducing UFuncs

Data Manipulation with Pandas: Installing and using Pandas, Introducing Pandas objects, data indexing and selection, Handling missing data, Combining datasets, Merge and join, Aggregation and grouping

Visualization with Matplotlib: Importing Matplotlib, Saving figures to files, Simple line plots, Simple scatter plots, Histograms, Binnings, and density, Example-Handwritten digits, Text and annotations Example-Effects of holidays on US births, Geographic data with basemap, Plotting data on maps, Example-California cities

Text Book:

[1] Reema Thareja, *Python Programming using problem solving approach*, New Delhi: Oxford University Press, 2017. *(Chapter 1 to 7)*
[2] Jake VanderPlas, *Python Data Science Handbook- Essential Tools for Working with Data*, California: O'Reilly Media Inc., 2016. (*Chapter 2 to 4*)

Reference Books:

[1] Dr.Charles R. Severance, *Python for Everybody-Exploring Data Using Python*, open book, 2016.
[2] David Beazley, *Python Cookbook*, 3rd ed., California: O'Reilly Media, Inc., 2013.
[3] Caleb Hattingh, *20 Python Libraries You Aren't Using (But Should)*, 2nd ed., California: O'Reilly Media, Inc., 2016.
[4] Magnus Lie Hetland, *Beginning: from Novice to Professional*, New York City: A press, 2005.

Course Research Papers: Research papers (Indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in Course Web page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in Course Web page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in Course Web page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes(COs):
On completion of this course, student's will be able to…
CO1: make use of syntax, control statements, operators and functions for writing basic python programs
CO2: design programs using collections, namespaces, packages, strings& regular expressions
CO3: develop python programs using object oriented programming principles, files & database handling mechanisms
CO4: build visualization graphs with Matplotlib and adapt packages like Numpy or Pandas for statistical analysis & data handling

Course Articulation Matrix (CAM): U18AI406 PYTHON PROGRAMMING

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI406.1	1	1	1	1	2	1	-	1	1	1	-	2	2	1	1
CO2	U18AI406.2	1	1	2	1	2	1	-	1	1	1	-	2	2	1	1
CO3	U18AI406.3	2	2	2	2	3	1	-	1	1	1	-	2	2	2	1
CO4	U18AI406.4	2	2	2	2	3	1	-	1	1	1	-	2	2	2	2
U18AI406		1.5	1.5	1.75	1.5	2.5	1	-	1	1	1	-	2	2	1.5	1.25

U18AI407 DATABASE MANAGEMENT SYSTEMS LABORATORY

Class: B.Tech. IV- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives(LOs):

This course will develop student's knowledge in/on…

LO1: SQL queries related to DDL, DML, TCL and DCL constructs using Oracle
LO2: SQL queries related to functions, joins, indexes, sequences and user defined data types
LO3: PL/SQL programs using PL/SQL block, cursors, parameterized cursors, and exceptions
LO4: PL/SQL programs using procedures, functions, packages and triggers

LIST OF EXPERIMENTS

Structured Query Language (SQL)

Experiment-I

1. Design and implement DDL, DML, TCL and DCL commands
2. Design and implement Queries on types of constraints

Experiment -II

3. Design and implement Queries using built-in functions of NUMBER, CHARACTER and DATE Data types
4. Design and implement Queries on Data type conversion functions

Experiment -III

5. Design and implement Queries on single row functions and operators

Experiment -IV

6. Design and implement Queries on aggregate functions

Experiment -V

7. Design and implement Queries on joins and nested queries

Experiment -VI

8. Construct SQL statements to create simple, composite indexes, user-defined data types, views, sequences

PL/SQL Programs:

Experiment –VII

9. Implementation of sample PL/SQL programs using conditional and iterative statements

Experiment -VIII

10. Implementation of PL/SQL programs using cursors

Experiment -IX

11. Implementation of PL/SQL programs using parameterized cursors

Experiment-X

12. Create PL/SQL programs to handle exceptions

Experiment –XI

13. Create PL/SQL programs using stored procedures and functions

Experiment -XII

14. Create PL/SQL programs using packages and triggers

Laboratory Manual:

[2] *Database Management Systems Laboratory Manual,* Dept. of CSE (AI & ML), KITS Warangal

Reference Books:

[5] Ivan Bayross, *SQL, PL/SQL: The Programming Language of Oracle,* 4th ed., New Delhi: BPB publications, 2010

[6] P. S. Deshpande, *SQL & PL/SQL for Oracle 11g Black Book,* New Delhi: Wiley Publisher, 2011

Course Learning Outcomes (COs):

On completion of this course, students' will be able to…

CO1: develop SQL queries using the concepts related to DDL, DML, TCL and DCL constructs of Oracle
CO2: develop SQL queries using functions, joins, indexes, sequences and views
CO3: develop SQL queries using the PL/SQL programs, cursors and exceptions
CO4: create PL/SQL programs using procedures, functions, packages and triggers

Course Articulation Matrix (CAM): U18AI407 DATABASE MANAGEMENT SYSTEMS LABORATORY																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18AI407.1	2	2	2	2	2	1	-	1	2	1	-	2	2	1	2
CO2	U18AI407.2	2	2	2	2	2	1	-	1	2	1	-	2	2	1	2
CO3	U18AI407.3	2	2	2	3	2	1	-	1	3	1	-	2	2	1	3
CO4	U18AI407.4	2	2	3	3	2	1	-	1	3	1	-	2	3	1	3
U18AI407		2	2	2.25	2.5	2	1	-	1	2.5	1	-	2	2.25	1	2.5

U18AI408 PYTHON PROGRAMMING LAB

Class: B.Tech. IV-Semester **Branch: C**omputer Science & Engineering (AI & ML)

Teaching Scheme :

L	T	P	C
-	-	2	1

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LO):

This Course will develop student's knowledge in/on…

LO1: fundamentals of python programming such as variables, operators, control statements & functions

LO2: concepts such as namespaces, packages, string handling methods, regular expressions, lists & dictionaries of Python

LO3: concepts such as object oriented programming, creating classes, inheritance, polymorphism, error handling, file handling & accessing database of Python

LO4: NumPy, Pandas & Matplotlib libraries in python

Experiment-I (UNIT-I)

1. Installation of Python and verifying PATH environment variable
2. Running instructions in Interactive interpreter and a python script
   (a) Executing instructions in Python Interactive Interpreter
   (b) Running python scripts in Command Prompt
   (c) Running python scripts in IDLE
3. Write a program to demonstrate importance of indentations. Purposefully raise Indentation Error and correct it
4. Write a program to take input text as command line argument and display it on screen

Experiment-II

1. Write a program that takes 2 numbers as command line arguments and print its sum
2. Write a program to check whether the given number is even or odd
3. Write a program to calculate GCD of 2 numbers
4. Write a program to find Exponentiation (Power) of a number
5. Write a program to find given year is leap year or not
6. Write a program to develop a simple calculator

Experiment-III (Use functions concept for implementing below programs)

1. Write a program to find the Factorial of a given number
2. Write a program to evaluate the Fibonacci series for a given number 'n'
3. Write a program to find the Armstrong for a given number
4. Write a program to find sum of N numbers
5. Write a program to take a number as input, and print countdown from that number to zero (use while loop)
6. Write a program to find circulating 'n' values

Experiment-IV (UNIT-II)

1. Write a program to implement a module using import statement (Use python source file as a Module and implement import statement another python source files)
2. Write a program to implement from, import statement
3. Write a program to implement dir() function
4. Write a program to demonstrate packages in python

Experiment-V

Write python program on strings for the following
1. To display substring in a string
2. To update an existing string
3. To implement string concatenation
4. To demonstrate string formatting operator

Experiment-VI
1. Write a program to demonstrate use of slicing in strings
2. Write a program to compare two strings
3. Write a program which prints the reverse of a given input string. (use a function with name Reverse string and call this function for performing the operation)
4. To demonstrate built-in string methods
5. Write a program to demonstrate list and related functions

Experiment-VII
2. Write a program to demonstrate tuple, set and related functions
3. Write a program to demonstrate dictionaries
4. Write a program to demonstrate Regex functions
5. Write a program to demonstrate regular expressions using Meta characters

Experiment-VIII (UNIT-III)
Write python program for the following
1. To demonstrate classes and objects
2. To demonstrate class method and static method
3. To demonstrate inheritance

Write python program on file operations for the following
1. To open and read data from a file
2. To write data into a file
3. To compute number of characters, words, lines in a file

Experiment-IX
Write python programs to implement database connectivity
1. Install and verify SQLite Connector for Python
2. To connect check SQLite Database connectivity
3. To retrieve and display data from a table
4. To insert data into a table
5. To delete rows in a table

Experiment-X (UNIT-IV)
1. Install and setup NumPy environment
2. Write a program to demonstrate NumPy array
3. Write a program to demonstrate Slice operation
4. Write a program to demonstrate Reshaping of an array

Experiment-XI
1. Install and setup pandas environment
2. Write a python pandas program to create a series from anndarray
3. Write a python pandas program to demonstrate indexing and selecting data
4. Twitter data analysis using Pandas

Experiment-XII
1. Install and setup matplotlib
2. Write a program to draw a simple line plot
3. Write a program to draw a histogram plot
4. Customize plots and experiment with different maps plots

Laboratory Manual:

[1] *Python Programming Laboratory Manual*, Dept. of CSE (AI & ML), KITSW

Reference Books:

[1] Reema Thareja, Python Programming using problem solving approach, New Delhi: Oxford university press, 2017. *(Chapter 1 to 7)*

[2] Jake Vander Plas, Python Data Science Handbook- Essential Tools for Working with Data, California: O'Reilly Media, Inc., 2016. (*Chapter 2 to 4*)

Course Learning Outcomes (COs):

On completion of this course, student's will be able to...

CO1: develop python programs using operators, control statements &functions

CO2: apply namespaces, packages, string handling methods, regular expressions, lists &dictionaries of Python for writing programs

CO3: build new classes, create objects, perform operations on files and implement database operations in Python

CO4: design visualization graphs with Matplotlib and experiment with Numpy & Pandas libraries for data analysis programs in Python

Course Articulation Matrix (CAM): U18AI408 PYTHON PROGRAMMING LAB

Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18AI408.1	2	2	2	2	2	1	-	1	2	1	-	2	2	2	2
CO2	U18AI408.2	2	2	2	2	2	1	-	1	2	1	-	1	2	2	2
CO3	U18AI408.3	2	2	2	2	3	1	-	1	2	1	-	2	2	2	2
CO4	U18AI408.4	2	2	2	2	3	1	-	1	2	1	-	2	2	2	2
U18AI408		2	2	2	2	2.5	1	-	1	2	1	-	1.75	2	2	2

U18OE411D WEB PROGRAMMING LABORATORY

Class: B.Tech. IV- Semester **Branch:** Computer Science and Engineering (AI&ML)

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):
This course will develop students' knowledge in/on…
LO1: static webpage using HTML Tags, CSS properties, interactivity with JavaScript
LO2: dynamic webpage using JSP
LO3: server-side scripts for web applications using PHP
LO4: database applications using PHP and MYSQL, XML

EXPERIMENT – 1 (UNIT-1)
1. Design the following static web pages with the following attributes:
   a) Basic Tags.
   b) Heading Tags.
   c) List (Ordered and Un-Ordered).
   d) Textbox, Buttons.

EXPERIMENT – 2 (UNIT-1)
2. HTML
AIM: Design the following static web pages required for an online book store web site.
   a) HOMEPAGE:
   b) LOGINPAGE
   c) CATALOGUE PAGE

DESCRIPTION:
a. HOME PAGE
The static home page must contain three frames.
- *Top frame:* Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).
- *Left frame:* At least four links for navigation, which will display the catalogue of respective links. For e.g.: When you click the link "CSE" the catalogue for CSE Books should be displayed in the Right frame.
- *Right frame:* The pages to the links in the left frame must be loaded here. Initially this page contains description of the website.

Logo	Website Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIV	*Description of website*			

b. LOGIN PAGE

Logo	Website Name			
Home	Login	Registration	Catalogue	Cart

EXPERIMENT – 3 (UNIT-1)
c. CATALOGUE PAGE:
The catalogue page should contain the details of all the books available in the web site in a table. The details should contain the following:

- Snap shot of Cover Page.
- Author Name and Publisher.
- Price and Add to cart button.

Logo	Website Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIV		Book: Web Technologies Author: Kogent Publication: Dreamtech Press	$50	Add to Cart
		Book: JSP Complete Reference Author: Phil Hanna Publication: McGraw Hill	$28.5	Add to Cart
		Book: Web Technologies Author: Uttam K. Roy Publication: Oxford Higher Ed	$40	Add to Cart

EXPERIMENT – 4 (UNIT-1)

3. VALIDATION

AIM: To do validation for registration page using JavaScript.

DESCRIPTION: Write JavaScript to validate the following fields of the above registration page.

a) Name (Name should contains alphabets and the length should not be less than 6 characters).
b) Password (Password should not be less than 6 characters length).
c) e-mailid (should not contain any invalid and must follow the standard pattern (name@domain.com)
d) Phone number (Phone number should contain 10 digit sonly).

Note: You can also validate the login page with these parameters.

4. CSS

AIM: Write a program illustrating various methods in cascading style sheets

a) Use different font, styles and set a background image
b) Control the repetition of the image
c) Define styles for links
d) Work with layers and add a customized cursor

DESCRIPTION: Design a web page using CSS (Cascading Style Sheets) which includes the following:

a) Use different font, styles: In the style definition you define how each selector should work (font, color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles.
b) Set a background image for both the page and single elements on the page. You can define the background image for the page like this:
c) Control the repetition of the image with the background-repeat property. As background-repeat: repeat
d) Define styles for links
e) Work with layers:
f) Add a customized cursor:

Selector {cursor: value}.xlink {cursor: crosshair}.hlink {cursor: help}
5. Write a program to embed JavaScript in HTML pages.
6. Design a registration form and validate its field by using JavaScript.
7. Write a program to create popup boxes in JavaScript

EXPERIMENT – 5 (UNIT-II)

8. JSP program to print current date &time
9. JSP program to auto refresh a page
10. JSP program to count no. of visitors on website
11. JSP program for error handling
12. JSP program to demonstrate expression tag
13. JSP program to Detect locale, language settings & local specific time

EXPERIMENT – 6 (UNIT-II)

14. Demonstrate JSP implicit object
15. JSP Program to display given number in words
16. Write a HTML file to create a simple form with 5 input fields (Name, Password, Email, Pin code, Phone No. and a Submit button) and demonstrate required field validations to validate that all input fields are required and display error messages if the above validations do not hold using JSP

EXPERIMENT -7 (UNIT-II)

17. Create a JSP Page with and run in JSP Engines
18. Demonstrate Session Tracking in JSP
19. JSP Program to validate username and password

EXPERIMENT - 8 (UNIT-II)

20. Create Database Connectivity with JSP page with different JDBC Drivers.
21. JSP Program to Select record from database
22. JSP Program to Insert a record into the database
23. Create a CRUD operation for JSP Page using MySQL
24. JSP Program to upload file into server

EXPERIMENT - 9 (UNIT-III)

25. Design a PHP page to display student details.
26 .PHP program to demonstrate string functions
27. PHP program to demonstrate arrays (Numeric, Associative, Multi dimensional)
28. PHP program to demonstrate cookies
29. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.
30. PHP program to demonstrate Date() and Time() functions

EXPERIMENT - 10 (UNIT-III, IV)

31. PHP program to demonstrate Forms with GET, POST methods.
32. Create a student registration form and perform form validations and display error messages using PHP.
33. Design a Login Form in a neat format with CSS and Validate that form using PHP
34. Write a PHP program to implement MySQL connectivity
35. Create and delete MYSQL database using PHP
36. Create and delete table in MySQL using PHP

EXPERIMENT – 11 (UNIT-IV)

37. Demonstrate CRUD operations in MySQL using PHP
38. Write a PHP which does the following job:
    Insert the details of the 3 or 4 users who register with the web site by using student registration form (experiment-32) authenticate the user when he submits the login form using the UserName and Password from the database (instead of cookies)
39. Create tables in the database which contain the details of items (books in our case like Book name, Price, Quantity, Amount) of each category. Modify your catalogue page in such a waythat

you should connect to the database and extract data from the tables and display them in the catalogue page using PHP

EXPERIMENT - 12 (UNIT-IV)

40. Create a PHP program to demonstrate opening and closing a file
41. Create a PHP program to demonstrate reading a file and writing in a file
42. Design a form which upload & display image using PHP
43. Write a PHP program to demonstrate parsing an XML document
44. Write a PHP program to generate an XML Document

Laboratory Manual:

[1] *Web Programming Laboratory Manual,* Dept. of CSE, KITS Warangal.

Text Book:

[1] Kogent, *Web Technologies HTML, CSS, JavaScript, ASP.NET, Servlets, JSP, PHP, ADO.NET, JDBC and XML*, 1st ed., New Delhi: Dreamtech Press (Black Book), 2013 *(Chapters 2, 3, 4, 5, 6, 7, 8, 12,13)*

[2] Phil Hanna, *JSP: The Complete Reference*, 2nd ed., Noida: McGraw-Hill, 2001 *(Chapters 5, 6, 7, 8, 9, 10, 13, 14)*

Reference Books:

[1] Ivan Bayross, *Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP*, 4th ed., New Delhi: BPB Publications, 2009

[2] Uttam K. Roy, *Web Technologies*, 7th ed., New Delhi: Oxford Higher Education, 2010

[3] S Luke Welling, Laura Thomson, *PHP and MySQL Web Development*, 3rd ed., Chennai: Sams publications, 2005

[4] Jayson Falkner, Kevin Jones, *Servlets and Java Server Pages,* 1st ed., Chennai: Pearson, 2003

Course Learning Outcomes (COs):

On completion of this course, students' will be able to…

CO1: build static web pages using HTML Tags, CSS properties and Java scripts
CO2: build dynamic web pages using JSP concepts.
CO3: develop server side scripts for web applications using PHP
CO4: develop databases for web-based applications using PHP and MySQL, XML

Course Articulation Matrix (CAM):U18OE411D WEB PROGRAMMING LABORATORY																
Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18OE411D.1	2	2	2	1	1	-	-	1	2	1	-	2	2	2	2
CO2	U18OE411D.2	2	2	2	2	3	-	-	1	2	1	-	2	2	2	3
CO3	U18OE411D.3	2	2	2	2	3	-	-	1	2	1	-	2	2	2	3
CO4	U18OE411D.4	2	2	2	2	3	-	-	1	2	1	-	2	2	2	3
U18OE411D		2	2	2	2	2.5	-	-	1	2	1	-	2	2	2	2.75

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING(NETWORKS)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)

SCHEME OF INSTRUCTION & EVALUATION
V-SEMESTER OF 4-YEAR B. TECH DEGREE PROGRAM

Sl. No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	MC	U18MH501	Universal Human Values –II	2	-	-	-	10	30	40	60	100
2	PE	U18AI502	Professional Elective - I / MOOC-I	3	-	-	3	10	30	40	60	100
3	PCC	U18AI503	Internet of Things	3	-	-	3	10	30	40	60	100
4	PCC	U18AI504	Software Engineering	3	-	-	3	10	30	40	60	100
5	PCC	U18AI505	Compiler Design	3	-	-	3	10	30	40	60	100
6	PCC	U18AI506	Machine Learning	3	-	-	3	10	30	40	60	100
7	PCC	U18AI507	Advanced Java Programming Laboratory	-	-	2	1	40	-	40	60	100
8	PCC	U18AI508	Internet of Things Laboratory	-	-	2	1	40	-	40	60	100
9	PCC	U18AI509	Machine Learning Laboratory	-	-	2	1	40	-	40	60	100
10	PROJ	U18AI510	Seminar	-	-	2	1	100	-	100	-	100
Total:				17	1	8	19	280	180	460	540	1000
Additional Learning: Maximum credits allowed for Honours/Minor in Engineering*				-	-	-	*7*	-	-	-	-	-
Total credits for students opted for Honours/Minor:				**-**	**-**	**-**	***19+7***	**-**	**-**	**-**	**-**	**-**

** List of courses for additional learning through **MOOCs** towards Honours/Minor in Engineering shall be prescribed by the department under Honours/ Minor Curricula*

[L= Lecture, T = Tutorials, P = Practicals & C = Credits] **Total Contact Periods/Week : 26** **Total Credits : 19**

Professional Elective-I / MOOC-I:
U18AI502A: Computer Networks
U18AI502B: Advanced Database Management System
U18AI502C: Computer Graphics
U18AI502M: MOOCs course

MOOCs: Students are encouraged to do Massive Open Online Courses (MOOCs) on SWAYAM platform(https://www.swayam.gov.in) offered by NPTEL, CEC, IIM-B, IGNOU. Students shall contact the Head of the Department (HoD) to get their interested MOOCs approved by the HoD/Dean Academic Affairs for proper transfer of the credits for the MOOCs.

U18MH501 UNIVERSAL HUMAN VALUES -II

Class: B.Tech. V- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
2	1	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

*** Pre-requisite:U18MH111 Universal Human Values - I (Induction Programme)**

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: self-exploration, happiness and prosperity as the process of value education
LO2: harmony in the human being- self & family
LO3: co-existence of human being with society & nature
LO4: professional ethics, commitment and courage to act

UNIT – I(9)

Introduction - Need, Basic Guidelines, Content and Process for Value Education: Purpose and motivation for the course, Recapitulation from Universal Human Values - I (Induction programme) Self-Exploration:Its content and process, Natural acceptance and experiential validation – As the process for self-exploration

Continuous Happiness and Prosperity:A look at basic human aspirations, Right understanding, Relationship and physical facility - The basic requirement for fulfillment of aspirations of every human being with their correct priority

Understanding Happiness and Prosperity correctly:A critical appraisal of the current scenario, Method to fulfill the above human aspirations - Understanding and living in harmony at various levels

UNIT - II (9)

Understanding Harmony in the Human Being- Harmony in Myself & Family: Harmony in

Myself: Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Happiness and physical facility; Understanding the 'Body' as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of 'I' with the 'Body' - Sanyam and Health; Correct appraisal of physical needs, Meaning of prosperity in detail, Programs to ensure Sanyam and Health

Harmony in Family: Understanding values in human - Human relationship; Meaning of justice (Nine universal values in relationships), Program for its fulfillment to ensure mutual happiness, Trust and respect as the foundational values of relationship, Understanding the meaning of trust, Difference betweenintention and competence; Understanding the meaning of respect, Difference between respect and differentiation, The other salient values in relationship

UNIT - III (9)

Understanding Harmony with Society, Nature & Existence:
Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, Fearlessness (trust) and Co-existence as comprehensive human goals, Visualizing a universal harmonious order in society – Undivided society; Universal order - From family to world family

Understanding the harmony in the nature: Interconnectedness and mutual fulfillment among the four orders of nature - Recyclability and self-regulation in nature

Whole Existence as Co-existence: Understanding existence as co-existence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence

UNIT - IV (9)

Implications of Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of ethical human conduct, Basis for Humanistic education, Humanistic constitution and Humanistic universal order

Competence in professional ethics: a) Ability to utilize the professional competence for augmenting universal human order b) Ability to identify the scope and characteristics of people friendly and eco-friendly production systems and c) Ability to identify and develop appropriate technologies and management patterns for above production systems

Case studies: Case studies of typical holistic technologies, Management models and production systems, Strategy for transition from the present state to Universal human order – a) At the level of individual: As socially and ecologically responsible engineers, technologists and managers b) At the level of society: As mutually enriching institutions and organizations

Text Book:

[1]R.R.Gaur, R.SangalandG.P.Bagaria, *Human Values and Professional Ethics*, NewDelhi: Excel Books, 2010.

Reference Books:

[1]A. Nagaraj, Jeevan Vidya: Ek Parichaya, Raipur: Jeevan Vidya Prakashan, Amarkantak, 2018.
[2]A.N. Tripathi, Human Values, 3rd ed. New Delhi: New Age International Publisher, 2019.
[3]M. Govindrajran, S. Natrajan & V.S. Senthil Kumar, Engineering Ethics (includes Human Values), 12th ed. Haryana: PHI Learning Pvt. Ltd., 2011.
[4] Jayshree Suresh, B. S. Raghavan, Human Values & Professional Ethics, 4th ed. New Delhi: S. Chand & Co. Ltd., 2012

Course Research Paper: Research paper(indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patentrelevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Additional Resources:

[1]R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics (Teacher's Manual), New Delhi: Excel books, 2010.
[2]A set of DVDs containing - Video of Teachers' Orientation Program - PPTs of Lectures and Practice Sessions (Audio-visual material for use in the practice sessions)

Course Learning Outcomes (COs):

On completion of this course, student's will be able to…

CO1: interpret the importance of continuous happiness & prosperity through self exploration and imbibe skills to examine harmony

CO2: appraise the concept of sentience, distinguish between intention & competence and prioritize human values in relationships

CO3: build fearlessness & co-existence as comprehensive human goal and agree upon interconnectedness & mutual fulfilment

CO4: assess the understanding of harmony, adapt professional ethics and take part in augmenting universal human order

Course Articulation Matrix (CAM):U18MH501UNIVERSAL HUMAN VALUES – II																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18MH501.1	-	-	-	-	-	1	-	2	1	1	-	2	-	-	1
CO2	U18MH501.2	-	-	-	-	-	1	-	2	1	1	-	2	-	-	1
CO3	U18MH501.3	-	-	-	-	-	1	-	2	1	1	-	2	-	-	1
CO4	U18MH501.4	-	-	-	-	-	1	-	2	1	1	-	2	-	-	1
U18MH501		-	-	-	-	-	1	-	2	1	1	-	2	-	-	1

U18AI502A COMPUTER NETWORKS

Class: B.Tech. V- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme: **Examination Scheme:**

L	T	P	C
3	-	-	3

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: introduction to computer networks and reference models
LO2: types of data link and medium access control protocols
LO3: routing algorithms, congestion control algorithms and internetworking
LO4: transport and application layer protocols used in the networks

UNIT – I (9)

Introduction: Uses of computer networks, Network hardware, Network software
Reference Models: OSI reference model, TCP/IP reference model, Comparison of OSI and TCP/IP reference model
Physical Layer: Transmission media - Guided transmission media, Wireless transmission, Communication satellites; Digital modulation and multiplexing
Switching: Circuit and Packet switching

UNIT - II (9)

Data Link Layer: Data link layer design issues, Error detection and correction, Elementary data link protocols, Sliding window protocols
Medium Access Control Sub Layer: Channel allocation problem, ALOHA, Carriers sense multiple access, Collision free protocols, Limited contention protocol, IEEE standard 802.3, Token bus, Token ring, Switched ethernet, Fast ethernet, Gigabit ethernet, Data link layer switching

UNIT - III (9)

Network Layer: Network layer design issues, Routing algorithms - Optimality principle, Shortest path algorithm, Flooding, Distance vector routing, Link state routing, Hierarchical routing, broadcast routing, Multicast routing
Congestion Control Algorithms: Approaches to congestion control, Traffic aware routing, Admission control, Traffic throttling, Load shedding
Internetworking: How networks differ, How networks can be connected, Tunneling, Internetwork routing, Packet fragmentation

UNIT - IV (9)

Network Layer in The Internet: IP version 4 protocol, IP addresses, IP version 6 protocol, Internet control protocols, OSPF – Interior gateway routing protocol, BGP – Exterior gateway routing protocol, Internet multicasting
Transport Layer: Transport services, Elements of transport protocols – Connection establishment and release, Error control and flow control, Crash recovery, Multiplexing congestion control; Internet transport protocols - UDP, TCP
Application Layer: Domain name system (DNS), Electronic mail, World Wide Web

Text Book:

[1] Andrew S.Tannenbaum, David J.Wetherall, "Computer Networks", *5th Edition Pearson Education*, ISBN-13: 978-0-13-212695-3, 2011

Reference Books:

[1] William Stallings, "Data and Computer Communications", *9th Edition, Prentice-Hall of India(PHI),* ISBN-81-203-1240-6, 2011

[2] Forouzan, "Data Communication and Networking", *5th Edition, Tata McGraw Hill* , ISBN: 978-0-07-296775-3, 2012

Course Research Paper: Research paper (Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1:make use of OSI & TCP/IP reference models for data transmission

CO2: analyzedifferent types of sliding window protocols for reliable data transfer &CSMA/CD protocols to know whether the shared channel for transmission is busy or not

CO3: examine routing algorithms for directing internet traffic efficiently and congestion control algorithms for controlling data packets in the network

CO4:analyze the different services of transport layer for ensuring data packets arrival and application layer protocols for accessing and managing files in a remote computer

Course Articulation Matrix (CAM): U18AI502A COMPUTER NETWORKS

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI502A.1	2	2	2	2	2	1	-	1	1	1	-	1	2	2	2
CO2	U18AI502A.2	2	2	2	2	2	1	-	1	1	1	-	1	2	2	2
CO3	U18AI502A.3	2	2	2	2	2	1	-	1	1	1	-	1	2	2	2
CO4	U18AI502A.4	1	2	2	1	1	1	-	1	1	1	-	1	2	2	2
U18AI502A		1.75	2	2	1.75	1.75	1	-	1	1	1	-	1	2	2	2

U18AI502B ADVANCED DATABASE MANAGEMENT SYSTEM

Class:B.Tech.V-Semester **Branch:** Computer Science and Engineering (AI&ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40marks
End Semester Exam	60marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: data storage, disk organization, tree structured indexing & hash-based indexing techniques
LO2: parallel& distributed database architectures, organization & management
LO3: object database systems, operators and query evaluation
LO4: deductive databases, web databases, X Query and spatial data management

UNIT-I (9)

Overview of Storage and Indexing: Data on external storage, File organizations and indexing, Index data structures, Indexes and performance tuning

Storing Data Disks and Files: The memory hierarchy, Red undantarray so findependent disks, Disk space management, Buffer manager, Files of records, Page formats, Record formats

Tree – Structured Indexing: Intuition for tree indexes, ISAM, B+trees- Search, insert, delete, duplicates, B+ trees in practice;

Hash-Based Indexing: Statichashing, Extendible hashing, Linear hashing, Extendible versuslinear hashing

UNIT-II (9)

Parallel Databases: Introduction, Architectures for parallel databases, Parallel query evaluation, Parallelizing individual operations and parallel query optimization

Distributed Databases: Introduction, Distributed DBMS architectures, storing data in distributed DBMS, Distributed catalog management, Distributed query processing, Updating distributed data, Distributed transactions, Distributed concurrency control, Distributed recovery

UNIT-III (9)

Object-Database Systems: Motivating example, Structured data types, Operations on structured data, Encapsulation and ADTS, Inheritance, Objects, OIDS and reference types, Database design for an ORDBMS, ORDBMS implementation challenges, OODBMS, Comparing RDBMS, OODBMS, and ORDBMS

Overview of Query Evaluation: The system catalog, Introduction to operatore valuation, Introduction to query optimization, what a typical optimizer does

Evaluating Relational Operators: The selection operation, General selection conditions, The projection operation, The join operation, These toperations, Aggregate operations

UNIT-IV (9)

Deductive Databases: Introduction to recursivequeries, Recursivequeries with negation, Datalog to SQL, Evaluating recursive queries

Web Data bases: Introduction to information retrieval, indexing for text search, Web search engines, Managing text in DBMS, A data model for XML

X Query: Querying XML data, Efficient evaluation of XML queries

Spatial Data Management: Types of spatial data and queries, Applications involving spatial data, Introduction to spatial indexes, Indexing based on space-filling curves

Text Book:

[1] Raghu Ramakrishnan, Johannes Gehrke, *Database Management Systems*, 4thed. Hyderabad: Mc-GrawHill,2014. *(Chapters7to10,12,13,21,22,25,26,27)*

Reference Books

[1] Hector Garcia Molina, Jeffery DU llman, and Jennifer Widom, *Database Systems: The Complete Book*, 2nd ed., New Jersey: Pearson, 2008.

[2] Ramez Elmasri, ShamkanthB. Navathe, *Fundamentals of Database Systems*, 7th ed. NewDelhi: Pearson Education, 2017.

[3] Abraham Siberschatz, Henry F.Korth, and S.S udarshan, *Database System Concepts*, 6th ed. New Delhi: McGraw-Hill2011.

[4] R.P. Mahapatra, Govind Verma, *Database Management Systems*, 1st ed., New Delhi: Khanna publications, 2016.

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in Course Web page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in Course Web page.

Course Project: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in Course Web page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: illustrate the way data stored & organized in external storage devices and apply various indexing techniques to efficiently access the data

CO2: Analyze the architectures, data organization and management of parallel & distributed databases in transactional processing system

CO3: evaluate queries using various operators and features of object data base systems

CO4: make use of the data management in deductive data bases, web databases, X Queries & spatial data bases

Course Articulation Matrix (CAM): U18AI502B ADVANCED DATABASE MANAGEMENT SYSTEM

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI502B.1	2	2	2	2	1	-	-	1	-	1	-	2	2	1	2
CO2	U18AI502B.2	2	2	2	2	1	-	-	1	-	1	-	2	2	1	2
CO3	U18AI502B.3	2	2	2	2	1	-	-	1	-	1	-	1	2	1	2
CO4	U18AI502B.4	2	2	2	2	1	-	-	1	-	1	-	2	2	1	2
U18AI502B		**2**	**2**	**2**	**2**	**1**	-	-	1	-	1	-	**1.75**	**2**	**1**	**2**

U18AI502C COMPUTER GRAPHICS

Class: B.Tech.V–Semester **Branch**: Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: computer graphics primitives algorithms by drawing line drawing algorithms and 2D transformations
LO2: algorithms of segments, clipping & 3D viewing transformations
LO3: deriving projections mathematically and identification of hidden surfaces for creating standard animations
LO4: fundamental concepts of multimedia systems

UNIT-I (9)

Geometry and line generation: Introduction, Application of computer graphics, Pixels and frame buffer, Graphics standards, Image representation, *DDA* and Bresenham line generation algorithms, Graphics primitive operations, Character generation methods, Aliasing and anti aliasing

Polygons: Polygon representation, Inside test methods, Seed filling, Scanline filling algorithms

Two dimensional transformations: Scaling, Translation and rotation transformations, Rotation about arbitrary point, Homogenous coordinates, Inverse transformations, Transformation routines, Reflection and shearing transformations, Instance transformations

UNIT-II (9)

Segments: Segment creation algorithm, Segment closing algorithm, Segment deletion and segment renaming algorithms, Image transformation

Windowing and clipping: Window and view port, Viewing transformation matrix, Implementation of viewing transformation, Multiple windowing, Cohen Sutherland out code algorithm , Sutherland hodgman algorithm, Midpoint subdivision algorithm, Generalized clipping

Three dimensions: *3D* primitives, *3D* transformations, Rotation about arbitrary axis, *3D* viewing, Viewing parameters

UNIT-III (9)

Projections: Parallel projection, Perspective projection, Derivation of parallel projection matrix, Derivation of perspective projection matrix

Hidden surface and line removal algorithms: *Z-buffer* algorithm, Painters algorithm, Warnock algorithm, Franklin algorithm, Back face removal algorithm

Computer based animation: Basic concepts, Animation languages, Methods of controlling animation, Display of animation, Transmission of animation

UNIT-IV (9)

Multimedia: Media and data streams, Main properties of multimedia system, Traditional data stream characteristics - Asynchronous transfer mode, Synchronous transfer mode

Sound / Audio: Basic sound concepts - Computer representation of sound, Audio formats, Music - *MIDI* concepts, *MIDI* devices, *MIDI* messages, *MIDI* software, Speech - Speech generation, Speech analysis, Speech transmission

Multimedia applications: Media preparation, Media composition, Media integration, Media communication, Media consumption, Media entertainment

Text Books:

Ralf Steinmetz, Klara Nahrstedt, Multimedia: *Computing, Communications & Applications*, New Delh Pearson First Impression, 2006. (Chapters 2, 3, 17)

Reference Books:

James D.FoleyAndries Van Dam Steven K. Fernier, John Hugs, *Computer Graphics Principles & Practice*, 2nd ed. New Delhi: Pearson Education, 2002.

Donad Hearn, Pauline Baker, *Computer Graphics*, 2nded. New Delhi: Pearson Education, 1997.

Fabio Ganovelli, Massimiliano Corsini, Sumanta Pattanaik, Marco Di Benedetto, *Introduction to computer graphics a practical learning approach*, Newyork: Chapman and Hall, 2014.

Dr Rajiv chopra *Computergraphics : a practical approach, concepts, principles, case studies, experiments,* 4th ed.New Delhi: S Chand, 2011.

Course Research Paper: Research paper (Journal/Conference paper) relevant to the course content will be posted by the course faculty in Course Webpage.

Course Patent: Patent relevant to the course content will be posted by the course faculty in Course Webpage.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWebpage. Students are encouraged to comeup and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: design and transform a line or polygon using two dimensional transformations

CO2: apply segmentation and clipping algorithms to transform 2D to basic 3D transformations

CO3: analyze the concepts of projections, computer-based animations, and apply algorithms to eliminate hidden surfaces and lines

CO4: make use of animation's design principles for creation of quality multimedia applications

Course Articulation Matrix (CAM): U18AI502C COMPUTER GRAPHICS

Course Outcomes		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	U18AI502C.	2	2	2	1	-	-	-	1	1	1	-	2	2	2	-
CO2	U18AI502C.	2	2	2	1	-	-	-	1	1	1	-	2	2	2	-
CO3	U18AI502C.	2	2	1	1	-	-	-	1	1	1	-	1	2	1	-
CO4	U18AI502C.	1	1	-	-	1	-	-	1	1	1	-	2	1	1	1
U18AI502C		1.75	1.75	1.66	1	1	-	-	1	1	1	-	1.75	1.75	1.5	1

U18AI503 INTERNET OF THINGS

Class: B.Tech. V- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T		P	C
3	-		-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: fundamentals of IoT, sensors, actuators and IoT boards
LO2: IoT network architecture, design, connectivity technologies
LO3: interoperability between systems, IoT connectivity technologies, data protocols
LO4: IoT-cloud convergence and cloud based real world applications using IoT

UNIT – I(9)

Introduction: Introduction to IoT, Evolution of IoT-IoT versus M2M, IoT versus CPS, IoT versus WoT; Enabled technologies, Networking components, Challenges and applications
Sensors: Definition, Characteristics, Deviations, Types-Scalar, Multimedia, Hybrid and virtual; Considerations
Actuators: Definition, Types-Hydraulic, Pneumatic, Electric, Thermal or Magnetic, Mechanical, Soft and shape memory polymers; Characteristics
Classification of IoT boards: Microcontroller boards, Single board controller, System on chipboard

UNIT - II (9)

IoT Network Architecture and Design: Drivers behind new network architectures, The OneM2M IoT standardized architecture, The IoT World Forum (IoTWF) standardized architecture, A simplified IoT architecture, The Core IoT functional stack, IoT Data management and Compute stack
IoT Connectivity Technologies: Introduction, IEEE 802.15.4- 802.15 standards, Architecture, Topology, Addressing modes and Packet structure, Security, Zigbee-overview, PHY and MAC layer, Protocol stack, Addressing modes and Packet structure, Topology, Security; Z-Wave-overview, Protocol stack, Addressing, Topology and routing

UNIT - III (9)

IoT Connectivity Technologies: LoRa-Introduction, Physical layer, MAC layer and topology, Physical layer, MAC layer, Protocol stack and topology, Thread, ISA100.11A, Wireless HART, RFID, NFC, DASH7, Weightless, NB-IoT, Wi-Fi, Bluetooth
Data Protocols: MQTT-Publish-Subscribe, architecture, packet structure and communication format; MQTT-SN-Architecture, Topology, Transparent and aggregating gateways, Gateway advertisement and discovery, COAP-Architecture, Message formats, Usage example; AMQP, XMPP, SOAT, REST, Web socket

UNIT - IV (9)

IoT-Cloud Platform in Industry: Amazon web services, Google app engine and Microsoft Azure
IoT-Cloud Convergence: Challenges and open issues, Architecture for convergence, data offloading and computation, Dynamic resource provisioning, Security aspects
Cloud-Based Smart City using IoT: Introduction to smart city, characteristics, standards and protocols for cloud-based smart city, Applications: Traffic management, Smart healthcare, Disaster management, Air pollution monitoring and Smart waste management.

Text Books:

[1] Arshdeep Bahga and Vijay Madisetti, *Internet of Things: A Hands-On Approach,* Hyderabad: University Press, 2015.

[2] David Hanes, Gonzalo Salgueiro and Patrick Grossetete, *IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things,* Cisco Press, 2017. (Chapters: 2, 3, 4, 5, 8,13,15)

Reference Books:

[1] Bassi Alessandro, *Enabling things to talk*, Berlin: Springer-Verlag, 2016.

[2] Hersent, Olivier, David Boswarthick, and Omar Elloumi, *The internet of things: Key applications and protocols*.London: John Wiley & Sons, 2011.

[3]Buyya, Rajkumar, and Amir Vahid Dastjerdi, *Internet of Things: Principles and paradigms*. New York: Elsevier, 2016.

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patentrelevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, student's will be able to…

CO1: make use of the basics of IoT, sensors, actuators and IoT boards to design IoT based applications

CO2: analyze various IoT network architectures and connectivity technologies to address the heterogeneity in devices

CO3: analyze the protocol stack for wireless devices & data protocols to address the heterogeneity in networks

CO4: analyze the IoT-cloud convergence and design solutions for real world applications like smart mobile apps for societal applications

Course Articulation Matrix (CAM): U18AI503 INTERNET OF THINGS

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI503.1	2	2	2	2	2	1	1	1	1	1	-	1	2	2	2
CO2	U18AI503.2	2	2	2	1	1	1	1	1	1	1	-	3	2	2	2
CO3	U18AI503.3	2	2	2	1	1	1	1	1	1	1	-	3	2	2	2
CO4	U18AI503.4	2	2	2	2	2	1	1	1	1	1	-	3	2	2	2
U18AI503		2	2	2	2	1.5	1	1	1	1	1	-	2.5	2	2	2

U18AI504 SOFTWARE ENGINEERING

Class: B. Tech. V-Semester **Branch:** Computer Science and Engineering (AI&ML)

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):
This course will develop students' knowledge in/on…

LO1: fundamental concepts of software and different types of software models
LO2: different types of design concepts and patterns
LO3: software design principles and test strategies
LO4: metrics for quality analysis of software and risk management

UNIT-I (9)

Software Engineering Concepts: The changing nature of software, Software application domains, Legacy software, Software myths, Software engineering layered technology, A process framework, The capability maturity model integration (*CMMI*), Agile software

Process Models -Prescriptive process models, RAD model, Specialized process models, Unified process model, Personal and team process models

Agile Development: Agility and the cost of change, Agile process, Extreme programming, Other agile process models

Software **Engineering Practices**: Communication principles, Planning principles, Modeling principles, Construction principles, Deployment principles

UNIT-II (9)

Requirements Engineering Tasks: Requirements analysis and modeling strategies, User requirement, System requirement, Software requirements document
Design Engineering: Design within the context of software engineering, Design process, Design concepts, The design model
Architectural Design: Software architecture, Architectural genres, Architectural styles, Architectural design, Assessing alternative architectural designs, Designing class based components, Conducting component level design, Design for WebApps, Designing traditional components

UNIT-III (9)

User Interface Design: The golden rules, User interface analysis and design, Interface analysis, Interface design steps, WebApp and mobile interface design
Testing Strategies: Software testing fundamentals, Test strategies for conventional software, Test strategies for object-oriented software, Validation testing, System testing, The art of Debugging, White box testing, Basis path testing, Control structure testing, Black box testing
Testing Web Applications: Testing concepts for web apps, The testing process, Content testing, User interface testing, Component-level testing, Navigation testing, Configuration testing, Security testing, Performance testing

UNIT-IV (9)

Product Metrics: Measures, Metrics and indicators, Metrics for the requirements model, Metrics for the design model, Metrics for source code, Metrics for testing, Metrics for maintenance

Process and Project Metrics: Metrics in the process and project domains, Software measurement, Metrics for software quality, Integrating metrics within the software process, The *W5HH* principle

Project Scheduling: Project scheduling, Scheduling for WebApps projects, Earned value analysis

Risk Management: Reactive versus Proactive risk strategies, Software risks, Risk identification, Risk projection, Risk refinement, RMMM plan

Text Book:

[1] Roger S. Pressman and Bruce R. Maxim, *Software Engineering: A Practitioner's Approach*, 8th ed., New Delhi: McGraw Hill, 2019

Reference Books:

[1] Ian Sommerville, *Software Engineering*, 10th ed., Delhi: Pearson Education, 2016
[2] Deepak Jain, *Software Engineering: Principles and Practices*, 3rd ed., Delhi: Oxford University Press, 2008
[3]Pankaj Jalote, *Software Engineering: A Precise Approach,* NewDelhi: Wiley India, 2010
[4]Waman S. Jawadekar, *Software Engineering: A Primer*, NewDelhi: Tata Mcgraw Hill, 2008

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):
On completion of this course, students will be able to…

CO1: implement the appropriate software model for a given real time application
CO2: develop different types of software designs & patterns
CO3: apply an appropriate testing method for a given software
CO4: apply metrics to assess the quality of software and analyze the risk management in project scheduling

Course Articulation Matrix (CAM) U18AI504 SOFTWARE ENGINEERING

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI504.1	1	1	1	1	-	-	-	-	1	1	2	1	2	1	2
CO2	U18AI504.2	1	1	1	1	-	-	-	-	1	1	2	1	1	1	2
CO3	U18AI504.3	2	2	1	1	-	1	1	-	1	1	2	1	2	1	2
CO4	U18AI504.4	2	2	2	1	-	1	1	-	1	1	2	1	2	1	2
U18AI504		1.5	1.5	1.25	1	-	1	1	-	1	1	2	1	1.75	1	2

U18AI505 COMPILER DESIGN

Class:B.Tech. V- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: phases of a compiler and design of a lexical analyzer
LO2: parsing techniques using context-free grammar and construction of syntax tree
LO3: specification of a type checker, storage allocation strategies and generating intermediate form for the given programming statements
LO4: generating target code from the intermediate form and applying code optimization techniques to improve the performance of the code

UNIT-I (9)

Introduction to Compiling: Compilers, Analysis of the source program, Phases of a compiler, Cousins of the compiler, Grouping of phases, Compiler construction tools **Lexical Analysis:** Role of lexical analyzer, Input buffering, Specification of tokens, Recognition of tokens, A language for specifying lexical analyzers, Finite automata, Design of a lexical analyzer, Optimization of deterministic finite automata based pattern matchers

UNIT-II (9)

Syntax Analysis: Role of the parser, Writing grammars, Context free grammars, Top down parsing, Bottom up parsing, Operator precedence parsing, LR parsers, Using ambiguity grammars, Parser generators

Syntax Directed Translation: Syntax directed definitions, Construction of syntax trees, Bottom up evaluation of S-attributed definitions, L-attributed definitions, Top down translation, Bottom up evaluation of inherited attribute, Space for attribute values at compile time, Analysis of syntax directed definition

UNIT-III (9)

Type Checking: Type systems, Specification of a simple type checker, Equivalence of type expressions, Type conversions

Runtime Environments: Source language issues, Storage organization, Storage allocation strategies, Symbol tables, Language facilities for dynamic storage allocation, Dynamic storage allocation techniques

Intermediate Code Generation: Intermediate languages, Declarations, Assignment statements, Boolean expressions, Back patching

UNIT-IV (9)

Code Generation: Issues in the design of code generator, The target machine, Runtime storage management, Basic blocks and flow graphs, Next-use information, A simple code generator,

Register allocation and assignment, Directed acyclic graph representation of basic blocks, Peephole optimization, Generating code from directed acyclic graphs, Code generation algorithm

Code Optimization: Introduction, The principal sources of optimization, Optimization of basic blocks, Loops in flow graphs, Introduction to global data flow analysis, Code improving transformations

Text Book:

[1] Alfred V.Aho, Ravi Sethi and Jeffrey D.Ullman, *Compilers: Principles, Techniques and Tools*, 2nd ed. Hong Kong: Pearson Education Asia, 2013.

Reference Books:

[1] Allen I. Holub, *Compiler Design in C*, 2nd ed. New Jersey: Prentice Hall of India, 2003.
[2] C. N. Fischer, R. J. LeBlanc, *Crafting a compiler with C*, California: Pearson Education, 2003.
[3] J.P. Bennet, *Introduction to Compiling Techniques*, 2nd ed. New York: McGraw-Hill, 2003.
[4] Henk Alblas, Albert Nymeyer, *Practice and Principles of Compiler Building with C*, London: PHI, 2001.

Course Research Paper: Research paper (Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students' will be able to…

CO1: design lexical analyzer using regular expressions to generate tokens from the given programming statements
CO2: construct syntax tree and parsing table for the given context-free grammar
CO3: construct intermediate code for the given programming statements
CO4: develop target code from the intermediate form and apply code optimization techniques to improve the performance of the code

Course Articulation Matrix (CAM):U18AI505COMPILER DESIGN

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI505.1	3	3	2	2	1	-	-	1	1	1	-	2	1	1	1
CO2	U18AI505.2	3	3	2	2	1	-	-	1	1	1	-	2	1	1	1
CO3	U18AI505.3	3	3	3	3	1	-	-	1	1	1	-	3	1	1	1
CO4	U18AI505.4	3	3	3	3	1	-	-	1	1	1	-	3	1	1	1
U18AI505		3	3	2.5	2.5	1	-	-	1	1	1	-	2.5	1	1	1

U18CAI506 MACHINE LEARNING

Class: B.Tech. V- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on…

LO1: machine learning fundamentals, binary classification and handling more than two classes

LO2: dimensionality reduction, linear and kernel models

LO3: fundamentals of ANN, multi-layer feed forward and back propagation networks

LO4: reinforcement learning, decision making by ensemble learning

UNIT – I (9)

The ingredients of machine learning: The problems that can be solved with machine learning, The output of machine, The workhorses of machine

Binary classification: Classification, Scoring and Ranking, Class probability estimation

Beyond Binary Classification: Handling more than two classes

Case Study: Spam filtering

UNIT - II (9)

Dimensionality Reduction: Linear discriminant analysis (LDA), Principal components analysis (PCA), Factor analysis, Independent components analysis (ICA)

Linear Models: The Least-Squares method, Multivariate linear regression

Support Vector Machines: Optimal separation, Kernels, The support vector machine algorithm, Extensions to the SVM

Case Study: Disease prediction using SVM

UNIT - III (9)

Artificial Neural Networks: Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptron, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm

The Multi-layer Perceptron: Going forwards, Going backwards, Back-propagation of error, The Multi-layer perceptron in practice, Examples of using the MLP, A Recipe for using the MLP, Deriving Back-Propagation

UNIT - IV (9)

Reinforcement Learning: Overview, Example: getting lost, Markov decision processes, Values, Back on holiday: Using reinforcement learning, The difference between SARSA and Q-Learning, Uses of Reinforcement learning

Ensemble Learning: Boosting, Bagging, Random forests, Different ways to combine classifiers

Case Study: optimization of disease prediction using ensemble learning

Text Books:

[1] Peter Flach, *Machine Learning: The Art and Science of Algorithms that Make Sense of Data*, Cambridge University Press, 1st ed., ISBN: 978-1 -107-09639-4, 2012.

[2] Stephen Marsland, Taylor & Francis, *Machine Learning: An Algorithmic Perspective*, CRC, ISBN - 13: 978-1420067187, 2009.(Ch:

Reference Books:

[1] Tom M. Mitchell, *Machine Learning*, MGH, Indian Edition, ISBN 1259096955, 2013

[2] S. Russell and P. Norvig, *Artificial Intelligence – A Modern Approach*, 2nd ed., Pearson Education, 2003, ISBN: 978-0137903955

[3] Jason Bell, *Machine Learning: Hands-On for Developers and Technical Professionals*, John Wiley & Sons, 1st ed., ISBN-13: 978-1118889060, 2014.

[4]William W Hsieh, *Machine Learning Methods in the Environmental Sciences, Neural Networks*, Cambridge University Press, ISBN -13: 978-0805822410, 2009.

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students' will be able to…

CO1: classify given input class based on binary and multivariate classification techniques

CO2: apply linear models and dimensionality reduction in real world problems like disease prediction

CO3: analyzethe ANN and its usage in real world problems like handwritten digit recognition

CO4: analyze the concepts of reinforcement learning and decision making by ensemble learning

Course Articulation Matrix (CAM):U18AI506 MACHINE LEARNING																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**U18AI506.1**	2	2	2	3	3	2	-	1	1	1	-	2	2	2	2
CO2	**U18AI506.2**	3	3	3	2	2	2	-	1	1	1	-	2	3	2	3
CO3	**U18AI506.3**	2	2	2	3	3	1	-	1	1	1	-	2	2	2	3
CO4	**U18AI506.4**	3	2	3	3	3	2	-	1	1	1	-	2	3	2	3
U18AI506		2.5	2.5	2.5	2.75	2.75	1.75	-	1	1	1	-	2	2.5	2	2.75

U18AI507 ADVANCED JAVA PROGRAMMING LABORATORY

Class:B. Tech.V-Semester **Branch:** Computer Science & Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LOs):
This course will develop student's knowledge in/on…
LO1: developing GUI based programs using the concept of swings
LO2: the concepts of generics and collections
LO3: sorting user-defined data using Comparable & Comparator interfaces and performing the unit testing with JUnit
LO4: lambda expressions and Stream API

List of Experiments

Experiment-I

1. Create a JFrame program to display "Good Morning" if current time is between "6 AM to 12 PM" and "Good Afternoon" if the current time is between "12 PM to 6PM", and "Good Evening" if the current time is between "6PM to 12AM"
2. Create a JFrame program to perform basic arithmetic calculations on given two numbers with the help of button events

Experiment-II

1. Create a JFrame program from which you can open other frames with the help of button events
2. Design different JFrame's to demonstrate different layouts like Flow layout, Border layout, Grid layout & null layout
3. Create a JFrame program to work with window events

Experiment -III

1. Create a JFrame to add a menu bar with which you can select different options from different menus and perform some action on selection of every menu item
2. Create a JFrame program to open the text file using JFileChooser and display the selected text file content on the JTextArea
3. Design a registration form with the help of a JFrame and save the details in to the text file

Experiment -IV

1. Create a JFrame program to insert, delete & update the records of a database table
2. Create a JFrame program to select a database table using JComboBox component and display the content of the selected database table in JTable componen

Experiment -V

1. Write a java program to demonstrate generic class
2. Write a java program to demonstrate methods and constructors in generics
3. Write a java program to demonstrate multiple type parameters in generic classes
4. Write a java program to demonstrate in heritances in generics

Experiment -VI

1. Write a java program to perform following operations on Array List, LinkedList, HashSet and Linked HashSet
   i. Insertion
   ii. Deletion
   iii. Traversing using traditional-for, for-each, Iterator and ListIterator
   iv. Display the elements in reverse order

2. Write a program that will have a Vector which is capable of storing Employee objects. Use an Iterator and enumeration to list all the elements of the Vector

Experiment -VII

1. Write a java program to perform different operations on inbuilt Stack class
2. Write a java program to perform different operations on inbuilt Queue class
3. Write a java program to perform insertion, deletion, traversing and searching operations on HashMap and TreeMap

Experiment -VIII

1. Write a java program to store and retrieve user defined class objects from TreeSet
2. Write a java program to read a set of values and display the count of occurrences of each number using collection concept

Experiment-IX

1. Write a java program to display ArrayList values in sorted order
2. Write a java program to demonstrate Comparable interface for sorting user defined data type
3. Write a java program to demonstrate Comparator interface for sorting user defined data type

Experiment-X

1. Write a java program to test simple arithmetic operations of Calculator class using JUnit concept
2. Write a java program to demonstrate different Assert methods and annotations

Experiment-XI

1. Write a java program to demonstrate lambda expression with no parameter
2. Write a java program to demonstrate lambda expression with single and multiple parameters
3. Write a java program to iterate the List and Map using lambda expressions
4. Create two threads using lambda expressions, where one thread displays even numbers for every half second and the other thread displays odd numbers for every second

Experiment-XII

1. Write a java program to demonstrate following methods using streams on a List
   a) filter **b)** sorted **c)** distinct **d)** limit **e)** count
2. Write a java program to read a string and collect upper case characters, lower case characters & digits into different ArrayList objects using streamAPI and display them

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Laboratory Manual:

[1] Advanced Java Programming Laboratory Manual, Dept. of CSE (AI & ML), KITSW.

Reference Books:

[1] Herbert Schildt,JAVA The Complete Reference, 10th ed.New York: McGraw-Hill Education India Pvt.Ltd, 2017.

[2] Sachin Malhotra, Saurabh Choudhary, Programming in JAVA, 2nd ed. New Delhi: Oxford University Press, 2013.

[3] UttamK.Roy, Advanced JAVA Programming, New Delhi: Oxford University Press, 2015.

[4] PualDeitel, Harvey Deitel, Java How to program, 10th ed. Chennai: Pearson Education, 2016.

[5] Sujoy Acharya, Mastering Unit Testing Using Mockito and JUnit, Birmingham: Packt Publishing Limited, 2014.

Course Learning Outcomes (COs):
On completion of this course, students will be able to…

CO1: design GUI programs by using the concept of swings
CO2: apply the concept of generics &collections to work on dynamic data
CO3: demonstrate correct usage of Comparable & Comparator interfaces and examine the test cases to perform unit testing using the concept of JUnit
CO4: apply the lambda expressions instead of anonymous class and effectively process collections of objects using Stream API

Course Articulation Matrix (CAM): U18AI507 ADVANCED JAVA PROGRAMMINGLABORATORY																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18AI507.1	2	2	2	1	2	-	-	1	2	1	-	2	3	1	3
CO2	U18AI507.2	2	2	2	1	-	-	-	1	2	1	-	2	3	1	2
CO3	U18AI507.3	2	2	2	1	2	-	-	1	2	1	-	2	3	3	3
CO4	U18AI507.4	2	2	2	1	-	-	-	1	2	1	-	2	3	1	2
U18AI507		2	2	2	1	2	-	-	1	1	1	-	2	3	1.5	2.5

U18AI508 INTERNET OF THINGS LABORATORY

Class: B.Tech. V- Semester **Branch:**Computer Science andEngineering(AI & ML)

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: configuring Raspberry Pi for IoT applications
LO2: running python program on Raspberry Pi for developing IoT applications
LO3: implementing cloud based IoT applications
LO4: usage of Pi camera and 7-segment display

List of Experiments

Experiment-I (UNIT-I)

1. Exploring sensors and actuators
2. Demonstrating Arduino board and Raspberry Pi
3. Installation of OS onto Raspberry Pi

Experiment-II (UNIT-I)

1. Raspberry Pi and try various Linux commands in command terminal window:
   i. *ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip*
   ii. *cat, more, less, ps*
2. Start Raspberry Pi and try various Linux commands in command terminal window:
   i. *sudo, cron, chown, chgrp, ping etc.*
   ii. *process-related commands*

Experiment-III (UNIT-I)

1. Run a python program on Pi to Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input
2. Run a python program on Pi to demonstrate *while* loop
3. Run a python program on Pi to demonstrate *for* loop
4. Run a python program on Pi to demonstrate handle *Divide By Zero* Exception
5. Run a python program on Pi to demonstrate file operations

Experiment-IV (UNIT-II)

1. Demonstrate Light an LED through Python program.
2. Write a program to demonstrate light an LED which are connected in series
3. Write a program to demonstrate light an LED which are connected in parallel.
4. Design a program to infinitely blink a sequence of 4 LEDs connected to Pi, one after the other with the delay of 500 ms.

Experiment-V (UNIT-II)

1. Write a program to demonstrate LED with button.
2. Write a program to demonstrate two LEDs with Two buttons.
3. Write a program to demonstrate light an LED through web.

Experiment-VI (UNIT-II)

1. Get input from DHT sensor and upload on cloud

Experiment -VII (UNIT-III)
1.Get input from ultrasonic sensor and upload on cloud

Experiment-VIII (UNIT-III)
1. Working with LED, button, *pir*sensor

Experiment-IX (UNIT-III)
1. Design a program to sense temperature using DHT sensor and if the temperature is exceeds the 40^0C, servo motor is actuated for 10seconds. The actuated motor rotates between 0 to 180 degrees.

Experiment-X (UNIT-IV)
1. Design a program to demonstrate DC motor

Experiment-XI (UNIT-IV)
1. Design a program to demonstrate stepper motor

Experiment-XII (UNIT-IV)
1. Working with Pi camera
2. Working with 7-segment display using Raspberry PI

Laboratory Manual:
Internet of Things Laboratory Manual, Dept. of CSE(AIML), KITSW.

Text Books:
[1]ArshdeepBahga and Vijay Madisetti, *Internet of Things: A Hands-On Approach,* Hyderabad: University Press, 2015.
[2]David Hanes, Gonzalo Salgueiro and Patrick Grossetete, *IoT Fundamentals: Networking Technologies, Protocols, andUse Cases for the Internet of Things,* Cisco Press, 2017. (Chapters: 2, 3, 4, 5, 8,13,15)

Reference Books:
[1] Bassi Alessandro, *Enabling things to talk*, Berlin: Springer-Verlag, 2016.
[2] Hersent, Olivier, David Boswarthick, and Omar Elloumi, *The internet of things: Key applications and protocols*.London: John Wiley & Sons, 2011.
[3] Buyya, Rajkumar, and Amir Vahid Dastjerdi, *Internet of Things: Principles and paradigms*. New York: Elsevier, 2016.

Course Research Paper: Research paper(indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patentrelevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):
On completion of the course, students will be able to…
CO1: analyse various commands used in Raspbian operating system
CO2: develop python programs for connecting sensor and actuators
CO3: make use of IoT-Cloud platform for uploading and visualizing sensor data
CO4: develop smart application such as automatic door opening and closing using actuators and sensors

Course Articulation Matrix (CAM): U18AI508 INTERNET OF THINGS LABORATORY																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18AI508.1	**1**	**2**	**2**	**1**	**2**	**1**	**1**	**1**	**1**	**-**	**-**	**1**	**2**	**1**	**1**
CO2	U18AI508.2	**1**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**-**	**-**	**1**	**2**	**1**	**1**
CO3	U18AI508.3	**1**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**-**	**1**	**1**	**2**	**1**	**1**
CO4	U18A508.4	**1**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**
U18AI508		**1**	**2**	**2**	**1.75**	**2**	1	1	1	1	1	1	**1**	**2**	**1**	**1**

U18AI509 MACHINE LEARNING LABORATORY

Class: B.Tech. V- Semester **Branch:**Computer Science and Engineering(AI & ML)

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledgein / on…

LO1: binary classification and handling more than two classes
LO2: dimensionality reduction, linear and kernel models classes
LO3: multi-layer feed forward and back propagation networks
LO4: reinforcement learning, decision making by ensemble learning

List of Experiments

Experiment-I (Unit-I)

1. Implement classification on spam filtering for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

Experiment-II (Unit-I)

1. Write a program to implement the Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

Experiment-III (Unit-I)

1. Implement prediction of lung pneumonia disease to demonstrate multi label classification

Experiment-IV (Unit-II)

1. Implement Linear discriminant analysis (LDA) using an appropriate binary dataset.

Experiment-V (Unit-II)

1. Implement Independent components analysis (ICA) on any appropriate data set.
2. Implement Principal components analysis (PCA) on any appropriate data set.

Experiment-VI (Unit-II)

1. Implement logistic regression on any appropriate data set.

Experiment-VII (Unit-II)

1. Implement linear regression on any appropriate data set.

Experiment-VIII (Unit-II)

1. Build linear SVM model for any appropriate data set.
2. Build anon linear SVM model for any appropriate data set.

Experiment-IX (Unit-III)

1. Build a Multi layer perceptron network for handwritten digit recognition.

Experiment-X (Unit-III)

1. Build an Artificial Neural Network by implementing the back propagation algorithm and test the same using appropriate data sets.

Experiment-XI (Unit-IV)

1. Implement Recommendation system using reinforcement learning.

Experiment-XII (Unit-IV)

1. Build an ensemble classifier for disease prediction and tune the model using hyper parameter optimization.

Laboratory Manual:

[1] *Machine Learning Laboratory Manual*, Dept. of CSE (AI & ML), KITSW.

Text Books:

[1] Peter Flach, *Machine Learning: The Art and Science of Algorithms that Make Sense of Data*, Cambridge University Press, 1st ed., ISBN: 978-1 -107-09639-4, 2012.

[2] Stephen Marsland, Taylor & Francis, *Machine Learning: An Algorithmic Perspective*, CRC, ISBN -13: 978-1420067187, 2009.

Reference Books:

[1] Tom M. Mitchell, *Machine Learning*, MGH, Indian Edition, ISBN 1259096955, 2013

[2] S. Russell and P. Norvig, *Artificial Intelligence – A Modern Approach*, 2nd ed., Pearson Education, 2003, ISBN: 978-0137903955

[3] Jason Bell, *Machine Learning: Hands-On for Developers and Technical Professionals*, John Wiley & Sons, 1st ed., ISBN-13: 978-1118889060, 2014.

[4]William W Hsieh, *Machine Learning Methods in the Environmental Sciences, Neural Networks*, Cambridge University Press, ISBN -13: 978-0805822410, 2009.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: develop programs given input class based on binary and multivariate classification techniques

CO2: develop programs on linear models and dimensionality reduction in real world problems like disease prediction

CO3: develop programs on ANN and its usage in real world problems like handwritten digit recognition

CO4: develop programs on reinforcement learning and decision making by ensemble learning

Course Articulation Matrix (CAM):U18AI509 MACHINE LEARNING LABORATORY

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**U18AI509.1**	2	2	2	3	3	2	-	1	1	1	-	2	2	2	2
CO2	**U18AI509.2**	3	3	3	2	2	2	-	1	1	1	-	2	3	2	3
CO3	**U18AI509.3**	2	2	2	3	3	1	-	1	1	1	-	2	2	2	3
CO4	**U18AI509.4**	3	2	3	3	3	2	-	1	1	1	-	2	3	2	3
U18AI509		2.5	2.5	2.5	2.75	2.75	1.75	-	1	1	1	-	2	2.5	2	2.75

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING(NETWORKS)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)

URR-18R22

SCHEME OF INSTRUCTION & EVALUATION
VI-SEMESTER OF 4-YEAR B. TECH DEGREE PROGRAM

[6Th+3P+Miniproject]

Sl. No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	HSMC	U18TP601	Quantitative Aptitude & Logical Reasoning	2	-	-	1	10	30	40	60	100
2	HSMC	U18MH602	Management, Economics and Accountancy	3	-	-	3	10	30	40	60	100
3	PE	U18AI603	Professional Elective - II / MOOC-II	3	-	-	3	10	30	40	60	100
4	PCC	U18AI604	Design and Analysis of Algorithms	3	-	-	3	10	30	40	60	100
5	PCC	U18AI605	Deep Learning	3	-	-	3	10	30	40	60	100
6	PCC	U18AI606	Computer Vision and Image Processing	3	1	-	4	10	30	40	60	100
7	PCC	U18AI607	Design and Analysis of Algorithms Laboratory	-	-	2	1	40	-	40	60	100
8	PCC	U18AI608	Deep Learning Laboratory	-	-	2	1	40	-	40	60	100
9	PCC	U18AI609	Computer Vision and Image Processing Laboratory	-	-	2	1	40	-	40	60	100
10	PROJ	U18AI610	Mini Project	-	-	2	1	100	-	100	-	100
Total:				17	-	8	21	280	180	460	540	1000
Additional Learning: Maximum credits allowed for Honours/Minor in Engineering*				-	-	-	*7*	-	-	-	-	-
Total credits for** students opted for **Honours/Minor students:				-	-	-	*21+7*	-	-	-	-	-

List of courses for additional learning through **MOOCs towards Honours/Minor in Engineering shall be prescribed by the department under Honours/ Minor Curricula*

[L= Lecture, T = Tutorials, P = Practicals & C = Credits] **Total Contact Periods/Week: 26** **Total Credits: 21**

Professional Elective-II / MOOC-II:
U18AI603A: Natural Language Processing
U18AI603B: Information Retrieval Systems
U18AI603C: Soft Computing
U18AI603M: MOOCs Course

U18TP601 QUANTITATIVE APTITUDE AND LOGICAL REASONING

Class: B.TechVI-Semester **Branch:** Computer Science and Engineering (AI&ML)

Teaching Scheme:

L	T	P	C
2	-	-	1

Examination Scheme:

Continuous Internal Evaluation	40marks
End Semester Exam	60marks

Course Learning Objectives (LOs):
This course will develop students' knowledgeon / in…
LO1: quantitative aptitude & problem solving skills
LO2: computing abstract quantitative information
LO3: application of basic mathematics skills & critical thinking to draw conclusions
LO4: evaluating the validity & possible biases in arguments presented in authentic contexts

UNIT-I(6)

Quantitative Aptitude-I: Number system, Averages, Percentages, Ratios & proportions, Time, Speed &distance, Time and work, Data interpretation

UNIT - II (6)

Quantitative Aptitude-II: Simple Interest, Compound Interest, Profit & loss, Ages, Permutations &Combinations, Probability

UNIT - III (6)

Logical Reasoning-I: Series completion, Analogy, Coding and decoding, Blood relations, Number, Ranking & Time sequence test, Linear & Circular arrangements

UNIT - IV (6)

Logical Reasoning-II: Data sufficiency, Logical Venn diagram, Syllogisms, Statement & Arguments, Statement & Assumptions, Direction sense test

TextBooks:

[1] RSA garwal, Quantitative Aptitude for Competitive Examinations, 3rded. NewDelhi: S.Chand Publications, 2019.(Chapters1,6,7,8,10,11,12,15,17,21,22,30,31)

[2] RSAgarwal, AModern Approach to Verbaland Non-Verbal Reasoning, 3rded. NewDelhi: S.Chand Publications, 2019. (Chapters Section I:1,3,4,5,6,8,16, Section II:2,3)

Reference Books:

[1] Dinesh Khattar, *Quantitative Aptitude for Competitive Examinations*, New Delhi: Pearson India, 2019.

[2] Nishit K Sinha, *Reasoning for Competitive Examinations*, New Delhi: Pearson India, 2019.

[3] R.N. Thakur, *General Intelligence and Reasoning*, New Delhi: McGraw Hill Education,2017.

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in Course Webpage.

Course Patent: Patent relevant to the course content will be posted by the course faculty in Course Webpage.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in Course Web page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be ble to…

CO1: solve arithmetic relationships and interpret data using mathematical models

CO2: compute abstract quantitative in formation

CO3: apply basic mathematics & critical thinking skills to draw conclusions and solve problems

CO4: evaluate the validity & possible biases in arguments presented in authentic contexts logically & sensibly

Course Articulation Matrix (CAM):U18TP601 QUANTITATIVE APTITUDE AND LOGICAL REASONING																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**U18TP601.1**	-	2	-	1	-	-	-	-	-	-	-	1	-	-	1
CO2	**U18TP601.2**	-	2	-	1	-	-	-	-	-	-	-	1	-	-	1
CO3	**U18TP601.3**	-	1	-	2	-	2	-	-	-	-	-	1	-	-	1
CO4	**U18TP601.4**	-	1	-	2	-	2	-	-	-	-	-	1	-	-	1
U18TP601		-	1.5	-	1.5	-	2	-	-	-	-	-	1	-	-	1

U18MH602 MANAGEMENT ECONOMICS AND ACCOUNTANCY

Class: B.TechVI-Semester **Branch:** Computer Science and Engineering (AI&ML)

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives (LOs):
This course will develop students' knowledge on/in...
LO1:basic concepts of management
LO2: concepts of economics and forms of business organizations
LO3: fundamentals of accountancy and journalizing
LO4: preparation of final accounts

UNIT-I(9)

Management: Meaning and definition, Scientific Management - Definition, Characteristics, Principles of management

Functions of Management: Planning - Definition, Characteristics; Organizing - Definition, Characteristics; Staffing- Meaning, Functions of personnel management; Directing- Leadership, Nature; Motivation— Nature, Types (financial, non-financial, intrinsic and extrinsic), Communication- Process, Types, Co- ordination- Definition, Steps to achieve effective coordination, Controlling- Definition, process (Chapters 1,3, 4, 5, 6, 7 of Part 4 of Text 1)

UNIT - II (9)

Economics: Meaning and definition, Scope, Micro and Macro Economics, Methods of Economics, Laws of Economics

Forms of Business Organization: Sole Proprietor ship, Partnership firm- Types of Partners, Cooperative society, Joint Stock Company- Features, Types, Merits and demerits (Chapters 1, 2, 3, 4 of Part 2 of Text 1)

UNIT - III (9)

Double Entry System and Book Keeping: Accounting concepts and conventions, Overview of accounting cycle, Journal- meaning, Journalizing, Ledger- Meaning, Ledger posting, Balancing; Cashbook (Single column), Preparation of Trial balance (Chapter 3, 4 of Text 2)

UNIT - IV (9)

Final Accounts: Trading Account, profit and loss account and Balance Sheet with simple adjustments (Chapter5 of Text2)

Text Book:

[1] Y.K. Bhushan, Fundamentals of Business Organization and Management, 20th ed. New Delhi: Sultan Chand & Sons, 2017. (Units 1,2)

[2] T. S. Grewal, S.C. Gupta, Introduction to Accountancy, 8th ed. New Delhi: Sultan Chand & Sons, 2014. (Units 3, 4)

Reference Books:

[1] L. M. Prasad, Principles and Practice of Management, 9th ed. New Delhi: Sulthan Chand, 2016.

[2] R.L. Gupta & V.K. Gupta, Principles and Practice of Accountancy, 14th ed. New Delhi: Sulthan Chand and Son, 2018.

Course Research Paper: Research paper (Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWebpage.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWebpage.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to...

CO1: comprehend the basic concepts of management
CO2: distinguish between micro & macro economics and forms of business organizations
CO3: pass journal entries & post the minto ledgers
CO4: prepare proof & loss accounts and assess the financial position through the balance sheet

Course Articulation Matrix (CAM):U18MH602MANAGEMENT ECONOMICS ANDACCOUNTANCY

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18MH602.1	-	-	-	-	-	-	-	-	1	1	1	1	1	-	-
CO2	U18MH602.2	-	-	-	-	-	-	-	-	1	1	2	1	1	-	-
CO3	U18MH602.3	-	-	-	-	-	-	-	-	1	1	1	1	1	-	-
CO4	U18MH602.4	-	-	-	-	-	-	-	-	1	1	1	1	1	-	-
U18MH602		-								1	1	1.25	1	1		

U18AI603A NATURAL LANGUAGE PROCESSING

Class: B.Tech. VI-Semester **Branch:** Computer Science & engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LOs):

This course will develop student's knowledge in/on…

LO1: fundamental concepts of natural language processing
LO2: language model, naïve bayes and sentiment classification
LO3: sequence labeling and constituency parsing
LO4: applications of natural language processing

UNIT-I(9)

Natural Language Processing (NLP): Introduction to NLP, ambiguity, Language, Thought, and Understanding.
Regular Expressions, Text Normalization, Edit Distance: Regular expression, words, morphology, morphology parsing, word tokenization, lemmatization, stemming, edit distance.

UNIT-II(9)

N-gram Language Models: N-Grams, Evaluating language models and smoothing, Kneser-Ney Smoothing, Perplexity's Relation to Entropy.
Naive Bayes and Sentiment Classification: Naive Bayes Classifiers, Training the Naive Bayes Classifier, Worked example, Optimizing for Sentiment Analysis.

UNIT-III(9)

Sequence Labeling for Parts of Speech and Named Entities: English Word Classes, Part-of-Speech Tagging, Named Entities and Named Entity Tagging, HMM Part-of-Speech Tagging.
Constituency Parsing: Ambiguity, CKY parsing, Partial Parsing.

UNIT-IV(9)

Compositional semantics: Introduction, Semantic Role Labeling and Semantic Parsing, Discourse Analysis.
Applications: Named entity recognition and relation extraction-IE using sequence labeling-Machine Translation (MT) - Basic issues in MT-Statistical translation-word alignment-phrase-based translation – Question Answering, Chatbots and dialog system

Text book:

[1] Daniel Jurafsky and James H. Martin, "Speech and Language Processing", Pearson Education, Second edition, ISBN: 978-9332518414, 2009.

[2] Daniel Jurafsky and James H. Martin, "Speech and Language Processing", Pearson Education, Third edition- Drafted Copy – available online.

Reference books:

[1] Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", O'Reilly Media, 1 edition, ISBN:978-0596516499, 2009.

[2] Roland R. Hausser, "Foundations of Computational Linguistics: Human-Computer Communication in Natural Language", MIT Press, first edition, ISBN: 978-3540424178, 2011.

Course Research Paper: Research paper (Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

Upon completion of this course, students will be able to…

CO1: make use of the essential concepts of natural language processing to train a machine to understand text and spoken words in much the same way human beings can understand

CO2: analyze language models, naïve bayes and sentiment classifiers to recommend an opinion model

CO3: apply the part of speech tagging and parsing techniques to automate the system responses

CO4: analyze and develop different applications based on natural language processing such as named entity recognition, question answering, machine translation and chat bots

Course Articulation Matrix (CAM):U18AI603A NATURAL LANGUAGE PROCESSING																
Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI603A.1	2	2	2	2	1	-	-	1	1	1	-	2	1	1	1
CO2	U18AI603A.2	3	3	3	3	1	-	-	1	1	1	-	2	1	1	1
CO3	U18AI603A.3	3	3	2	3	1	-	-	1	1	1	-	2	1	1	1
CO4	U18AI603A.4	3	3	3	3	1	-	-	1	1	1	-	2	1	1	1
U18AI603A		2.75	2.75	2.5	2.75	1	-	-	1	1	1	-	2	1	1	1

U18AI603B INFORMATION RETRIEVAL SYSTEMS

Class: B.Tech. VI - Semester **Branch**: Computer Science and Engineering (AI & ML)

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs) :

This course will develop students' knowledge in/on

LO1: retrieval of information based on capabilities and imprecise nature of the search algorithms

LO2: search techniques and finding relevant items

LO3: concept of indexing and the data structures most commonly associated with information retrieval systems and technical platforms needed for sophisticated display

LO4: retrieval and evaluation techniques for information retrieval systems

UNIT - I (9)

Introduction: Definition, Objectives, Functional overview, Relationship to database management systems, Digital libraries and Data warehouses

Information Retrieval System Capabilities: Search, Browse and miscellaneous

Cataloging and Indexing: Objectives, Indexing process, Automatic indexing and information extraction

UNIT - II (9)

Data Structure: Introduction, Stemming algorithms, Inverted file structures, N-gram data structure, PAT Data structure, Signature file structure and Hypertext and XML data structures, Hidden markov models

Automatic Indexing: Classes of automatic indexing, Statistical indexing, Natural language, Concept indexing, Hypertext linkages

UNIT - III (9)

Document and Term Clustering: Introduction, Thesaurus generation, Item clustering, Hierarchy of clusters

User Search Techniques: Search statements and binding, Similarity measures and ranking, Relevance feedback, Selective dissemination of information search, Weighted searches of boolean systems, Searching the internet and hypertext

Information Visualization: Introduction, Cognition and perception, Information visualization technologies

UNIT - IV (9)

Text Search Algorithms: Introduction, Software text search algorithms, Hardware text search systems

Multimedia Information Retrieval: Spoken language audio retrieval, Non-speech audio retrieval, Graph retrieval, Image retrieval, Video retrieval

Information System Evaluation: Introduction, Measures used in system evaluation

Text Book:

[1] Gerald J. Kowalski, Mark T.Maybury, "Information Storage and Retrieval Systems: Theory and Implementation", *Kluwer Academic Publishers (Springer Publisher)*, 2nd Edition, ISBN-10: 058532090X, ISBN-13: 9788181284976, 2009.

Reference Books:

[1] Ricardo Baeza-Yates, Berthier Ribeiro-Neto, "Modern Information Retrieval", *Addison Wesley Publication*, 1st Edition, ISBN-10: 020139829X, ISBN-13: 9780321416919, 2011.

[2] Christopher D. Manning, Prabhakar Raghavan, Hinrich Schutze, "Introduction to Information Retrieval", *Cambridge University Press*, 1st Edition, ISBN-10: 0521865719, ISBN-13: 978-0521865715, 2008.

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: apply all the IRS capabilities and perform information extraction operation using cataloging and indexing
CO2: identify suitable data structure and indexing mechanism for manual and automatic clustering
CO3: choose index to define the searchable concepts that represent the items received by a system and viewing the results of a search using a hierarchical paradigm
CO4: select appropriate search algorithm, apply different measures for evaluation and compare the measurement results of the designed IRS system

Course Articulation Matrix (CAM): U18AI603B INFORMATION RETRIEVAL SYSTEMS

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
U18AI603B.1	2	1	1	-	-	-	-	1	-	1	-	-	1	-	-
U18AI603B.2	1	1	2	1	-	-	-	1	-	1	-	2	2	1	-
U18AI603B.3	1	2	1	2	1	-	-	1	-	1	-	2	2	2	1
U18AI603B.4	2	2	2	2	1	-	-	1	-	1	-	2	2	2	2
U18AI603B	1.5	1.5	1.5	1.66	1	-	-	1	-	1	-	2	1.75	1.66	1.5

U18AI603C SOFT COMPUTING

Class: B.Tech. VI- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):
This course will develop student's knowledge in/on…
LO1: key aspects and evolution of soft computing and building blocks of genetic programming
LO2: supervised learning through neural networks and adaptive network models
LO3: fuzzy logic, fuzzy rules, fuzzy reasoning and fuzzy inference systems
LO4: neuro fuzzy modeling and data clustering algorithms

UNIT – I (9)

Introduction to Soft Computing: Evolution of Computing – Soft Computing Constituents – From Conventional AI to Computational Intelligence – Neuro-Fuzzy and Soft Computing Characteristics
Genetic Programming: Introduction to Genetic Programming (GP) – Applications of GP - Other Evolutionary computing methods such as Ant Colony Optimization and Swarm Optimization

UNIT - II (9)

Neural Networks: Adaptive Networks – Architecture-Backpropagation for Feed Forward Networks – Recurrent Neural Networks
Supervised Learning Neural Networks: Perceptron -Adaline- Backpropagation for Multilayer Perceptron-Radial Basis Function Networks

UNIT - III (9)

Fuzzy Logic: Fuzzy Sets – Basic definitions and terminology- Set-theoretic Operations- Membership Functions Formulation and Parameterization -Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems

UNIT - IV (9)

Neuro-Fuzzy Modeling: Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rule based Structure Identification

Text Book(s):

[1] Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", Prentice - Hall of India, 2002 (Chapters 1, 2, 3, 4, 8, 9, 12, 13, 15, 16).
[2] David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, 1989.

Reference Books:

[1] George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall, 1996.
[2] James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Addison Wesley, 2003.
[3] KwangH.Lee, "First course on Fuzzy Theory and Applications", Springer, 2005.

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in Course Web page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, student's will be able to…

CO1: identify the differences between conventional AI and computational Intelligence and apply genetic programming to solve optimization problems

CO2: apply supervised learning concepts to design neural networks that provide robust solutions for classification and predictive analysis

CO3: design fuzzy inference system for data classification and decision analysis using fuzzy logic, fuzzy rules and fuzzy reasoning

CO4: design neuro fuzzy models for feature extraction, solving classification and regression problems

Course Articulation Matrix (CAM):U18AI603CSOFT COMPUTING																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18AI603C.1	2	2	2	2	1	-	-	1	1	1	-	1	1	1	1
CO2	U18AI603C.2	2	2	2	2	1	-	-	1	1	1	-	1	1	1	1
CO3	U18AI603C.3	3	2	3	3	1	-	-	1	1	1	-	1	1	1	1
CO4	U18AI603C.4	3	2	3	3	1	-	-	1	1	1	-	1	1	1	1
U18AI603C		2.5	2	2.5	2.5	1	-	-	1	1	1	-	1	1	1	1

U18AI604 DESIGN AND ANALYSIS OF ALGORITHMS

Class: B.Tech. VI- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: time and space complexity, asymptotic notations, set operations, problem solving with divide and conquer strategy

LO2: greedy and backtracking methods to solve computational problems

LO3: principle of optimality and problem solving with dynamic programming method

LO4: branch and bound method, classes of P,NP,NP-Hard and NP-Complete

UNIT-I (9)

Introduction: Algorithm analysis, Performance analysis, Space complexity and time complexity, Big 'O' notation, Omega notation, Theta notation, Different mathematical approach's for solving time complexity of algorithms

Sets and Disjoint Set Union: Introduction, Union, Find operations

Divide and Conquer: General method, Binary search, Merge sort, Quick sort, Strassen's matrix multiplication

UNIT-II (9)

Greedy Method: General method, Knapsack problem, Job sequencing with deadlines, Optimal storage on tapes, Optimal merge patterns, Single source shortest paths

Back Tracking: General method, N-Queens problem, Sum of subsets, Graph coloring problem

UNIT-III (9)

Dynamic Programming: General method, Multistage graphs, All pairs shortest paths, Single source shortest paths, Optimal binary search trees, String editing, 0/1 Knapsack problem, Reliability design problem, Travelling sales person problem

UNIT-IV (9)

Branch and Bound: General method, Least cost (LC) search, The 15-puzzle problem, Control abstractions for LC search, 0/1 Knapsack problem, Travelling salesperson problem

NP Hard and NP Complete Problems: Basic concepts - Nondeterministic algorithms, The classes NP hard and NP complete; COOK's theorem, NP hard graph problems - Clique decision problem, Node cover decision problem, Traveling sales person decision problem

Text Book:

[1] E.Horowitz, S.Sahni, S.Rajasekaran, *Fundamentals of Computer Algorithms,* 2nd ed. Hyderabad:Universities Press, 2018

Reference Books:

[1] Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest, Cliford Stein, *Introduction to Algorithms*, 3rd ed. New Delhi: Prentice-Hall of India, 2010

[2] Gajendra Sharma, *Design and Analysis of Algorithms*,4thed. Rajput: Khanna Publishing, 2019

[3] S.Sridhar, *Design and Analysis of Algorithms*,3rded. UK: Oxford University Press, India, 2015

[4] Mark Allen Weiss, *Data Structures and Algorithm Analysis in Java,* 3rd ed. New Delhi: Pearson,2012.
[5] Rajiv Chopra ,Shipra Raheja, *Design and Analysis of Algorithms*, New Delhi: New Age International Publishers,2019

Course Research Paper: Research paper (Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):
On completion of this course, student's will be able to…
CO1:apply divide and conquer strategy for searching and sorting techniques with performance
CO2: analyze 0/1 Knapsack problem, optimal merge pattern and single source shortest path algorithms using greedy method and N-Queen problem, graph colouring problem using backtracking method
CO3:design of algorithms using dynamic programming approach to find the shortest path
CO4:analyze and categorize NP-Hard and NP-Complete problems for the classes of P and NP

Course Articulation Matrix (CAM): U18AI604 DESIGN AND ANALYSIS OF ALGORITHMS																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18AI604.1	3	3	2	2	1	-	-	1	1	1	-	1	2	1	2
CO2	U18AI604.2	3	3	3	2	1	-	-	1	1	1	-	1	2	1	2
CO3	U18AI604.3	3	3	3	2	1	-	-	1	1	1	-	1	2	1	2
CO4	U18AI604.4	2	2	2	2	1	-	-	1	1	1	-	1	2	1	2
U18AI604		**2.75**	2.75	2.5	2.5	2	-	-	1	1	1	-	1	2	1	2

U18AI605 DEEP LEARNING

Class: B.Tech. VI- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: deep learning fundamental and regularization parameters

LO2: principles and architectures of convolutional neural networks

LO3: principles and architectures of recurrent and recursive neural networks

LO4: practical methodology and applications of deep neural networks

UNIT – I (9)

Introduction: Why Deep Learning? Deep learning architecture, Historical trends in deep learning and its performance, deep feed forward networks, Gradient based learning, Hidden Units, Back propagations and differentiation algorithms, Case study: Deep learning applications and societal impact

Regularization for Deep learning: Parameters norm penalties, Norm penalties as constrained optimization, Regularization and under constrained problems, Dataset augmentation, Noise robustness, semi-supervised learning, multitask learning, Parameter tying and sharing, Sparse representation

UNIT –II (9)

Optimization for Training Deep Models: Pure optimization, challenges in neural network optimization, Basic algorithms, Parameter initialization strategies, Algorithms with adaptive learning rates

Convolutional Neural Networks: Convolution operations, Motivation, Pooling, Convolution and pooling as an infinitely strong prior, Variants of the basic convolution functions, Structured outputs, Data types, Efficient convolution algorithms, random or unsupervised features, Convolution networks and the history of deep learning **TensorFlow case study:** Using Convolutional Neural Networks for recognizing and classifying images

UNIT– III (9)

Recurrent Neural Networks: Architecture, Unfolding computational graphs, Recurrent neural networks, Bidirectional Recurrent neural networks, Encoder-decoder architectures, Deep recurrent networks

Recursive Neural networks: Architecture, Challenges of long-term dependencies, Echo state networks, Leaky units, Strategies for multiple time scales, Long and short term memory for recursive neural networks, Gated recursive neural networks, optimization for long term dependencies, Explicit memory

Case study: Tensor flow modeling for recognition of hand-written digits

UNIT - IV (9)

Practical Methodology: Performance Metrics, Default baseline models, selecting hyper parameters, debugging strategies, Case study: Multi digit number recognition

Applications: Large scale deep learning, Computer vision using deep learning, Speech recognition using deep learning, Natural language processing using deep learning, other deep learning applications,

TensorFlow case studies: Textual document processing, Deep learning on cloud

Text Book(s):

[1] Ian Goodfellow and Yoshua Bengio and Aaron Courville, *Deep Learning*, 1st ed., MIT Press,2017.

[2] Antonio Gulli, Amita Kapoor, Sujit Pal, *Deep Learning with TensorFlow 2.0 and Keras*, 2nd ed., Mumbai: Packt, 2019 (Chapters: 1, 3, 4, 5).

Reference Books:

[1] Deng & Yu, *Deep Learning: Methods and Applications,1st ed.,* USA:Now Publisher, 2013

[2] Ian Goodfellow, YoshuaBengio, Aaron Courville, *Deep Learning*, 1sted., Massachusetts: MIT Press, 2016.

[3] Sebastian Raschka, Vahid Mirjalili - *Python Machine Learning*, 2nd ed., Mumbai: Packt, 2019.

Course Research Paper: Research paper (indexed Journal/conference paper) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1: apply deep learning fundamentals and regularization techniques for tuning the performance of the deep learning models

CO2: design and analyze deep convolutional neural network models for image recognition

CO3: apply recurrent and recursive neural network architectures for handling long term dependencies and vanishing gradient problem

CO4: design deep learning models for computer vision, speech and natural language processing applications

Course Articulation Matrix (CAM):U18AI605 DEEP LEARNING																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18AI605.1	2	2	2	1	-	1	-	1	1	1	-	1	2	1	2
CO2	U18AI605.2	2	2	1	2	2	-	-	1	1	1	-	1	2	1	2
CO3	U18AI605.3	2	2	1	3	2	-	-	1	1	1	-	1	2	1	2
CO4	U18AI605.4	-	2	2	3	2	-	-	1	1	1	-	1	2	1	2
U18AI605		2	2	1.5	2.25	2	1	-	1	1	1	-	1	2	1	2

U18AI606 COMPUTER VISION AND IMAGE PROCESSING

Class: B.Tech. VI- Semester

Branch: Computer Science and Engineering(AI & ML)

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: fundamental concepts of image processing such as sampling, quantization, basic relationship between pixels, intensity transformation and spatial filtering techniques

LO2: frequency domain filters for smoothing and sharpening of input images along with image restoration and reconstruction techniques

LO3: morphological image processing and image segmentation techniques applied on input images to filter and segment the objects present in an input image

LO4: providing vision to a computer by extracting the features from an object present in an input image and identify the object using classification techniques

UNIT – I (9+3)

Introduction: What is digital image processing, Examples of fields that use digital image processing, Fundamental steps in digital image processing

Digital Image Fundamentals: Elements of visual perception, Light and the electromagnetic spectrum, Image sensing and acquisition, Image sampling and quantization, some basic relationships between pixels, Introduction to the mathematical tools used in digital image processing

Intensity Transformations & Spatial Filtering: The basics of intensity transformations and spatial filtering, Basic intensity transformation functions, Histogram processing, Fundamentals of spatial filtering, Smoothing spatial filters, Sharpening spatial filters, Combining spatial enhancement methods.

UNIT - II (9+3)

Filtering in the Frequency Domain: A brief history of the Fourier series and transform, Preliminary concepts, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, Some properties of the 2-D discrete Fourier transform, The basics of filtering in the frequency domain

Image Restoration and Reconstruction: A model of the image degradation/restoration process, Noise models, Restoration in the presence of noise only-spatial filtering, Periodic noise reduction using frequency domain filtering

UNIT - III (9+3)

Morphological Image Processing: Preliminaries, Erosion and dilation, Opening and closing, Hit-or-miss transformation, Some basic morphological algorithms

Image Segmentation: Fundamentals, Point, Line and edge detection**,** Thresholding, Segmentation by region growing and by region splitting and merging, Region segmentation using clustering and superpixels, Segmentation using morphological watersheds

UNIT - IV (9+3)

Feature Extraction: Background, Boundary preprocessing, Boundary feature descriptors, Region feature descriptors, Principal components as feature descriptors, Whole-image features, Scale-invariant feature transform

Image Pattern Classification: Background, Patterns and pattern classes, Pattern classification by prototype matching, Optimum (Bayes) statistical classifiers, Neural networks and deep learning, Deep convolution neural networks

Text Book:

[1] Rafael C. Gonzalez, Richard E. Woods, *Digital Image Processing*, 4th ed., New Delhi: Pearson, 2018. *(Chapters 1 to 5, 9 to 12)*

Reference Books:

[1] Anil K. Jain, *Fundamentals of Image Processing*, 1st ed., Chennai: Pearson, 2015.

[2] B. Chanda, D. Dutta Majunder, *Digital Image Processing and Analysis*, 2nd ed., New Delhi: Prentice Hall of India, 2011.

[3] S. Sridhar, *Digital Image Processing*, 2nd ed., Noida: Oxford University Press, 2016.

[4] Munesh C. Trivedi, *Digital Image Processing*, 1st ed., New Delhi: Khanna Book Publishing, 2014.

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, student's will be able to…

CO1: apply the image pre-processing techniques such as sampling, quantization, basic relationships between pixels, various intensity transformation and filtering techniques to enhance the look and feel of an input image for further processing

CO2: identify the effect of frequency domain filters, image restoration and reconstruction techniques and apply the same for smoothing, sharpening and image enhancement

CO3: apply morphological image processing techniques on objects present in input images to extract image components and discover various ways to segment the objects present in the input images

CO4: extract the features to depict the shape of an object and apply classification techniques to identify the object present in an input image

Course Articulation Matrix (CAM):U18AI606COMPUTER VISION AND IMAGE PROCESSING																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18AI606.1	2	2	2	2	1	-	-	1	1	1	-	1	1	1	1
CO2	U18AI606.2	3	3	3	3	1	-	-	1	1	1	-	3	1	1	1
CO3	U18AI606.3	3	3	3	3	1	-	-	1	1	1	-	3	1	1	1
CO4	U18AI606.4	3	3	3	3	1	-	-	1	1	1	-	3	1	1	1
U18AI606		2.75	2.75	2.75	2.75	1	-	-	1	1	1	-	2.5	1	1	1

U18AI607 DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY

Class: B. Tech, VI-Semester **Branch:** Computer Science &Engineering(AI & ML)

Teaching Scheme :

L	T	P	C
-	-	2	1

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: searching and sorting techniques using divide and conquer strategy
LO2: computational problems using greedy and backtracking methods
LO3: computational problems using dynamic programming technique
LO4: computational problems using branch and bound methods

List of Experiments

Experiment-I (UNIT-I)

1. Program to implement binary search algorithm.
2. Program to implement min-max algorithm.

Experiment-II(UNIT-I)

1 Program to implement merge sort algorithm
2 Program to implement quick sort algorithm

Experiment-III(UNIT-I)

1. Apply strassen's matrix multiplication to multiply following matrix

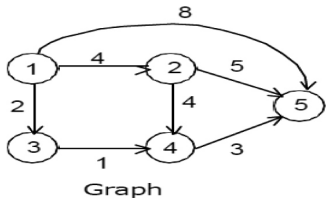
$$A=\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \qquad B=\begin{pmatrix} 2 & 1 \\ 4 & 3 \end{pmatrix}$$

Experiment-IV(UNIT-II)

1. Program to implement 0/1 knapsack problem.
2. Program to implement Job sequencing with deadlines .

Experiment-V(UNIT-II)

1. Apply Dijkstras algorithm find the shortest path from 1 to each of the other five vertices in the graph



Graph

2. Program to implement N-Queens problem.

Experiment-VI(UNIT-II)

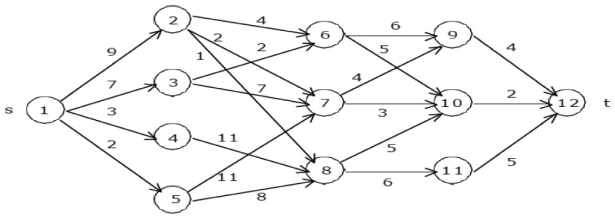
1. Program to implement sum of subsets

Experiment-VII(UNIT-III)

1 Implement bellman ford algorithm for Single source shortest paths using

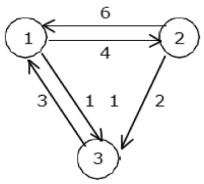
Experiment-VIII(UNIT-III)

1 Apply Multistage graph algorithm and find shortest path



Experiment-IX (UNIT-III)

1. Apply All pairs shortest paths algorithm and find shortest path



Experiment-X (UNIT-III)

1. Program to implement Optimal binary search trees.

Experiment-XI (UNIT-III)

1. Apply travelling sales person algorithm using dynamic programming and find shortest path

0 10

$$\begin{pmatrix} 15 & 20 & & \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{pmatrix}$$

Experiment-XII (UNIT-IV)

1. Apply travelling salesperson algorithm using branch and bound and find shortest path

$$\begin{pmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{pmatrix}$$

Note: Students are required to develop generalized programs. The above specified examples can be taken as sample input only.

Laboratory Manual:

[1] *Design and analysis of algorithms laboratory manual*, Dept. of CSE, KITSW.

Reference Books:

[1] E.Horowitz, S.Sahni, S.Rajasekaran, *Fundamentals of Computer Algorithms,* 2nd ed, Universities Press, 2018

[2] Mark Allen Weiss, *Data Structures and Algorithm Analysis in Java,* 3rd ed, Pearson,2012.

[3] Kathy Sierra, Bert Bates, *Head First Java8*, 2nd ed, O'Reilly Publications, 2020.

[4] Narasimha Karumanchi, *Data Structures and Algorithms Made Easy in Java*, careermonk 2011

[5] Uttam K. Roy, *Advanced JAVA Programming*, Oxford Publications, 2015

Course Learning Outcomes (COs):

On completion of this course, student's will be able to…

CO1: demonstrate programs on binary search, min-max, mergesort, quicksort and strassen's matrix multiplication problems

CO2 : develop knapsack, job sequencing with deadline, shortest path using greedy method, N-Queens and sum of subsets using backtracking method

CO3 : construct programs on single source shortest path, multistage graph and all pairs shortest path using dynamic programming technique

CO4: develop programme for travelling sales person problem using branch and bound method

Course Articulation Matrix (CAM):U18AI607 DESIGN AND ANALYSIS OF ALGORITHMS LAB

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI607.1	3	3	2	2	1	-	-	1	1	1	-	1	2	1	2
CO2	U18AI607.2	3	3	3	2	1	-	-	1	1	1	-	1	2	1	2
CO3	U18AI607.3	3	3	3	2	1	-	-	1	1	1	-	1	2	1	2
CO4	U18AI607.4	2	2	2	2	1	-	-	1	1	1	-	1	2	1	2
U18AI607		2.75	2.75	2.5	2	1	-	-	1	1	1	-	1	2	1	2

U18AI608 DEEP LEARNING LABORATORY

Class: B.Tech. VI- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledgein / on…

LO1: deep learning fundamentals and regularization parameters
LO2: principles and architectures of convolutional neural networks
LO3: principles and architectures of recurrent and recursive neural networks
LO4: practical methodology and applications of deep neural networks

List of Experiments

Experiment-I (Unit-I)
1. Implement Gradient descent algorithm using neural networks

Experiment-II (Unit-I)
1. Implement Back propagation algorithm using neural networks

Experiment-III (Unit-I)
1. Implement Regularization Techniques in Deep Learning – L1, L2 and Dropout

Experiment-IV (Unit-II)

1. Implement Adaptive learning rate algorithms-Adam, Adagrad, Adadelta andRMSProp

Experiment-V (Unit-II)
1. Build a CNN classification model for Image Recognition using tensor flow

Experiment- VI (Unit-III)
1. Build a CNN classification model for recognition of hand-written digits using tensor flow

Experiment- VII (Unit-III)
1. Build a classification model for text classification using Recurrent Neural Networks

Experiment- VIII (Unit-III)
1. Implement a recursive neural network model for predictive analysis

Experiment - IX (Unit-IV)
1. Build a deep learning model for multi digit number recognition

Experiment- X (Unit-IV)
1. Build a deep learning model for Speech recognition

Experiment-XI (Unit-IV)

Build a deep learning model for Natural language processing
2. Build a deep learning model for Textual document processing

Experiment- XII (Unit-IV)

1. Build a deep learning model for handwritten digit recognition using tensorflow

Laboratory Manual:

[1] *Deep Learning Laboratory Manual*, Dept. of CSE (AI&ML), KITSW.

Text Books:

[1] Ian Goodfellow and Yoshua Bengio and Aaron Courville, *Deep Learning*, 1st ed.,MIT Press,2017.

[2] Antonio Gulli, Amita Kapoor, Sujit Pal, *Deep Learning with TensorFlow 2.0 and Keras*, 2nd ed., Mumbai: Packt, 2019 (Chapters : 1, 3, 4, 5).

Reference Books:

[1] Deng & Yu, *Deep Learning: Methods and Applications,1st ed.,* USA:Now Publisher, 2013.

[2] Ian Goodfellow, YoshuaBengio, Aaron Courville, *Deep Learning*, 1sted., Massachusetts: MIT Press, 2016.

[3] Sebastian Raschka, Vahid Mirjalili - *Python Machine Learning*, 2nd ed., Mumbai: Packt, 2019.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: develop deep learning models and regulate parameters for effective performance
CO2: develop adaptive learning rate algorithms and convolutional neural networks
CO3: develop programs for predictive analysis using recurrent neural networks and recursive neural networks
CO4: develop deep learning models for speech recognition, natural language processing and textual document processing

Course Articulation Matrix (CAM):U18AI608DEEP LEARNING LABORATORY

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**U18AI608.1**	**2**	**2**	**2**	**1**	**-**	**1**	**-**	**1**	**1**	**1**	**-**	**1**	**2**	**1**	**2**
CO2	**U18AI608.2**	**2**	**2**	**1**	**2**	**2**	**-**	**-**	**1**	**1**	**1**	**-**	**1**	**2**	**1**	**2**
CO3	**U18AI608.3**	**2**	**2**	**1**	**3**	**2**	**-**	**-**	**1**	**1**	**1**	**-**	**1**	**2**	**1**	**2**
CO4	**U18AI608.4**	**2**	**2**	**2**	**3**	**2**	**-**	**-**	**1**	**1**	**1**	**-**	**1**	**2**	**1**	**2**
U18AI608		**2**	**2**	**1.5**	**2.25**	**2**	**1**	-	1	1	1	-	1	**2**	**1**	**2**

U18AI609 COMPUTER VISION AND IMAGE PROCESSING LABORATORY

Class: B.Tech. VI- Semester **Branch:**Computer Science and Engineering(AI & ML)

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in / on…

LO1: image pre-processing techniques such as intensity transformation techniques and spatial filtering techniques
LO2: frequency domain filters for smoothing and sharpening of input images along with image restoration an reconstruction techniques
LO3: morphological image processing and image segmentation techniques
LO4: feature extraction and classification techniques

List of Experiments

Experiment-I (Unit-I)

1. Write a program to read an image and display an image.
2. Write a program to convert a color image to gray scale and binary image.
3. Write a program to apply various affine transformations to an input image.

Experiment-II (Unit-I)

1. Write a program to apply basic intensity transformation functions.
2. Write a program to implement contrast stretching.
3. Write a program to implement intensity level slicing.
4. Write a program to implement bit-plane slicing and show all bit planes during experimentation.
5. Write a program to generate histogram of an input image.
6. Write a program to implement histogram equalization.
7. Write a program to implement histogram processing.

Experiment-III (Unit-I)

1. Write a program to demonstrate 1-D correlation.
2. Write a program to demonstrate 1-D convolution.
3. Write a program to demonstrate smoothing linear filters.
4. Write a program to demonstrate order statistic (non-linear) filters.

Experiment-IV (Unit-II)

1. Write a program to demonstrate sharpening filters.

Experiment-V (Unit-II)

1. Write a program to demonstrate various frequency domain filtering techniques.

Experiment-VI (Unit-II)

1. Write a program to demonstrate various image restoration and reconstruction techniques.

Experiment-VII (Unit-III)

1. Write a program to demonstrate erosion and dilation.
2. Write a program to demonstrate opening and closing.
3. Write a program to demonstrate hit or miss transform.

Experiment-VIII (Unit-III)

1. Write program to demonstrate boundary extraction.
2. Write a program to demonstrate convex hull.
3. Write a program to demonstrate thinning.
4. Write a program to demonstrate thickening.
5. Write a program to demonstrate skeletonization.

Experiment-IX (Unit-III)

1. Write a program to demonstrate the detection of point.
2. Write a program to demonstrate the detection line.
3. Write a program to demonstrate the detection of an edge.

Experiment-X (Unit-III)

1. Write a program demonstrate various segmentation techniques.

Experiment-XI (Unit-IV)

1. Write a program to demonstrate various feature extraction techniques.

Experiment-XII (Unit-IV)

1. Write a program to demonstrate object detection using various classification techniques.

Laboratory Manual:

[1] *Computer Vision and Image Processing Laboratory Manual*, Dept. of CSE(AI&ML), KITSW.

Text Book:

[1] Rafael C. Gonzalez, Richard E. Woods,*Digital Image Processing*, 4th ed., New Delhi: Pearson, 2018. *(Chapters 1 to 5, 9 to 12)*

Reference Books:

[1] Anil K. Jain, *Fundamentals of Image Processing*, 1st ed., Chennai: Pearson, 2015.
[2] B. Chanda, D. Dutta Majunder, *Digital Image Processing and Analysis*, 2nd ed., New Delhi: Prentice Hall of India, 2011.
[3] S. Sridhar, *Digital Image Processing*, 2nd ed., Noida: Oxford University Press, 2016.
[4] Munesh C. Trivedi, *Digital Image Processing*, 1st ed., New Delhi: Khanna Book Publishing, 2014.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO5: develop programs to enhance the look and feel of the image by using various intensity transformation function various filtering techniques
CO6: develop programs to enhance the look and feel of the input image by using various frequency domain filtering techniques and image restoration and re-construction techniques
CO7: apply various morphological algorithms to extract the components of an input image and segment the image for further processing
CO8: *develop programs to extract the features from input image for identification and classification of objects*

Course Articulation Matrix (CAM):U18AI609COMPUTER VISION AND IMAGE PROCESSING LABORATORY

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI609.1	2	2	2	2	1	-	-	1	1	1	1	1	1	1	1
CO2	U18AI609.2	3	3	3	3	1	-	-	1	1	1	1	3	1	1	1
CO3	U18AI609.3	3	3	3	3	1	-	-	1	1	1	1	3	1	1	1
CO4	U18AI609.4	3	3	3	3	1	-	-	1	1	1	1	3	1	1	1
U18AI609		2.75	2.75	2.75	2.75	1	-	-	1	1	1	1	2.5	1	1	1

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING(NETWORKS)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL - 15
(An Autonomous Institute under Kakatiya University, Warangal)

SCHEME OF INSTRUCTION & EVALUATION
VII-SEMESTER OF 4-YEAR B. TECH DEGREE PROGRAM

[4Th+2P+1MC+1MP-I]

Sl. No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	OE	U18OE701	Open Elective - III	3	_	_	3	10	30	40	60	100
2	PE	U18AI702	Professional Elective - III / MOOC-III	3	-	-	3	10	30	40	60	100
3	PE	U18AI703	Professional Elective - IV / MOOC-IV	3	-	-	3	10	30	40	60	100
4	PCC	U18AI704	Cloud Computing	3	-	-	3	10	30	40	60	100
5	PCC	U18AI705	Cloud Computing Laboratory	-	-	2	1	40	-	40	60	100
6	PCC	U18AI706	Natural Language Processing Laboratory	-	-	2	1	40	-	40	60	100
7	PROJ	U18AI707	Major Project - Phase - I	-	-	6	3	100	-	100	-	100
8	MC	U18AI708	Internship Evaluation	-	-	2	-	-	-	-	-	-
Total:				12	_	12	17	220	120	340	360	700
Additional Learning*: *Maximum credits allowed for Honours/Minor in Engineering*				-	-	-	*7*	-	-	-	-	-
Total credits for students opted for Honours/Minor students:				-	-	-	***17+7***	-	-	-	-	-

** List of courses for additional learning through **MOOCs** towards Honours/Minor in Engineering shall be prescribed by the department under Honours/ Minor Curricula*

[L= Lecture, T = Tutorials, P = Practicals & C = Credits] **Total Contact Periods/Week: 24** **Total Credits: 17**

Open Elective-III:	Professional Elective-III / MOOC-III:	Professional Elective-IV / MOOC-IV:
U18OE701A: Disaster Management U18OE701B: Project Management U18OE701C: Professional Ethics in Engineering U18OE701D: Rural Technology and Community Development	U18AI702A: Reinforcement Learning U18AI702B: Big Data Analytics U18AI702C: Social and Information Network Analysis U18AI702M: MOOCs course	U18AI703A: Robotics U18AI703B: Cognitive Computing Systems U18AI703C: Cryptography and Network Security U18AI703M: MOOCs course

U18OE701A DISASTER MANAGEMENT

Class: B.Tech VII- Semester

Branch: Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: disaster types, its impact & national policy on disaster management
LO2: prevention, preparedness and mitigation measures for different disasters, emergency support functions and relief camps
LO3: different types of vulnerability, macroeconomic, financial management of disaster and its related losses
LO4: disaster management for infrastructure, treatment of plants, geo spatial information in agriculture, multimedia technology in disaster risk management and training

UNIT – I (9)

Introduction & Principles of Disaster Management: Nature – Development, Hazards and disasters; Natural disasters – Earth quakes, Floods, Fire, Landslides, Cyclones, Tsunamis, Nuclear; Chemical dimensions and Typology of disasters – Public health disasters, National policy on disaster management

UNIT - II (9)

Prevention Preparedness and Mitigation Measures: Prevention, Preparedness and Mitigation Measures for various disaster reliefs and logistics management, Emergency support functions and their coordination mechanism, Resources and material management, Management of relief camp

UNIT - III (9)

Risk and Vulnerability: Building codes and land use planning, Social vulnerability, Environmental vulnerability, Macroeconomic management and sustainable development, Climate change, Risk rendition, Financial management of disaster and related losses

UNIT - IV (9)

Role of Technology in Disaster Management: Disaster Management for infrastructures, Taxonomy of infrastructure, Treatment plants and process facilities, Electrical sub stations, Roads and Bridges, Geo spatial information in agriculture, Drought assessment, Multimedia technology in disaster risk management and training

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Text Book:

[1] Rajib Shah and R.R Krishnamurthy, *Disaster management-Global challenges and local solutions*, Hyderabad: Universities Press(India) Pvt.Ltd., 2009.

Reference Book:

[1] Satish Modh, *Introduction to Disaster management*, Bengaluru: Macmillan India Ltd., 2010.

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, student's will be able to…

CO1: classify the disasters and discuss natural & non-natural disasters, their implications, the institutional & legal framework for national policy on disaster management in India

CO2: identify mitigation strategies, preparedness & prevention measures and prioritizes the rescue and relief operations to reduce the impact of a disaster.

CO3: list the vulnerable groups in disaster; examine the concepts of macroeconomic & sustainability & impact disaster on development

CO4: discuss disaster management for infrastructure, utilize geospatial information in agriculture and apply multimedia technology for disaster risk management and training

Course Articulation Matrix (CAM): U18OE701A DISASTER MANAGEMENT

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18OE701A.1	-	-	-	-	-	2	2	1	-	-	1	1	-	-	-
CO2	U18OE701A.2	-	-	-	-	-	2	2	1	-	-	1	1	-	-	-
CO3	U18OE701A.3	-	-	-	-	-	2	2	1	-	-	1	1	-	-	-
CO4	U18OE701A.4	-	-	-	-	-	2	2	1	-	-	1	1	-	-	-
U18OE701A		-	-	-	-	-	2	2	1	-	-	1	1	-	-	-

U18OE701B PROJECT MANAGEMENT

Class: B.Tech VII- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: role of project manager, organization and management functions
LO2: effective time & conflict management, ethics & professional responsibilities
LO3: project planning, scheduling and budgeting
LO4: cost control, risk management and quality control techniques

UNIT – I (9)

Project Management: Understanding project management, Role of project manager, Classification of projects, Project management growth, Definitions and concepts, Organizational structures-Organizing and staffing the project management office and team; Management functions

UNIT - II (9)

Time and Conflict Management: Understanding time management, Time management forms, Effective time management, Stress and burnout, Conflict environment, Conflict resolution, Management of conflicts, Performance measurement, Financial compensation and rewards, Morality, ethics, Corporate culture, Professional responsibilities, Success variables, Working with executives

UNIT - III (9)

Project planning: General planning, Life-cycle phases, Proposal preparation, Project planning, The statement of work, Project specifications, Milestone schedules, Work breakdown structure, Executive role in planning, The planning cycle, Handling project phase outs and transfers, Stopping projects, Scheduling techniques – CPM and PERT, Pricing and estimating

UNIT - IV (9)

Cost and quality control: Understanding cost control, Earned Value Measurement System, Cost control problems, Methodology for trade-off analysis, Risk management process, Risk analysis, Risk responses, Monitoring and control of risks, Contract management, Quality management concepts, Cost of quality, Quality control techniques

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Text Book:

[1] Harold Kerzner, *Project Management: A Systems Approach to Planning, Scheduling and Controlling*, 10th ed. Hoboken, NJ: John Wiley & Sons Inc., 2009

Reference Books:

[1] Jack R Meredith & Samuel J mantel Jr., *Project Management: A Managerial Approach*, 8th ed. Hoboken, NJ: John Wiley & Sons Inc., 2012
[2] John M Nicholas & Herman Steyn, *Project Management for Business, Engineering and Technology*, 4th ed. Abingdon, UK: Taylor & Francis, 2012
[3] Adedeji B.Badiru, *Project Management: Systems, Principles and Applications*, Florida. USA: CRC Press, 2012

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, student's will be able to…

CO1: evaluate the desirable characteristics of effective project managers
CO2: plan to resolve issues in conflicting environments
CO3: apply appropriate approaches to plan a new project in-line with project schedule & suitable budget
CO4: estimate the risks to be encountered in a new project and apply appropriate techniques to assess & improve ongoing project performance

Course Articulation Matrix (CAM): U18OE701B PROJECT MANAGEMENT																
Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18OE701B.1	-	-	-	-	-	1	-	-	-	1	1	-	-	-	-
CO2	U18OE701B.2	-	-	-	-	-	1	-	2	-	1	1	-	-	-	-
CO3	U18OE701B.3	1	1	-	-	-	1	-	-	-	1	1	-	-	-	-
CO4	U18OE701B.4	1	1	-	-	-	1	-	-	-	1	1	-	-	-	-
U18OE701A		1	1	-	-	-	1	-	2	-	1	1	-	-	-	-

U18OE701C PROFESSIONAL ETHICS IN ENGINEERING

Class: B.Tech.VI–Semester **Branch(s):** ME, CSE, IT & CSN

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: human values and engineering ethics
LO2: professionalism, theory of virtues and code of ethics
LO3: safety & risk benefit analysis, professional and intellectual property rights
LO4: environmental & computer ethics and various roles of engineers in a company

UNIT–I (9)

Human Values: Morals, Values & ethics, Integrity, Work ethic, Service learning, Civic virtue, Respect for others, Living peacefully, Caring, Sharing, Honesty, Courage, Valuing time, Co-operation, Commitment, Empathy, Self-confidence, Character, Spirituality

Engineering Ethics: Senses of "Engineering Ethics", Variety of moral issues, Types of inquiry, Moral dilemmas, Moral autonomy, Kohlberg's theory, Gilligan's theory – Consensus and controversy

UNIT–II (9)

Profession and professionalism: Profession and its attributes, Models of professional roles

Theory of Virtues: Definition of virtue and theories of virtues, Self-respect, Responsibility and senses, Modern theories of virtues, Uses of ethical theories

Engineering a social experimentation: Engineering as experimentation, Engineers as responsible experimenters, Codes of ethics, A balanced outlook on law, The challenger case study

UNIT–III (9)

Safety, Responsibilities and Rights: Safety and risk, Assessment of safety and risk, Risk benefit analysis and reducing risk - Three Mile Island and Chernobyl case studies; Collegiality and loyalty, Respect for authority, Collective bargaining, Confidentiality, Conflicts of interest, Professional rights, Employee rights, Intellectual Property Rights (IPR), Discrimination

UNIT–IV (9)

Global Issues: Multinational corporations-Environmental ethics, Computer ethics, Engineers as managers, Consulting engineers, Engineers as expert witnesses and advisors, Moral leadership, Sample code of ethics (*Specific to a particular engineering discipline*)

Text Book:

[1] D.R.Kiran, *Professional Ethics and HumanValues*, New York: Mc Graw Hill, 2013 *(Chapters1 to 5)*

Reference Books:

[1] Govindarajan.M, Natarajan.S, SenthilKumar.V.S, *Professional Ethics and Human Values,* New Delhi: Prentice Hall of India, 2013.

[2] Mike Martin and Roland Schinzinger, *Ethics in Engineering*, 4th ed. New York: Mc Graw Hill, 2014.

[3] Charles D. Fleddermann, *Engineering Ethics*, 4th ed. New Delhi: Prentice Hall, 2004.

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, student's will be able to…

CO1: identify the need for human values, morals & ethics and apply Gilligan's & Kohlberg's theories for morale development

CO2: identify the desired characteristics of a professional & the need for code of ethics & balanced outlook on law

CO3: estimate the safety margin & threshold level and describe the procedure for obtaining a patent

CO4: analyze the role of engineer in multinational companies as an advisor, consultant & manager

Course Articulation Matrix (CAM): U18OE701C PROFESSIONAL ETHICS IN ENGINEERING															
Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18OE701C.1	-	-	-	-	-	1	-	2	1	-	-	1			
CO2	U18OE701C.2	-	-	-	-	-	1	-	2	1	-	-	1			
CO3	U18OE701C.3	-	-	-	-	-	1	-	2	1	-	-	1			
CO4	U18OE701C.4	-	-	-	-	-	1	-	2	1	-	-	1			
U18OE701C		**-**	**-**	**-**	**-**	**-**	**1**	**-**	**2**	**1**	**-**	**-**	**1**			

U18OE701D RURAL TECHNOLOGY AND COMMUNITY DEVELOPMENT

Class: B.Tech. VI–Semester **Branch(s):** ME, CSE, IT & CSN

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Examination	60 Marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on...

LO1: building technologies, modern agricultural implements and food processing methods

LO2: medicinal & aromatic plants to fulfill the needs of pharmaceutical industries and rural energy for eradication of drudgery

LO3: purification of drinking water, rainwater harvesting and employment generating technologies in rural areas

LO4: objectives & characteristics of community development, need for community mobilization and approaches for community organization

UNIT–I (9)

Technologies and Process: Building materials and components - Micro concrete roofing tiles, Water & fire proof mud walls and thatch, Red mud/rice husk cement, Types of bricks, Ferro-cement water tanks and other products, Cement blocks, Preservation of mud walls, Agricultural implements- Naveen sickle, Animal drawn digger, Grubber weeder, Self propelled reaper, Seed drill, Improved bakhar

Food Processing: Fruit and vegetable preservation - Process flow sheet, Scale of operation, Economic feasibility, Source of technology; Soya milk - Process, Economics; Dehydration of fruits and vegetables, Cultivation of oyster mushroom - Preparation of beds, Spawning, Removal of bags for production of mushrooms, Harvesting and marketing, Economics, Process flow sheet, Source of technology

UNIT–II (9)

Medicinal and Aromatic plants: Plants and its use, Aromatic plants, Cymbopogons, Geranium, Manufacturing of juice, Gel and powder, Rural energy – Cultivation of jatrophacurcus and production of biodiesel, Low cost briquetted fuel, Solar cookers and oven, Solar drier, Biomass gasifier

Bio-fertilizers: Introduction, Vermicompost, Improvement over traditional technology/process, Technoeconomics, Cost of production, Utilization of fly ash for wasteland development and agriculture

UNIT–III (9)

Purification of Drinking water: Slow sand filtration unit, Iron removal plant connected to hand pump, Chlorine tablets, Pot chlorination of wells, Solar still, Fluoride removal, Rain water harvesting through rooftop, Rain water harvesting through percolation tank, Check dams, Recharging of dug wells

Employment Generating Technologies: Detergent powder and cake - Process, Process for liquid detergent, Carcass utilization - Improvement over traditional technology, Flow chart, Process, Capital investment; Indigo blue - Dye, Organic plant production, Dye extraction techniques, Aspects of indigo market, Economics; Modernization of bamboo based industries - Process for bamboo mat making, Machinery, Products, Agarbatti manufacturing; Vegetable tanning of leathers - Raw material, Soaking, Liming, Reliming, Deliming, Pretanning, Malani, Setting, Yield

UNIT–IV(9)

Community Development: Community organization- Definition, Need, Functions, Principles, Stages; Community development - Definition, Need, Objectives, Characteristics, Elements, Indicators; Differences between community organization and community development

Community Mobilization: Need, Benefits, Preparing, Initial contact with community, Coordinating, Functions of the community, Challenges, Techniques for mobilizing community, Community contributions, Leadership and capacity building, Community participation, Role of community worker in community mobilization, Models of community organization practice - Local development model, Social planning model, Social action model, Approaches to community organization

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Text Books:

[1] M. S. Virdi, *Sustainable Rural Technology*, New Delhi: Day a Publishing House, 2009 *(Chapters 1 to 4 & 7)*

[2] Asha Ramagonda Patil, *Community Organization and Development: An Indian Perspective*, New Delhi: Prentice Hall of India, 2013.

Reference Books:

[1] Punia Rd Roy, *Rural Technology*, New Delhi: SatyaPrakashan Publishers, 2009.

[2] S.B.Verma, S.K.Jiloka, Kannaki Das, *Rural Education and Technology*, New Delhi: Deep & Deep Publications Pvt. Ltd., 2006.

[3] Edwards, Allen David and Dorothy G.Jones, *Community and Community Development*, The Hague, Netherlands: Mouton, 1976.

[4] Lean, Mary, *Bread, Bricks and Belief: Communities in Charge of Their Future*, West Hartford, US: Kumarian Press, 1995.

[5] Heskin, Allen David, *The Struggle for Community*, Colorado, US: West View Press, 1991

[6] Clinard, Marshall Barron, *Slums and Community Development: Experiments in Self- Help*, Mumbai: Free Press, 1970.

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: discuss various building technologies, modern agricultural implements and food processing methods which can be implemented in rural areas

CO2: identify major medicinal plants that are required for pharmaceutical companies & alternative fuel that meets substantial oil need in the country and the need and usage of bio- fertilizers

CO3: analyze several cost effective technologies for purification of water, rain water harvesting techniques for collection & storage of rain water and examine the employment generating technologies in tribal/rural areas

CO4: distinguish between community organization and community development and identify techniques for community mobilization & approaches to community organization for social change

Course Articulation Matrix (CAM): U18OE701D RURAL TECHNOLOGY AND COMMUNITY DEVELOPMENT																
Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18OE701D.1	-	-	1	-	-	1	2	-	-	-	-	1	-	-	-
CO2	U18OE701D.2	-	-	1	-	-	1	2	-	-	-	-	1	-	-	-
CO3	U18OE701D.3	-	-	1	-	-	1	2	-	-	-	-	1	-	-	-
CO4	U18OE701D.4	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-
U18OE701D		-	-	1	-	-	1	2	-	-	-	-	1	-	-	

U18AI702A REINFORCEMENT LEARNING

Class: B.Tech. VII- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: basic concepts, examples of reinforcement learning and multi-armed bandits
LO2: finite Markov decision processes and dynamic programming
LO3: Monte Carlo methods and temporal-difference learning
LO4: function approximation and policy gradient methods

UNIT – I (9)

Reinforcement Learning: Introduction, Examples, Elements of reinforcement learning, Limitations and scope. An extended example: Tic-Tac-Toe.
Multi-armed Bandits: A k-armed bandit problem, Action-value methods, Tracking a non-stationary problem, Optimistic initial values, Upper-confidence-bound action selection, Gradient bandit algorithms, Associative search (Contextual Bandits).

UNIT –II (9)

Markov Decision Processes: The Agent–environment interface, Goals and rewards, Returns and episodes, Policies and value functions, Optimality and approximation.
Dynamic Programming: Policy evaluation (Prediction), Policy improvement, Policy iteration, Value iteration, Asynchronous dynamic programming, Generalized policy iteration, Efficiency of dynamic programming

UNIT– III (9)

Monte Carlo Methods: Monte Carlo prediction, Monte Carlo estimation of action values, Monte Carlo control, On-policy & Off-policy Monte Carlo control and Incremental Implementation.
Temporal-Difference Learning: TD prediction, Optimality of TD (0), SARSA, Q-learning, R-learning, Games and after states.

UNIT - IV (9)

Function Approximation: Value prediction, gradient descent methods, linear function approximation, ANN based function approximation, lazy learning, instability issues.
Policy Gradient Methods: Non-associative learning – REINFORCE algorithm, exact gradient methods, estimating gradients, approximate policy gradient algorithms, actor-critic methods.

Text Book:
[1] Richard S. Sutton and Andrew G. Barto, *Reinforcement Learning*, 2nd ed. United Kingdom: MIT Press, 2018(*Chapters 1-8*)

Reference Books:
[1] Wiering, Marco, and Martijn Van Otterlo, *Reinforcement learning*, United States: Springer, 2012.
[2] Russell, Stuart J., and Peter Norvig, *Artificial intelligence: a modern approach*, United Kingdom: Pearson Education Limited, 2016.

Course Research Paper: Research paper (indexed Journal/conference paper) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1: solve Multi-armed Bandits problem in reinforcement learning algorithms
CO2: apply Markov decision processes to define the interaction between a learning agent and its environment
CO3: apply Monte Carlo Methods to model the probability of different outcomes in a process
CO4: make use of Policy Gradient Methods for policy approximation and parameterization

Course Articulation Matrix (CAM): U18AI702A REINFORCMENT LEARNING																
Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI702A.1	2	2	2	1	-	1	-	1	1	1	-	1	2	1	2
CO2	U18AI702A.2	2	2	1	2	2	-	-	1	1	1	-	1	2	1	2
CO3	U18AI702A.3	2	2	1	3	2	-	-	1	1	1	-	1	2	1	2
CO4	U18AI702A.4	-	2	2	3	2	-	-	1	1	1	-	1	2	1	2
U18AI702A		2	2	1.5	2.25	2	1	-	1	1	1	-	1	2	1	2

U18AI702B BIG DATA ANALYTICS

Class: B.Tech. VII- Semester

Branch: Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):
This course will develop students' knowledge in/on…
LO1: fundamental of big data platform and its technologies
LO2: optimize the apache hadoop, mapreduce and mongoDB
LO3: analyze the cassandra and hive
LO4: asses the pig and jasper reports

UNIT-I (9)

Introduction to Digital & Big Data: Types of digital data, Classification of digital data, Characteristics of data, Evolution of big data, Definition of big data, Challenges with big data, 3V's of Big data, Non definitional traits of Big Data - Business intelligence Vs Big Data - Data warehouse and hadoop environment, Coexistence

Big Data Analytics: Classification of analytics, Data science, Terminologies in big data, CAP Theorem, BASE concept, Few top analytics tools

The Big Data Technology Landscape: NoSQL (Not Only SQL), Hadoop

UNIT-II (9)

Introduction to Hadoop: History of hadoop, Hadoop overview, RDBMS vs hadoop, Distributed computing challenges, Use case of hadoop, Hadoop distributors, Hadoop distributed file system(HDFS), Processing data with hadoop, Managing resources and applications with hadoop YARN (Yet Another Resource Negotiator), Interacting with hadoop ecosystem

Map Reduce: Mapper, Reducer, Combiner, Partitioner, Searching, Sorting and Compression

Mongo DB: Terms used in RDBMS and mongoDB, Data types in mongoDB, mongoDB query language

UNIT-III (9)

Introduction to Cassandra: Features of cassandra, CQL data types, CQLSH, Keyspaces, CRUD (Create, Read, Update, and Delete) operations, Collections, Using a counter, Time to live (TTL), Alter commands, Import and export, Querying system tables

Introduction to Hive: Hive architecture, Hive data types, Hive file format, Hive query language (HQL), RCFile implementation, SerDe, User defined function (UDF)

UNIT-IV (9)

Introduction to Pig: Pig on hadoop, Use case for pig-ETL processing, Data types in pig, Running pig, Execution modes of pig, HDFS commands, Relational operators, Eval function, Complex data types, Piggy bank, User defined functions (UDF), Parameter substitution, Diagnostic operator, Word count example using pig, Pig vs hive

Introduction to Jasper Reports: Connecting to mongoDB NoSQL database, Connecting to cassandra NoSQL database

Case Study: Global innovation network and analysis (GINA)

Text Book:

[1] Seema Acharya and Subhashini Chellappan, *Big Data and Analytics*, 2nd ed., New Delhi: Wiley India Pvt. Ltd., 2019. *(Chapters 1 to 11)*

Reference Books:

[1] John Wiley, *Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data*, 1st ed., United States: Indianapolis - EMC Education Services, 2015.
[2] DT Editorial Services, *BIG DATA, Black Book*, 1st ed., New Delhi: DreamTech Press,2016.
[3] Russell Bradberry, Eric Blow, *Practical Cassandra A developers Approach*, 1st ed., New York: Pearson Education, 2014.
[4] Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, *Big Data for Dummies*, 1st ed., New York: John Wiley & Sons, Inc., 2013.
[5] Kyle Banker, *Mongo DB in Action*, 1sted., George Town: Manning Publications Company, 2012.
[6] Tom White, *Hadoop: The Definitive Guide*, 4th ed., New York: O'Reilly Publications, 2011.

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: fundamentals of big data and its business implications
CO2: examine the use cases of hadoop and mapreduce operations
CO3: inspect various query languages such as cassandra and hive
CO4: asses the various concepts of pig and its applications

Course Articulation Matrix (CAM): U18AI702B BIG DATA ANALYTICS

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI702B.1	2	2	1	1	1	-	-	1	1	1	-	1	2	1	2
CO2	U18AI702B.2	2	2	2	1	1	-	-	1	1	1	-	1	2	1	2
CO3	U18AI702B.3	2	2	2	2	1	-	-	1	1	1	-	2	2	1	2
CO4	U18AI702B.4	2	2	2	2	2	-	-	1	1	1	-	2	2	2	2
U18AI702B		2	2	1.75	1.5	1.25	-	-	1	1	1	-	1.5	2	1.25	2

U18AI702C SOCIAL AND INFORMATION NETWORK ANALYSIS

Class: B.Tech. VII- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):
This course will develop student's knowledge in/on…
LO1: mathematical concepts and research design
LO2: multivariate techniques, visualization and testing hypotheses
LO3: directed and undirected networks
LO4: structural equivalence and regular equivalence

UNIT – I (9)

Introduction: Network essentials, Types of relations, Goals of analysis, Network variables as explanatory variables, Network variables as outcome variables
Mathematical Foundations: Introduction, Graphs, Paths and components, Adjacency matrices, Ways and modes, Matrix products
Research Design: Introduction, Experiments and field studies, Whole-network and personal-network research designs, Sources of network data, Types of nodes and types of ties, Actor attributes, Sampling and bounding, Sources of data reliability and validity issues, Ethical considerations

UNIT - II (9)

Multivariate Techniques Used in Network Analysis: Introduction, Multidimensional scaling, Correspondence analysis, Hierarchical clustering
Visualization: Introduction, Layout, Embedding node attributes, Node filtering, Ego networks, Embedding tie characteristics, Visualizing network change, Exporting visualizations, Closing comments
Testing Hypotheses: Introduction, Permutation tests, Dyadic hypotheses, Mixed dyadic–monadic hypotheses, Node-level hypotheses, Whole-network hypotheses, Exponential random graph models, Stochastic actor-oriented models (SAOMs)

UNIT - III (9)

Characterizing Whole Networks: Introduction, Cohesion, Reciprocity, Transitivity and the clustering coefficient, Triad census, Centralization and core–periphery indices
Centrality: Introduction, Basic concept, Undirected, non-valued networks, Directed, non-valued networks, Valued networks, Negative tie networks
Subgroups: Introduction, Cliques, Girvan–Newman algorithm, Factions and modularity optimization, Directed and valued data, Computational considerations, Performing a cohesive sub graph analysis, Supplementary material

UNIT - IV (9)

Equivalence: Introduction, Structural equivalence, Profile similarity, Block models, The direct method, Regular equivalence, The REGE algorithm, Core–periphery models
Analyzing Two-mode Data: Introduction, Converting to one-mode data, converting valued two-mode matrices to one-mode, Bipartite networks, Cohesive subgroups and community detection, Core–periphery models, Equivalence
Large Networks: Introduction, Reducing the size of problem, Choosing appropriate methods, Sampling, Small-world and scale-free networks

Text Book:

[1] Stephen P Borgatti, Martin G Everett, Jeffrey C Johnson, *Analyzing Social Networks*, 2nd ed. Melbourne: Sage publications, 2018.

Reference Books:

[1] Stanley Wasserman, Katherine Faust, *Social Network Analysis: Methods And Applications*, New York: Cambridge University Press, 1999.

[2] Derek. L. Hansen, Ben Shneiderman, Marc A. Smith, *Analyzing social media networks with NodeXL*, Burlington: Elsevier Publication, 2010

[3] MaKsim Tsvetovat, Alexander Kouznetsov, *Social Network Analysis for Startups*, California: O'Reilly Media publications, 2011.

[4] Borko Furht, *Handbook of Social Network Technologies and Applications*, New York: Springer publications, 2010.

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, student's will be able to…

CO1: illustrate networks in graph-theoretic language and identify sources and boundaries of network data.

CO2: apply clustering algorithms to detect groups in proximity data and analyze testable hypothesis at the dyadic, monadic and whole-network level

CO3: analyze directed & undirected networks and evaluate measures of transitivity, reciprocity & clustering

CO4: interpret sampling methods and block models for both regular and structural equivalence

Course Articulation Matrix (CAM): U18AI702C SOCIAL AND INFORMATION NETWORK ANALYSIS

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI702C.1	1	1	1	1	-	-	1	-	1	1	1	2	1	1	1
CO2	U18AI702C.2	1	1	1	-	-	1	1	-	1	1	1	2	1	1	1
CO3	U18AI702C.3	1	-	1	-	1	1	-	-	-	2	-	2	1	1	1
CO4	U18AI702C.4	1	1	1	1	-	1	-	-	-	2	1	2	1	1	1
U18AI702C		1	1	1	1	1	1	1	-	1	1.5	1	2	1	1	1

U18AI703A ROBOTICS

Class: B.Tech. VII- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: fundamental concepts of robotics such as kinematics of a robot, direct kinematics problem and the inverse kinematic solutions

LO2: Lagrange-Euler formulation, Newton-Euler formulation, Generalized D'Alermbert Equation of motion and linear trajectory function, polynomial trajectory function, joint-interpolated Trajectories

LO3: concepts of Sensing, Force and Torque, image acquisition, image geometry, pre-processing, description of 3D Structures, recognition, interpretation, intelligence and task planning

LO4: characteristics of Robot-level Languages, characteristics of task-level languages and robotics simulation frameworks.

UNIT-I (9)

Introduction: Background, Historical Development, Robot Kinematics and Dynamics, Robot Sensing, Robot Programming Languages, Machine Intelligence.

Robot Kinematics: The Direct Kinematics Problem, Rotation Matrix, Composite Rotation Matrix, Rotation Matrix using Euler's Angels Representation, Denavit-Hartenberg Representation, The Inverse Kinematic Solutions

UNIT-II (9)

Robot Dynamics: Lagrange-Euler Formulation, Newton-Euler Formulation, Generalized D'Alermbert Equation of Motion, Inverse and forward dynamics, Determination of inertia tensor, Lagrange-Euler formation for joint torque, Control of robotic joints.

Trajectory and Motion Planning: General Considerations on Trajectory Planning, Linear trajectory function, polynomial trajectory function, Joint-interpolated Trajectories, Planning of Manipulator Cartesian path trajectories.

UNIT-III (9)

Sensors: Introduction, Range Sensing, Proximity Sensing, Touch Sensors, Force and Torque Sensing

Vision: Introduction, Image Acquisition, Illumination techniques, Image Geometry, Pre-processing, Description of 3D Structures, Recognition, Interpretation.

Robot Intelligence and Task Planning: State Space Search, Problem Reduction, Use of Predicate Logic, Problem solving, Robot Learning, Robot Task Planning and Basic Problems in Task Planning.

UNIT- IV(9)

Robot Programming Languages: Characteristics of Robot-level Languages, Characteristics of Task-Level Languages.

Case studies on the usability, acceptability and functionality of autonomous mobile delivery robots in real world healthcare settings

Robotics Simulation Frameworks: Existing state-of-the-art of robotics frameworks, Webtools, Robot Operating System (ROS), Open Robotics Middleware Framework (Open-RMF)

Case Study on Testing Robotic Systems

Text books:

[1] Fu. K.S, Gonzalez. R.C, Lee. C.S.G, Robotics: Control, Sensing, Vision, and Intelligence, McGraw Hill, 2015 (Chapters 1 to 5, 6 to 10)

[2] Pratihar. D. K, Fundamentals of Robotics, Narosa Publishing House, India, 2019

Reference Books:

[1] Mikell Groover, Industrial Robotics Technology Programming and Applications, McGraw Hill, 2014

[2] Deb S.R, Robotics Technology and Flexible Automation, 2nd ed., Tata McGraw Hill Co, 2013.

[3] NPTEL Course on Robotics, Prof. Dilip Kumar Prathihar

[4] Koren Y, Robotics for Engineers, McGraw Hill Book Co, 1992
[5] Maja J Mataric, The Robotics Primer, Universities Press. 2013.
[6] John J. Craig , Introduction to Robotics Mechanics and Control, 3¬rd ed., Pearson Education India, 2008
[7] Law, M., Ahn, H.S., Broadbent, E. et al. Case studies on the usability, acceptability and functionality of autonomous mobile delivery robots in real-world healthcare settings. Intel Serv Robotics 14, 387–398 (2021)
[8] Totev Nikola, Testing Robotic Systems: Case Study, 2021

Course Research Paper: the course faculty in CourseWeb page will post Research paper (indexed Journals/conference papers) relevant to the course content.

Course Patent: the course faculty in CourseWeb page will post Patent relevant to the course content.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):
On completion of this course, student's will be able to…
CO1: apply the fundamental concepts of robotics and the problems of robot kinematics with solutions.
CO2: apply the dynamics of robotics, calculate the trajectory both linear and polynomial functions, andmotion planning
CO3: identify multiple sensors and vision techniques for any robot, calculate robot intelligence and task planning
CO4: apply robotics-programming languages with in a open source frameworks.

Course Articulation Matrix (CAM): U18AI703A ROBOTICS																
Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI703A.1	3	3	2	1	-	-	-	-	1	1	1	3	1	1	1
CO2	U18AI703A.2	3	3	3	1	-	-	-	-	1	1	1	3	2	1	1
CO3	U18AI703A.3	3	2	3	1	-	-	-	-	1	1	1	3	2	1	1
CO4	U18AI703A.4	3	3	3	1	-	-	-	-	1	1	1	3	3	1	2
U18AI703A		3	2.75	2.75	1	-	-	-	-	1	1	1	3	2	1	1.25

U18AI703B COGNITIVE COMPUTING

Class: B.Tech. VII- Semester

Branch: Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: introduction to cognitive science and cognition modeling paradigms
LO2: essential components of memory and language in cognitive systems
LO3: cognitive modeling
LO4: different cognitive architectures

UNIT – I (9)

Introduction to Cognitive Science: Understanding Cognition, IBM's Watson, Design for Human Cognition, Augmented Intelligence

Cognition Modeling Paradigms: Declarative/logic-based computational cognitive modeling, Connectionist models of cognition, Bayesian models of cognition, A dynamical systems approach to cognition

UNIT - II (9)

Cognitive Models of memory and language, Computational models of episodic and semantic memory, Modeling psycholinguistics.

UNIT - III (9)

Cognitive Modeling: modeling the interaction of language, Memory and learning, Modeling select aspects of cognition classical models of rationality, Symbolic reasoning and decision making.

History of cognitive systems and cognitive computing: A case study of Watson Engagement Manager (WEM)

UNIT - IV (9)

Formal models of inductive generalization, Causality, Categorization and similarity, The role of analogy in problem solving, Cognitive Development Child concept acquisition. Cognition and Artificial cognitive architectures such as ACT-R, SOAR, OpenCog, CopyCat, Memory Networks.

Case Study: Healthcare Concierge by Welltok using IBM Watson

Text Book:

[1] Ron Sun (ed.),"*The Cambridge Handbook of Computational Psychology*", Cambridge University Press.

Reference Books:

[1] Emmanuel M. Pothos, Andy J. Wills ,"*Formal Approaches in Categorization*", Cambridge University Press

[2] Judith S. Hurwitz, Marcia Kaufman, Adrian Bowles," *Cognitive Computing and Big Data Analytics*", Wiley

[3] Vijay V Raghavan, Venkat N. Gudivada, Venu Govindaraju, "*Cognitive Computing: Theory and Applications: Volume 35 (Handbook of Statistics)*", North Holland.

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, student's will be able to…

CO1: compare traditional approaches and cognition computing along with cognitive modeling paradigms
CO2: elaborate essential components of memory and language in cognitive systems
CO3: apply cognitive modeling techniques
CO4: analyze different cognitive architectures

Course Articulation Matrix (CAM): U18AI703B COGNITIVE COMPUTING																
Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI703B.1	1	2	1	1	-	1	-	1	1	1	1	1	2	2	2
CO2	U18AI703B.2	1	2	2	2	1	-	-	-	1	1	1	-	2	2	2
CO3	U18AI703B.3	1	2	2	2	1	-	-	-	2	1	1	1	2	2	2
CO4	U18AI703B.4	1	2	1	1	1	-	-	-	2	1	1	1	2	2	2
U18AI703B		1	2	1.5	1.5	1.5	1	-	1	1.5	1	1	1	2	2	2

U18AI703C CRYPTOGRAPHY AND NETWORK SECURITY

Class: B.Tech. VII- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: basic concepts of security attacks, services, mechanisms and symmetric key cryptographic algorithms.
LO2: number theory and public key cryptographic algorithms.
LO3: hash techniques, message authentication techniques and key management & distribution.
LO4: understand the concept of IP security, web security, firewalls and various malicious software

UNIT –I (9)

Overview: The OSI security architecture, Security attacks, Security services, Security mechanisms, A model for network security

Classical Encryption Techniques: Symmetric cipher model, Substitution techniques, Transposition techniques, Steganography.

Block Ciphers and the Data Encryption Standard: Traditional block cipher structure, The data encryption standard, The strength of DES, Block cipher design principles, Block cipher operation.

Advanced Encryption Standard: AES structure, AES transformation functions, AES key expansion.

UNIT-II (9)

Number Theory: Prime numbers, Fermat's and Euler's theorems, Discrete algorithms.

Public-Key Cryptography and RSA: Principles of public-key cryptosystems, The RSA algorithm.

Other Public-Key Crypto systems: Diffie Hellman key exchange, Elliptic curve arithmetic, Elliptic curve cryptography.

UNIT-III (9)

Cryptographic Hash functions: Applications of cryptographic hash functions, Two simple hash functions, Secure hash algorithm (SHA).

Message Authentication Codes: Message authentication requirements, Message authentication functions, Requirements for message authentication codes, Security of MACs, HMAC.

Digital Signature and Authentication Protocols: Digital signatures, Schnorr digital signature scheme.

Key Management and Distribution: Symmetric key distribution using symmetric encryption, Symmetric key distribution using a symmetric encryption, Distribution of public keys, X.509 certificates.

Electronic Mail Security: Pretty good privacy, S/MIME.

UNIT-IV (9)

IP Security: IP security overview, IP security policy, encapsulating security payload, Combining security associations.

Transport-Level Security: Web security considerations, Secure sockets layer, Transport layer security.

Malicious Software: Types of malicious software, Propagation-infected content-viruses, Virus counter measures.

Firewalls: The need for firewalls, Firewall characteristics, Types of firewalls.

Text Book:

[1] William Stallings, *Cryptography and Network Security: Principles and Practice,* 6th ed., England : Pearson Education,2014.

Reference Books:

[1] Behrouz A. Forouzan and Deb deep Mukhopadhyay, *Cryptography and Network Security*, 2nd ed., New Delhi:McGraw Hill Education, 2010.
[2] Atul Kahate,*Cryptography and Network Security*, 3rd ed., New Delhi:McGraw-Hill Education ,2003
[3] D, *Cryptography and Data Security*,1st ed., United Kingdom: Addison Wesley, 1982
[4] V.K.Iain, *Cryptography and Network Security*, 2nd ed., New Delhi: Khanna Publishing House, 2013.

Course Research Papers: Research papers (Journals/conference papers) relevant to the course content will be posted by the course faculty in Course Web page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in Course Web page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in Course Web page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):
On completion of this course, student's will be able to…
CO1: analyze different security attacks, services, mechanisms and symmetric key cryptographic algorithms
CO2: apply mathematical concepts in cryptographic algorithms for providing security & key exchange
CO3: categorize the hash & message authentication techniques and examine key management for distribution of keys
CO4: analyze the security issues at network layer & transport layer for protecting data from malicious Software

Course Articulation Matrix (CAM): U18AI703C CRYPTOGRAPHY AND NETWORK SECURITY																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18AI703C.1	3	2	2	1	2	-	-	1	1	1	-	1	2	1	2
CO2	U18AI703C.2	3	2	2	1	2	-	1	1	1	1	-	1	2	2	1
CO3	U18AI703C.3	3	2	2	2	2	1	-	1	1	1	-	1	2	2	2
CO4	U18AI703C.4	3	2	2	2	2	1	-	1	1	1	-	1	2	2	2
U18AI703C		**3**	**2**	**2**	**1.5**	**2**	**1**	**1**	**1**	**1**	**1**	**-**	**1**	**2**	**1.75**	**1.75**

U18AI704 CLOUD COMPUTING

Class: B.Tech. VII- Semester

Branch: Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: basic concepts of cloud and computing environments.
LO2: cloud architecture and virtualization techniques.
LO3: cloud platforms and real time applications used in industry.
LO4: importance of security and federated cloud.

UNIT –I (9)

Introduction: Cloud computing at a glance, Historical developments, Building cloud computing environment, Computing platforms and technologies

Principles of Parallel and Distributive Computing: Eras of computing, Parallel vs. distributive computing, Elements of parallel computing, Elements of distributive computing, Technologies for distributive computing

UNIT - II (9)

Virtualization: Introductions, Characteristics of virtualized environments, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Technology examples

Cloud Computing Architecture: Introduction, Cloud reference model, Types of cloud, Economics of the cloud, Open challenges

UNIT - III (9)

Data Intensive Computing: What is data intensive computing?Technologies for data intensive computing

Cloud Platform in Industry: Amazon web services, Google app engine, Microsoft azure Cloud

Applications: Scientific applications: ECG analysis in the cloud, Business and consumer applications: CRM and ERP

UNIT - IV (9)

Advanced Topics in Cloud Computing: Federated clouds/InterCloud characterization and definition, Cloud federation stack, Aspects of interest, Technologies for cloud federation

Cloud Security: Security the top concern for cloud users, Cloud security risks, Privacy and privacy impact assessment, Trust, Cloud data encryption, Security of database services, Operating system security, Virtual machine security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management operating system,
Mobile devices and cloud security

Text Book:

[1] Rajkumar Buyya, Christian Vecchiola, Thamarai Selvi, *Mastering Cloud Computing*, New Delhi: McGraw Hill, 2019. *(Chapters 1,2 3,4,8,9,10 and 11)*

[2] Dan C. Marnescu, *Cloud Computing Theory and Practice*, 2nd ed. Cambridge: Elsevier, 2018. *(Chapter 9)*

Reference Books:

[1] Dr. Kumar Saurabh, *Cloud Computing: Architecting Next-Gen Transformations Paradigms*, 4th ed. New Delhi: Wiley India Private Limited, 2018.

[2] Barrie Sosinsky, *Cloud Computing Bible*, Indiana: Wiley Publications, 2011.

[3] Anthony T.Velte, Toby J Velte and Robert Elsenpeter, *Cloud Computing: A practical Approach*, New York: McGraw Hill, 2010.

[4] Dan C. Marinescu *Cloud Computing: Theory and Practice,* 3rd ed. USA: Morgan Kaufmann 2013.

Course Research Papers: Research papers (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, student's will be able to…

CO1: make use of different cloud computing environments.
CO2: identify various cloud architectures and importance of virtualization along with their technologies.
CO3: apply cloud platforms, technologies and applications in industry.
CO4: analyse federated cloud techniques, cloud security and carry out further study & research.

Course Articulation Matrix (CAM): U18AI704 CLOUD COMPUTING																
Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI704.1	2	2	2	1	2	-	-	1	1	1	-	1	2	1	1
CO2	U18AI704.2	2	2	2	1	2	-	1	1	1	1	-	1	2	1	1
CO3	U18AI704.3	2	2	2	2	2	1	-	1	1	1	-	1	2	1	2
CO4	U18AI704.4	2	2	2	2	2	1	-	1	1	1	-	1	2	1	2
U18AI704		2	2	2	1.5	2	1	1	1	1	1	-	1	2	1	1.5

U18AI705 CLOUD COMPUTING LABORATORY

Class: B.Tech. VII- Semester **Branch:** Computer Science and Engineering(AI & ML)

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):
This course will develop student's knowledge in/on…
LO1: installation and configuration of cloud.
LO2: virtualization techniques.
LO3: implement parallel programming using Hadoop.
LO4: implementing cloud based applications.

List of Experiments

Experiment-I (UNIT-I)
1. Install Oracle Virtual box and create two VMs on your laptop.
2. Install a C compiler in the virtual machine created using virtual box and executes simple programs.

Experiment-II (UNIT-I)
1. Simulate a cloud scenario using CloudSim to create a datacenter with one host and run one cloudlet on it.
2. Simulate a cloud scenario using CloudSim to create a datacenter with one host and run two cloudlets on it. The cloudlets run in VMs with the same MIPS requirements. The cloudlets will take the same time to complete the execution.

Experiment-III (UNIT-I)
1. Simulate a cloud scenario using CloudSimto create a datacenter with two hosts and run two cloudlets on it. The cloudlets run in VMs with different MIPS requirements. The cloudlets will take different time to complete the execution depending on the requested VM performance.
2. Simulate a cloud scenario using CloudSimto create two datacenters with one host each and run two cloudlets on them.3. Simulate a cloud scenario using CloudSimto create two datacenters with one host each and run cloudlets of two users on them.

Experiment-IV (UNIT-II)
1. Simulate a cloud scenario using CloudSim and run a SJF scheduling algorithm.
2. Simulate a cloud scenario using CloudSim and run a FCFS scheduling algorithm.

Experiment-V (UNIT-II)
1. Simulate a cloud scenario using CloudSim and run a Round Robin scheduling algorithm.

Experiment-VI(UNIT-II)
1. Simulate a cloud scenario using CloudSim and propose new scheduling algorithm.

Experiment -VII (UNIT-III)
1. Develop a word count program to demonstrate the use of Map and Reduce task.

Experiment-VIII(UNIT-III)
1.Create a word document of your class time table and store on the cloud with docx and pdf format.
2. Develop a program to generate 'n' even numbers and deploy in cloud.

Experiment-IX (UNIT-III)
1.Create your own Virtual Private Cloud (VPC).
2. Create public and private subnet.

Experiment-X(UNIT-IV)
1. Create Public Routing Table, associate subnet and add routing rules.

Experiment-XI (UNIT-IV)
1. Create Private Routing Table, associate subnet and add routing rules.

Experiment-XII (UNIT-IV)
1. Write a program to validate user, create a database login (username, password) and deploy in cloud.

Laboratory Manual:
[1] Cloud Computing Laboratory Manual,prepared by the faculty of Department of CSE(N), KITS Warangal.

Text Books:
[1] Rajkumar Buyya, Christian Vecchiola, ThamaraiSelvi, *Mastering Cloud Computing*, New Delhi : McGraw Hill, 2013 (reprint 2019).
[2] Dan C. Marinescu, *Cloud Computing Theory and Practice*, 2nd ed. Cambridge: Elsevier, 2018.
[3] Dr. Kumar Saurabh, *Cloud Computing: Architecting Next-Gen Transformations Paradigms*, 4th ed. New Delhi: Wiley India Private Limited, 2018.
[4] Gautham Shroff Enterprise *Cloud Computing Technology, Architecture, Applications,* UK, Cambridge University Publisher, 2010
[5] Dan C. Marinescu *Cloud Computing: Theory and Practice,* 3rd ed. USA: Morgan Kaufmann 2013.

Course Learning Outcomes (COs):
On completion of the course, students will be able to…
CO1: analyse installation of virtualizationusing different types of Hypervisors.
CO2: develop java programs for cloud architecture.
CO3: make use of Hadoop platform for parallel programming.
CO4: analyse the functioning of components in cloud platform, technologies and applications in industry.

Course Articulation Matrix (CAM):U18AI705CLOUD COMPUTING LABORATORY

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI705.1	2	2	2	2	2	-	-	1	1	1	1	1	2	1	2
CO2	U18AI705.2	2	2	2	2	2	-	-	1	1	1	1	1	2	1	2
CO3	U18AI705.3	2	2	2	2	2	-	-	1	2	1	1	1	2	1	2
CO4	U18AI705.4	2	2	2	2	2	-	-	1	1	1	1	1	2	1	2
U18AI705		2	2	2	2	2	-	-	1	1.25	1	1	1	2	1	2

U18AI706 NATURAL LANGUAGE PROCESSING LABORATORY

Class: B.Tech. VII- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):
This course will develop student's knowledge in / on...

LO1: regular expression, stemming, lemmatization and tokenization
LO2: N-Gram model, smoothing techniques
LO3: HMM tagger, Markov chains, POS tagging and named entity tagging
LO4: thematic role, propbank, framenet and relation extraction algorithms.

List of Experiments

Experiment-I (Unit-I)

1. Develop a regular expression to parse all plural words from a given text.
2. Develop a program to split the given text into words and remove the special characters and punctuations.

Experiment-II (Unit-I)

1. Apply Porter stemmer algorithm for stemming the words present in given text.
2. Apply WordNetLemmatizer for Lemmatization of the words present in text.
3. Develop a program for stop word removal from given text.

Experiment-III (Unit-I)

1. Develop a program for sentence tokenization.
2. Develop a program to compute the Edit distance between two given strings.

Experiment-IV (Unit-II)

1. Develop a program to build a N-Gram model from the words present in the given text.
2. Apply the add-one smoothing to smooth the probability distribution of the bi-gram model built from the given text.

Experiment-V (Unit-II)

1. Develop a program to implement the Kneser-Ney smoothing technique for language modeling.
2. Develop a program to apply naïve bayes classification for the given text.

Experiment-VI (Unit-III)

1. Develop a program to implement the process of chunking on the given text.

Experiment-VII (Unit-III)

1. Develop a program for constructing an HMM part of speech tagger.
2. Develop a program to implement POS tagging.

Experiment-VIII (Unit-III)

1. Develop a program to implement named entity tagging.

Experiment-IX (Unit-III)

1. Develop a program to implement the markov chains.

Experiment-X (Unit-IV)

1. Develop a program to implement thematic role.

2. Develop a program to implement propbank.

Experiment-XI (Unit-IV)

1. Develop a program to implement framenet.
2. Develop a program to implement relation extraction using handwritten pattern.

Experiment-XII (Unit-IV)

1. Develop a program to implement relation extraction using supervised learning.

Laboratory Manual:

[1] *Natural language Processing Laboratory Manual*, Dept. of CSE (AI & ML), KITSW.

Text Book:

[1] Daniel Jurafsky and James H.Martin, "Speech and Language Processing", Pearson Education, Second edition, ISBN: 978-9332518414, 2009.

Reference Book:

[1] Steven Bird, Ewan Klein and Edward Loper, "Natural Processing with Python', O'Reilly Media, 1 edition, ISBN: 978-0596516499, 2009.

[2] Roland R.Hausser, "Foundations of Computational Linguistics: Human-Computer Communication in Natural Language", MIT Press first edition, ISBN: 978-3540424178, 2011.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: develop regular expressions, apply stemming, lemmatization and tokenization
CO2: apply various smoothing techniques, develop N-gram model
CO3: implement HMM tagger, markov chains , POS tagging and named entity tagging
CO4: *implement thematic role, propbank, framenet and relation extraction algorithms.*

Course Articulation Matrix (CAM): U18AI706 NATURAL LANGUAGE PROCESSING LABORATORY																
Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI706.1	2	2	2	1	1	-	-	1	2	1	-	1	2	1	1
CO2	U18AI706.2	2	2	2	2	1	-	-	1	2	1	-	2	2	1	2
CO3	U18AI706.3	2	2	1	2	1	-	-	1	2	1	-	2	2	2	2
CO4	U18AI706.4	2	2	2	2	1	-	-	1	2	1	-	2	2	2	2
U18AI706		2	2	1.75	1.75	1	-	-	1	2	1	-	1.75	2	1.5	1.75

U18AI707 : MAJOR PROJECT WORK PHASE-I

Class: B.Tech. VII - Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
-	-	6	3

Examination Scheme:

Continuous Internal Evaluation	100 marks
End Semester Examination	--

Course Learning Objectives (LOs):

The major project work will develop students' knowledge on /in…

LO1: real-world complex engineering problems, literature review, problem formulation; and experimental and data analysis techniques

LO2: design/development of solutions to real-world engineering problems; conduct of investigations of complex problems; modern tool usage to design, build and test a prototype; impact of solution in society, environment and sustainability contexts

LO3: ethics, team work and project management skills such as budgeting, scheduling

LO4: oral, written and multimedia communication skills; self-directed independent learning and life-long learning

1. Final Year Major Project work represents the culmination of study towards the B. Tech degree. ***Major project offers an opportunity to integrate the knowledge acquired from various courses and apply it to solve real-world complex engineering problems***. The **student learning assessment process** (SLAP) shall include good number of presentations, demonstration of work undertaken, submission of a project report, writing project paper in scientific journal style & format, preparing project poster and creating video pitch on the complete project work.
2. Activities of major project SLAP shall be planned in such a way to ensure that the students acquire the essential knowledge, skills and qualities (KSQ) of a professional engineer.
3. **Team work:** Major project work is a team work.
   (i) The students of a project team shall work together to achieve a common objective.
   (ii) Every student of a project team is expected to function effectively as an individual, and also with others as a team member in an ecosystem of team having knowledge diversity, gender diversity, social and cultural diversity among its members.
4. **Two phases:** Major project work shall be carried out in two phases. Nearly 50 - 75% of the proposed work to be completed in 7th semester as *Phase-I* and the remaining work to be continued and completed in 8th semester as *Phase-II*.
5. Every student is expected to put approximately **72 hours of work** into the major project *phase-I* course over the 12 weeks of 7th semester.
6. **Major project work *Phase-I*: 7th semester**
   (i) The HoD shall constitute the ***department project evaluation committee (DPEC)*** with following composition

Department project evaluation committee (DPEC)	
HoD	Chairman
Senior Faculty	Convener
Coordinator(s)	Section - wise coordinator(s) *One coordinator for each section*
Three Faculty members	Section-wise faculty members *three faculty members for each section representing various socializations.* *(Five specializations will be covered including the coordinator's and Convener's)*

(ii) Major project allotment to students during last working week of 6th semester:

(a) **First / Second week of 6th Semester**: The process shall be initiated during the first / second week of 6th semester by collecting project titles from the department faculty research groups, on offering innovative ideas/solutions for engineering problems.

(b) **MSE-I period of 6th Semester – Notifying project titles**: The finalized project titles shall be notified to students during the MSE-I period of 6th semester and student teams shall be allowed to exercise their options on titles that interest them.

(c) **Last working week of 6th Semester – Allotment of titles and supervisors to project teams**:The project title allotment to major project teams shall be completed before the last day of instruction of 6th semester

(d) **6th semester summer break - Literature review**: This 6th semester schedule enables students to complete literature review, preliminary simulations / investigations / experimentation during 6th semester summer break and *start the work from day-one in 7th semester*

(e) Registration Presentation - Notifying the tentative dates: The major project teams are expected to give registration presentation during second / third week from the commencement of 7th semester. The tentative dates for conducting the registration presentation shall be notified at the time of releasing the circular on allotted project title and project supervisors, as indicated in (c) above. This enables student teams to plan the work accordingly during summer break, to complete the literature review, preliminary simulations / investigations and get ready for informative, confident and comfortable presentations on their project work.

(iii) The convener DPEC shall notify, during MSE-I period of 6th semester, the list of implementable project titles offered by the faculty of different research groups of the department

(a) Project titles shall come with the following details to be made available to students on dept webpage and notice boards, facilitating students to select problems that interest them.

- **i.** abstract
- **ii.** deliverables / outcomes
- **iii.** knowledge and skills required to complete the project
- **iv.** resources required
- **v.** one of the deliverables shall be writing a technical paper out of the major project work done for submission to a reputed non-predatory conference/non-paid peer reviewedjournal

(iv) The major project teams, finalized by the convener DPEC, shall be allowed to exercise their options on the titles that interest them from the notified list

(v) **Project supervisor allotment**: The convener DPEC shall allot, during the last week of 6th semester, the faculty supervisors to all project teams

(a) The project supervisors shall

- **i. define project objectives and expected deliverables**
- **ii. help the students plan their project work and timeline**
- **iii. provide enough resources for successful project completion**

(vi) The faculty supervisors are expected to provide guidance to project teams on

(a) *Knowledge, skills and qualities (KSQ) to be acquired* to propose solutions to the identified real-world problems

(b) *Problem analysis* - to identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

(c) *Applying engineering knowledge* - to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

(d) *Design/development of solutions* - to design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental Considerations

(e) *Conduct investigations of complex problems* - to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

(f) *Modern tool usage* – to create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

(g) *Engineering and society* – to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

(h) *Environment and sustainability* – to understand the impact of the professional engineering solutions in societal and environmental contexts, demonstrate the knowledge of, and need for sustainable development

(i) *Ethics* – to apply ethical principles and commit to professional ethics, responsibilities, and norms of the engineering practice

(j) Individual and team work – to function effectively as an individual, and as a member or leaderin diverse teams, and in multidisciplinary settings

(k) *Communication* – to communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

(l) *Project management and finance* – to demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

(m) *Life-long learning* – to recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

(vii) The project supervisors are also expected to continuously emphasize and guidestudents on

(a) Meeting Cadence:

i. Regular meetings with supervisor: Short and frequent meetings increase a team's work momentum. Regular meetings with supervisor to review the status of project are very essential. All students of the team shall participate in discussions and take notes.

ii. Meeting Frequency: Semi-weekly cadence, i.e., the meeting frequency shall be **twice a week.** Due weightage will be given to meeting cadence and considered for evaluation during presentations, i.e., number of planned meetings and number attended by students

(b) **Project Log Book:** The activity journaling in project log book is very important for a successful project.

i. Project log book is a written record showing the daily project activity on project goals from the very first thing like starting the project (an introduction statement what the project is all about), to the completion of the work (including the final results, and whether project met the core objectives / outcomes, etc.).

ii. In project log book, the activities like regular meetings with project supervisor, and work carried out on daily/weekly basis are to be recorded. This ensures that the student progress is being monitored well.

iii. The project supervisor shall regularly check the log book of every student of project team and endorse each and every activity by affixing his signature with date. With this, the number of planned meetings and number attended by the students will bealso monitored.

iv. Log books are to be shown during all presentations and will be graded along with the project.

v. At the conclusion of the project work *phase-I*, the supervisor shall specifically comment, in the project log book, on whether the project team met each of the project work *phase-I* goals and to give evidence which describes the quality of work. For project teams, this also serves as self-assessment.

(c) **Following project timeline**: completing the tasks as planned in project timeline

(d) The relevant knowledge, skills and qualities (**KSQ**) an engineering graduate should possess, which can be specially acquired by participating in major project work

(e) **Writing down whatever is done and making notes of whatever is read**. Writing down the procedures/models followed, designs made, experiments conducted, simulations carried out, intermediate results obtained, ***difficulties faced and how they were fixed*** are very important. This kind of documenting the whole process as we go with project implementation is a very effective way

and will help preparing a well- documented report having original content. Note down and include information about all the resources that you used, magazines, Journals, patents, books, and so on. This information will be needed for the bibliography in your project report. On the other hand, documenting a report ***on the spur of the moment*** would end up copying things from other sources resulting in a plagiarized document.

(f) **Good and sufficient literature review**: Literature review is a description and analysis of information related to the topic of project work. Reading good number of review articles, research articles published in recent issues of peer reviewed journals, technical magazines, patents, reference books on the topics of potential interest, will help one understand what has already been discovered and what questions remain to identify gaps in the literature.

(g) Completing nearly 50 - 75% of the proposed work during phase-I

(h) Right conduct of research to promote academic integrity, honesty and time management

(i) Preparing a well-documented report in proper format, covering the progress made during Phase-I

(j) Consequences of plagiarism and use of anti-plagiarism software to detect plagiarism in documents

(k) Submission of major project phase-I report within acceptable plagiarism levels, as per the Anti-plagiarism policy-2020 of our institute.

(l) **Video pitch:** Capturing short videos, photos, screenshots on experiments conducted, simulations carried out, prototype / working model / process /software package/system developed during course of project execution, photos showing interaction with supervisor for creating a short video pitch on the work done during *phase-I*.

(m) **Project Paper**: Writing a technical paper at the end of *phase-II* based on the solution(s) proposed, results obtained and prototype / working model / process software package /system developed, for submission to a reputed non-predatory conference/non-paid peer reviewed journal.

Project poster: At the end of phase-II, the project teams shall have to present their project in the form of posters, at the time of demonstration of complete prototype / working model / software package / system developed.

(viii) Phase – I evaluation: There shall be only Continuous Internal Evaluation (CIE) for major project work *phase-I* with following components

(a) **Registration Presentation** *(during second / third week of 7th semester):* The Registration Presentation shall include a brief report and presentation focusing the identified problem, objective(s), literature review, identifying research gap in the literature, implementation of existing methods, proposed solution, and expected outcome(s).

i. The registration presentation shall invariably include the **project plan timeline** with actual start and finish dates– monthly/weekly project milestones/ timeline prepared in MS Excel or any other project management tool.

ii. Project timeline – *Weekly project milestones*: It's a compact and creative way to present a project plan. Identify the project intermediate goals and related tasks for completing each of those goals. Categorize tasks for each week. In the project timeline use different colors to the tasks for each week. Horizontal timeline layouts shall be preferred or any other layout of team's choice.

iii. Project teams shall create and present the following during registration presentation

1. *Complete project timeline*
2. *Phase-I project timeline*
3. *Phase-II project timeline*

iv. During every presentation, project teams shall compulsorily show the following as part of their presentation

1. *The slides on project timeline and*
2. *A table showing targeted tasks as per timeline and status – whether tasks accomplished?*

v. Project log book: Every student of the Project team shall compulsorily show the activity journaling in the log book (*with due signatures of project supervisor*) during presentations

(b) Progress Presentation-I *(during penultimate week of 7th semester):* At the end of first stage (7th

semester), student teams shall be required present, before the DPEC, the progress made during phase-I and submit a well-documented report of work done for evaluation to the project coordinator

1. **Following project timeline**: The project timeline shall be meticulously followed and the tasks shall be completed as planned in project timeline.
2. Project teams shall compulsorily show the following as part of their progresspresentation-I
   1. The slides on project timeline and
   2. A table showing targeted tasks as per timeline and whether tasks accomplished?
3. **Project log book**: Every student of the Project team shall compulsorily show theactivity journaling in the log book (*with due signatures of project supervisor*)

(c) CIE schedule: The convener DPEC shall release complete schedule of CIE before start of 7th semester well in advance, so that student teams will complete the scheduled works and get ready with informative, confident and comfortable presentation for registration and progress presentations.

(ix) CIE for the Major project work phase-I shall be as given below:

Major project work Phase-I Assessment *(7^{th} semester)*	**Weightage**
A. Supervisor Assessment	**20%**
B. DPEC Assessment *(i) Registration Presentation (10%)* *(ii) Progress Presentation-I (20%)* *(iii) Project progress*: Part of working model/ process/software package/system developed (30%)* *(iii) Well-documented Progress Report on Phase-I work (10%)* *(iv) Video pitch on Phase-I (10%)*	**80%**
Total Weightage	100 %

**Students are advised to complete major part of the project in phase-I only*

(a) **Working Model:** Every project team shall be required to develop a working model/ process/software package/system, on the chosen work. The progress made in this shall be demonstrated during progress presentation-I at the end of *phase-I* and the completed working model/ process/software package/system before the DPEC as per the dates specified by DPEC atthe end of *phase-II*.

(b) **Progress Report on *phase-I*:** Every project team shall be required to submit a well-documentedprogress report on dissertation phase-I as per format specified by DPEC.

(i) Tangible outcomes of *phase-I* in Conclusions - Chapter: These are the lessons learnt from doing a project work. The students have to describe in their own words what they learnt from the *phase-I* project work experience. They have to describe what specific KSQs are acquired by them, with reference to the expected COs, after successful completion of *phase- I* work. Finally, a table depicting systematic mapping of what they have learnt and the expected major project work COs, is to be presented in the conclusions chapter of *phase-I*report

(c) **Video pitch on *phase-I*:** Every project team shall be required to create a pitch video, which is a video presentation on their major project work *phase-I*. The project team shall present the produced video pitch during progress presentation-I. The produced video pitch should

(i) be 3 to 5-minute-long video (no longer than 5 minutes)
(ii) be concise and to the point, on the problem and proposed solution
(iii) show project timeline and sample page of log book
(iv) highlight the progress made at various stages during *phase-I* project implementation with the help of short videos / photos / screenshots on experiments conducted, simulations carried out, part of prototype / working model / process / software package / system being under development as part of proposed solution and also photos showing team interactions with supervisor and the team working in the lab on project
(v) discuss the impact of proposed solution in *ethical, environmental, societal and sustainable development contexts.*
(vi) emphasize key points about *business idea, potential market for the proposed solution*

(x) It is mandatory for

(a) every student of the team to *appear for oral presentation and viva-voce*, as part of progress presentation -I to qualify for course evaluation

(b) every project team *to submit a well-documented progress report on major project work phase-I*, as part of progress presentation -I to qualify for course evaluation

(c) every project team to create and present a good video pitch on major project work *phase-I*, as part of progress presentation -I to qualify for course evaluation

xi) A student shall register for supplementary examination for the Major project work *phase-I* in the following cases:

(a) He/she is absent for oral presentation and viva-voce as part of progress presentation-I

(b) The project team fails to submit the progress report on *phase-I* in prescribed format

(c) The project team fails to submit the video pitch on the progress made during the P*hase-I* period.

(d) he/she fails to fulfill the requirements of Major project work *phase-I* evaluation as per specified guidelines

(xii) Supplementary examination for Major project work *phase-I*

a. The CoE shall send the list of students, registered for supplementary examination, to the HoDsconcerned

b. The DPEC, duly constituted by the HoD, shall conduct Major project phase-I supplementary examand send the award list to the CoE within the stipulated time

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Course Learning Outcomes (COs):

Upon completion of major project work, students will be able to…

CO1: review research literature, identify gaps in the literature, formulate problem, apply knowledge of mathematics, sciences, engineering fundamentals, experimental and data analysis techniques; synthesize technical knowledge and innovative approaches to generate suitable solutions for real-world complex engineering problems (**Technical skills**)

CO2: *design a system or product based on product/customer specifications; develop, analyze, and critically evaluate the design alternatives in order to justify the solutions to a real-world problem guided by ethical, environmental, societal and sustainable development considerations; use modern engineering and IT tools to design, build and test a prototype within specified project timeline and budget* (**Problem solving and critical thinking skills**)

CO3: apply project management and organizational skills; demonstrate integrity, leadership, creativity, professional and ethical responsibilities as an individual and as a member or leader to produce time-sensitive deliverables in a multi-disciplinary team (**Ethics and teamwork**)

CO4: *collate the results, compare performance of prototype to design specifications and present clearly and effectively the proposed solution, conclusions and/or recommendations in written (report, poster, technical paper), oral (presentations) and multimedia formats (video pitch) and engage in self-directed independent learning and life-long learning demonstrating the KSQ of a professional engineer* (**Communication skills and life-long learning**)

Course Articulation Matrix (CAM): U18AI707 MAJOR PROJECT WORK PHASE-I

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI707.1	2	2	2	2	-	-	-	3	-	2	-	3	3	3	3
CO2	U18AI707.2	2	2	2	-	2	2	2	3	-	-	-	3	3	3	3
CO3	U18AI707.3	-	-	-	-	-	-	-	3	2	-	2	3	3	3	3
CO4	U18AI707.4	-	-	2	2	-	-	-	3	-	2	-	3	3	3	3
U18AI707		2	2	2	2	2	2	2	3	2	2	2	3	3	3	3

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING(NETWORKS)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL - 15
(An Autonomous Institute under Kakatiya University, Warangal)

SCHEME OF INSTRUCTION & EVALUATION

VIII-SEMESTER OF 4-YEAR B. TECH DEGREE PROGRAM

[3Th+1MP-II]

Sl. No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	PE	U18AI801	Professional Elective - V / MOOC-V	3	-	-	3	10	30	40	60	100
2	PE	U18AI802	Professional Elective - VI / MOOC-VI	3	-	-	3	10	30	40	60	100
3	OE	U18OE803	Open Elective - IV / MOOC-VII	3	-	-	3	10	30	40	60	100
4	PROJ	U18AI804	Major Project - Phase - II	-	-	14	7	60	-	60	40	100
			Total	9	-	14	16	90	90	180	220	400
Additional Learning*: *Maximum credits allowed for Honours/Minor in Engineering*				-	-	-	*7*	-	-	-	-	-
Total credits for students opted for Honours/Minor students:				-	-	-	***16+7***	-	-	-	-	-

** List of courses for additional learning through **MOOCs** towards Honours/Minor in Engineering shall be prescribed by the department under Honours/ Minor Curricula*

[L= Lecture, T = Tutorials, P = Practicals & C = Credits] **Total Contact Periods/Week: 23** **Total Credits: 16**

Professional Elective-V / MOOC-V:	Professional Elective-VI/ MOOC-VI:	Open Elective-IV/MOOC-VII:
U18AI801A: Ethical Hacking U18AI801B: Virtual Reality Technologies U18AI801C: Robotic Process Automation U18AI801M: MOOCs course	U18AI802A: Data Visualization U18AI802B: Fog and Edge Computing U18AI802C: Block Chain Technologies U18AI802M: MOOCs course	U18OE803A: Operations Research U18OE803B: Management Information Systems U18OE803C: Entrepreneurship Development U18OE803D: Forex & Foreign Trade U18OE803M: MOOCs Course

U18AI801A ETHICAL HACKING

Class: B.Tech VIII- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: methodologies and framework of ethical hacking for enhancing the security.
LO2: business perspective and planning for a controlled attack
LO3: reconnaissance, preparing for a hack, enumeration and exploitation
LO4: deliverable and integration

UNIT – I (9)

Introduction: Hacking impacts, The hacker-Type of hacker, Script kiddies
Framework: Planning the test, Sound operations, Reconnaissance, Enumeration, Vulnerability analysis, Exploitation, Final analysis, Deliverable, Integration
Information Security Models: Computer security, Network security, Service security, Application security, Security architecture
Information Security Program: The process of information security, Component parts of information security programs, Risk analysis and ethical hacking

UNIT - II (9)

The Business Perspective: Business objectives, Security policy, Previous test results, Business challenges
Planning for a Controlled Attack: Inherent limitations, Imposed limitations, Timing is everything, Attack type, Source point, Required knowledge, Multi-phased attacks, Teaming and attack structure, Engagement planner, The right security consultant, The tester, logistics, Intermediates, Law enforcement

UNIT - III (9)

Reconnaissance: Social engineering, Physical security, Internet reconnaissance
Preparing for a Hack: Technical preparation, Managing the engagement
Enumeration: Enumeration techniques, Soft objective, looking around or attack, Elements of enumeration, Preparing for the next phase
Exploitation: Intuitive testing, Evasion, Threads and groups, Operating systems, Password crackers, Rootkits, Applications, Wardialing, Network, Services and areas of concern

UNIT - IV (9)

Deliverable: The deliverable, The document, Overall structure, Aligning findings, Presentation
Integration: Integrating the results, Integration summary, Mitigation, Defense planning, Incident management, Security policy, Conclusion

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Text Book:

[1] James S. Tiller, *The Ethical Hack: A Framework for Business Value Penetration Testing*, New York: Auerbach Publications, CRC Press, 2019.

Reference Books:

[1] Michael Simpson, Kent Backman, James Corley, Hands-On Ethical Hacking and Network Defense, 2nd ed. New York: Cengage Learning, 2005.
[2] Patrick Engebreston, The Basics of Hacking and Penetration testing, New York: Syngress Publishers, 2011.
[3] EC-Council, Ethical Hacking and Countermeasures: Attack Phases, New York: Course Technology Press, 2016.
[4] Hein Smith, Hilary Morrison, ETHICAL HACKING: Comprehensive Beginner's Guide to Learn and Master Ethical Hacking, New York: Kindle Edition, 2018.

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: *demonstrate phases of the penetration testing framework*
CO2: *identify various types of attacks*
CO3: *make use of reconnaissance tools to gather information*
CO4: *analyze the dangers associated with penetration testing*

Course Articulation Matrix (CAM): U18AI801A ETHICAL HACKING

Course Outcomes		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO 3
CO1	U18AI801A.1	2	2	2	1	-	1	-	1	-	1	-	1	1	1	2
CO2	U18AI801A.2	2	2	2	2	-	1	-	1	-	1	-	1	1	1	2
CO3	U18AI801A.3	2	2	2	2	-	1	-	1	-	1	-	1	2	1	2
CO4	U18AI801A.4	2	2	2	3	-	1	-	1	-	1	-	1	2	1	2
U18AI801A		2	2	2	2	-	1	-	1	-	1	-	1	1.5	1	2

U18AI801B VIRTUAL REALITY

Class: B.Tech. VIII- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: concepts and components of VR, multiple models of input & output interface in VR
LO2: geometric modeling, kinematics modeling, physical modeling and behavioral modeling
LO3: development tools like Java-3D, World Tool-Kit, Haptic General open source tool kit
LO4: augmented and mixed reality, AR methods, visualization techniques and applications of VR

UNIT – I (9)

Introduction of Virtual Reality: Fundamental Concept and Components of Virtual Reality. Primary Features and Present Development on Virtual Reality.

Input and Output Interface in Virtual Reality: Input - Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3D Scanner etc. Output - Visual / Auditory / Haptic Devices.

UNIT – II (9)

Modeling: Geometric Modeling, Virtual Object Shape, Object Visual Appearance.

Kinematics Modeling: Homogeneous Transformation Matrices, Object Position, Transformation Invariants, Object Hierarchies, Viewing the Three-Dimensional World.

Physical Modeling: Collision Detection, Surface Deformation, Force Computation, Force Smoothing and Mapping, Haptic Texturing.

Behavior Modeling: Model Management Level-of-Detail Management, Cell Segmentation.

UNIT – III (9)

VR Programming: Toolkits and Scene Graphs.

World Tool-Kit: Model Geometry and Appearance, The WTK Scene Graph, Sensors and Action Functions, WTK Networking.

Java 3D: Model Geometry and Appearance, Java 3D Scene Graph, Sensors and Behaviors, Java 3D Networking, WTK and Java 3D Performance Comparison.

General Haptics Open Software Toolkit: GHOST Integration with the Graphics Pipeline, The GHOST Haptics Scene Graph, Collision Detection and Response, Graphics and PHANTOM Calibration.

UNIT – IV (9)

Augmented Reality: Introduction to Augmented Reality, Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods

AR Hardware: Major Hardware Components for Augmented Reality Systems

AR Software: Major Software Components for Augmented Reality Systems, Software used to Create Content for the Augmented Reality Application

Interaction in AR: mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.

Traditional VR Applications: Medical applications, military applications, manufacturing.

Text Books:

[1] Burdea, G. C. and P. Coffet. *Virtual Reality Technology*, Second Edition, Wiley-IEEE Press, 2003/2006. *(Chapters 1 to 9)*

[2] Alan B. Craig, *Understanding Augmented Reality, Concepts and Applications*, Morgan Kaufmann, 2013. *(Chapters-1, 2, 3, 4 and 6)*

Reference Book(s):

[1] Alan Craig, William Sherman and Jeffrey Will, *Developing Virtual Reality Applications, Foundations of Effective Design*, Morgan Kaufmann, 2009

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, student's will be able to…

CO1: understand the components of VR, multiple models of input and output interface in VR
CO2: make use of modeling techniques to prepare object position, object behavior and collision detection in VR
CO3: apply the tools like Java-3D, World Tool-Kit, haptic general open source tool kit for designing VR apps
CO4: understand augmented reality and mixed reality, challenges , visualization techniques and applications

Course Articulation Matrix (CAM): U18AI801B VIRTUAL REALITY

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI801B.1	2	2	2	2	-	-	-	-	-	1	-	2	2	1	2
CO2	U18AI801B.2	2	2	2	2	-	-	-	-	-	1	-	2	2	1	2
CO3	U18AI801B.3	2	2	2	2	-	-	-	-	-	1	-	3	3	1	3
CO4	U18AI801B.4	2	2	2	2	-	-	-	-	-	1	-	3	3	1	3
U18AI801B		**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**2.5**	**2.5**	**1**	**2.5**

U18AI801C ROBOTIC PROCESS AUTOMATION

Class: B.Tech. VIII- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: a thorough understanding of Robotic Process Automation (RPA), its principles, concepts, and practical applications.

LO2: the practical skills and knowledge required to design, develop, and implement Robotic Process Automation (RPA) solutions using RPA tooling.

LO3: advanced automation concepts and techniques to develop RPA solutions that can automate complex business processes effectively and efficiently.

LO4: best practices for designing and developing maintainable and scalable automation solutions that can handle a wide range of user interactions and exceptions.

UNIT – I (9)

Introduction: Scope and techniques of automation, Robotic process automation - What can RPA do?, Benefits of RPA, Components of RPA, RPA platforms, the future of automation.

RPA Basics: History of automation, What is RPA, RPA vs Automation, Processes & flowcharts, Programming constructs in RPA, What processes can be automated, Types of bots, Workloads which can be automated, RPA advanced concepts, Standardization of processes, RPA development methodologies, Difference from SDLC, Robotic control flow architecture, RPA business case, RPA team, Process design document/solution design document, Industries best suited for RPA, Risks & challenges with RPA, RPA and emerging ecosystem.

UNIT - II (9)

RPA Tool Introduction and Basics: The user interface, Variables, Managing variables, Naming best practices, The variables panel, Generic value variables, Text variables, True or False variables, Number variables, Array variables, Date and time variables, Data table variables, Managing arguments, Naming best practices, The arguments panel, Using arguments, About imported namespaces, Importing new namespaces, Control flow introduction, If-else statements , Loops, Advanced control flow, Sequences, Flowcharts, About control flow, Control flow activities, The assign activity, The delay activity, The do-while activity, The if activity, The switch activity, The while activity, The for each activity, The break activity, Data manipulation introduction, Scalar variables, collections and tables, Text manipulation, Gathering and assembling data

UNIT - III (9)

Advanced Automation Concepts & Techniques: Recording introduction, Basic and desktop recording, Web recording, Input/output methods, Screen scraping, Data scraping, Scraping advanced techniques, Selectors, Defining and assessing selectors, Customization, Debugging, Dynamic Selectors, Partial selectors, RPA challenge, Image, Text & advanced citrix automation, Introduction to image & text automation, Image based automation, Keyboard based automation, Information retrieval, Advanced citrix automation challenges, Best practices, Using tab for images, Starting apps, Excel data tables & PDF - data tables in RPA, Excel and data table basics, Data manipulation in excel, Extracting data from PDF, Extracting a single piece of data, Anchors, Using anchors in PDF

UNIT - IV (9)

Handling User Events & Assistant Bots, Exception Handling: What are assistant bots?, Monitoring system event triggers, Hotkey trigger, Mouse trigger, System trigger, Monitoring image and element triggers, An example of monitoring email, Example of monitoring a copying event and blocking it, Launching an assistant bot on a keyboard event.

Text Book:

[1] Alok Mani Tripathi, "*Learning Robotic Process Automation*", Packt Publishing, 2018. *(Chapters 1 to 9)*

Reference Books:

[1] Frank Casale , Rebecca Dilla, Heidi Jaynes , Lauren Livingston, "*Introduction to Robotic Process Automation: a Primer*", Institute of Robotic Process Automation,1st Edition 2015.

[2] Richard Murdoch, *Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant*", Independently Published, 1st Edition 2018.

[3] Srikanth Merianda,"R*obotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automatio*n", Consulting Opportunity Holdings LLC, 1st Edition 2018.

[4] Lim Mei Ying, "*Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots and automate business processes*", Packt Publishing, 1st Edition 2018.

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, student's will be able to…

CO1: apply their knowledge of RPA to evaluate real-world scenarios and make informed decisions about the implementation of RPA in different industries and organizations.

CO2: make use of RPA tools to develop a solution to automate a business process for a real-world scenario.

CO3: apply advanced automation concepts and techniques to develop RPA solutions that can automate a wide range of business processes.

CO4: develop and deploy RPA solutions that can handle user events and assistant bots, effectively automating complex business processes.

Course Articulation Matrix (CAM): U18AI801C ROBOTIC PROCESS AUTOMATION

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI801C.1	2	2	2	2	1	-	-	1	1	1	-	1	2	2	2
CO2	U18AI801C.2	3	3	3	3	2	-	-	1	1	1	-	3	2	2	2
CO3	U18AI801C.3	3	3	3	3	3	-	-	1	1	1	-	3	2	2	2
CO4	U18AI801C.4	3	3	3	3	2	-	-	1	1	1	-	3	2	2	2
U18AI801C		2.75	2.75	2.75	2.75	2	-	-	1	1	1	-	2.5	2	2	2

U18AI802A DATA VISUALIZATION

Class: B.Tech. VIII- Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: fundamentals of data visualization and categories of data
LO2: spatial and geospatial data visualization techniques
LO3: time-oriented, trees, graphs and network-based data visualization techniques
LO4: text & document visualization and research directions

UNIT – I (9)

Data Visualization: Visualization functionalities, importance, The difference between visualization and computer graphics, The visualization process, The scatter plot.
Data Foundations: Types of data, Data preprocessing, Visualization foundations, The eight visual variables, Taxonomies.

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UNIT - II (9)

Visualization Techniques for Spatial Data: One-dimensional data, Two-dimensional data, Three-dimensional data, Visualizing volume data, Dynamic data
Visualization Techniques for Geospatial Data: Visualizing geospatial data, Map projections, Visualization of point data, line data.

UNIT - III (9)

Visualization Techniques for Time-Oriented Data: Introduction, Definitions, characterizing time-oriented data, Relating data and time, Visualizing time-oriented data, Categorization
Visualization Techniques for Trees, Graphs, and Networks: Displaying hierarchical structures, Displaying arbitrary graphs, networks, Node-link graphs, Matrix representations for graphs

UNIT - IV (9)

Text and Document Visualization: Levels of text representations, The Vector space model, Single document and Document collection visualizations.
Image Visualization: Image Data Representation, Image Processing and Visualization, Basic Imaging Algorithms, Shape Representation and Analysis, Conclusion
Visualization Systems: Systems based on data type, Systems based on analysis type, Toolkits, Libraries, Research directions in visualization

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Text Book:

[1] Matthew O. Ward, Georges Grinstein, Daniel Keim , *Interactive Data Visualization: Foundations, Techniques, and Applications*, 2nd ed., Boca Raton: A K Peters/CRC Press, 2015.
[2] Alexandru C. Telea , *Data Visualization: Principles and Practice* , 2nd ed., Boca Raton :CRC Press, 2015.

Reference Books:

[1] Claus Wilke, *Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures*, 1st ed., Sebastopol: O'Reilly Media Inc, 2019.
[2] Kristen Sosulski, *Data Visualization Made Simple Insights into Becoming Visual*, 2nd ed., Oxon: Routledge, 2015..
[3] Ben Fry, *Visualizing Data*, 1st ed., Sebastopol, O'Reilly Media Inc, 2008.

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, student's will be able to…

CO1: understand the basic and advanced techniques of data visualization, types of data and data processing
CO2: apply visualization techniques for representing the spatial and geospatial data
CO3: apply visualization techniques for representing the time-oriented and unstructured data
CO4: analyze text and document visualization techniques

Course Articulation Matrix (CAM): U18AI802A DATA VISUALISATION																
Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI802A.1	2	2	2	2	1	-	1	-	1	2	1	2	1	2	2
CO2	U18AI802A.2	2	2	2	1	1	-	1	-	1	3	1	3	1	2	2
CO3	U18AI802A.3	2	2	2	2	1	-	-	-	1	2	-	2	1	2	2
CO4	U18AI802A.4	2	2	2	2	1	-	-	-	1	2	1	2	1	2	2
U18AI802A		2	2	1.75	1.75	1	-	0.5	-	1	2.25	0.75	2.25	1	2	2

U18AI802B FOG AND EDGE COMPUTING

Class: B.Tech. VIII- Semester **Branch:** Computer Science & Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: fundamental concepts of Fog computing
LO2: fundamental concepts of Edge computing
LO3: network slicing in Fog and Edge computing
LO4: optimize the performance of Fog and Edge based applications

UNIT – I (9)

Introduction: Relevant technologies, Fog and Edge computing completing the Cloud, Advantages of FEC-SCALE, How FEC achieves these advantages: SCANC, Hierarchy of Fog and Edge computing outer-edge, Business models, Opportunities and challenges

Introduction to Fog Computing: Fog computing definition, Characteristics, Application scenarios, Issues and challenges, Cloud vs Fog computing

Fog Computing architecture: Communication and network model, Programming models.

Fog Computing Communication Technologies: Introduction, IEEE 802.11, 4G, 5G standards, WPAN, Short-range technologies, LPWAN and other medium, Long-range technologies.

Fog Computing Case Study: Intelligent Traffic Lights Management (ITLM) system

UNIT - II (9)

Introduction to Edge Computing: Edge Computing purpose and definition, Need of Edge computing, Key techniques that enable Edge computing, Characteristics, Application scenarios, Edge vs Fog Computing, Edge computing architectures

Edge Computing Systems: Apache Edgent, OpenStack, EdgeX Foundry, Data processing on the edge, Edge computing applications

Challenges: The Networking challenge, The management challenge, Miscellaneous challenges

Edge Computing Case study: A Wearable ECG Sensor, Smart home

UNIT - III (9)

Management and Orchestration of Network Slices in 5G, Fog, Edge and Clouds: Background, 5G, Cloud computing, Mobile Edge Computing (MEC), Edge and Fog computing

Network Slicing in 5G: Infrastructure layer, Network function and virtualization layer, Service and application layer, Slicing management and orchestration (MANO).

Network Slicing in Software-Defined Clouds: Network-aware virtual machines management, Network-aware virtual machine migration planning, Virtual network functions management. Network slicing management in Edge and Fog.

UNIT - IV (9)

Optimization Problems in Fog and Edge Computing: Introduction, The case for optimization in Fog computing, Formal modeling framework for Fog computing. **Metric:** Performance, Resource usage, Energy consumption, Financial costs, Further quality attributes, Optimization opportunities along the Fog architecture, Optimization opportunities along the service life cycle

Middleware for Fog and Edge Computing Design Issues: Need for Fog and Edge computing Middleware, Design goals, State-of-the-art middleware infrastructures, System model, Proposed architecture, Case study example – data analytics, mobility support, scheduling and security

Text Book:

[1] Rajkumar Buyya and Satish Narayana Srirama - *Fog and Edge Computing: Principles and Paradigms* 1st Ed. ,*USA,* Wiley Series on Parallel and Distributed Computing, 2019. *(Chapters 1 to 6)*

Reference Books:

[1] Assad Abbas, Samee U. Khan, Albert Y. Zomaya - *Fog Computing: Theory and Practice,* 1st Ed. USA*: W*iley Series on Parallel and Distributed Computing, 2020.

[2] David Jensen - *Beginning Azure IoT Edge Computing: Extending the Cloud to the Intelligent Edge,* 1st Ed. USA: MICROSOFT AZURE, *2021.*

[3] Zaigham Mahmood - *Fog Computing Concepts, Frameworks and Technologies*, 1st Ed. , UK: Springer publication, 2018.

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, student's will be able to…

CO1: design applications based on Fog computing technologies.

CO2: design applications based on Edge computing technologies.

CO3: apply network slicing in 5G, software defined networks, Fog and Edge applications.

CO4: analyze optimization problems and apply metrics with middleware technologies in Fog and Edge applications.

Course Articulation Matrix (CAM): U18AI802B FOG AND EDGE COMPUTING																
Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI802B.1	2	2	2	2	1	-	-	1	1	1	-	1	1	1	1
CO2	U18AI802B.2	2	2	2	2	1	-	-	1	1	1	-	1	1	1	1
CO3	U18AI802B.3	2	2	2	2	1	-	-	1	1	1	-	2	1	1	1
CO4	U18AI802B.4	2	2	2	2	1	-	-	1	1	1	-	2	1	1	1
U18IN802B		2	2	2	2	1	-	-	1	1	1	-	1.5	1	1	1

U18AI802C BLOCKCHAIN TECHNOLOGIES

Class: B. Tech. VIII-Semester **Branch:** Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):
This course will develop students' knowledge on/in…
LO1: basics of Blockchain, types of Blockchains & consensus algorithms
LO2: cryptographic primitives, Bitcoin Blockchain & alternative coins
LO3: Ethereum ecosystem & development tools
LO4: architecture of Hyper ledger Fabric, Corda architecture & Alternative Blockchain

UNIT – I (9)

Distributed systems:
The History of Blockchain and Bitcoin: Electronic cash, Blockchain, Generic elements of a Blockchain, Benefits and limitations of Blockchain, Tiers of blockchain technology, Features of a Blockchain
Types of blockchain: Distributed ledgers, Distributed Ledger Technology, Public Blockchains Private Blockchains, Shared ledger, fully private and proprietary Blockchains, Tokenized blockchains, Token less Blockchains
Consensus: Consensus mechanism, Types of consensus mechanisms, Consensus in Blockchain
CAP theorem and Blockchain

UNIT – II (9)

Public Key Cryptography: Asymmetric cryptography
Public and private keys: RSA, Discrete logarithm problem in ECC, Hash functions, RSA digital signature algorithm, Elliptic curve digital signature algorithm
Introducing Bitcoin: Bitcoin, Digital keys and addresses, Transactions, Blockchain, Mining
Bitcoin Network and Payments: The Bitcoin network, Wallets, Bitcoin payments, Innovation in Bitcoin
Bitcoin Clients and APIs: Bitcoin installation
Alternative Coins: Theoretical Foundations, Bitcoin limitations, Litecoin, Zcash

`UNIT – III (9)

Smart Contracts: History, Definition, Ricardian contracts
Ethereum: Introduction, Ethereum - bird's eye view, The Ethereum network, Components of the Ethereum ecosystem
Further Ethereum: Programming languages
Ethereum Development Environment: Test networks, setting up a private net, starting up the private network
Development Tools and Frameworks: Languages, Solidity language
Introducing Web3: Web3

UNIT – IV (9)

Hyper ledger: Projects under Hyper ledger, Hyper ledger as a protocol, The reference architecture, Fabric
Corda: Architecture, Components, The development environment – Corda
Alternative Blockchains: Ripple, Quorum, Multi chain, Rootstock, BigchainDB, Storj, Tezos
Current Landscape and What Next: Start-ups, Strong research interest, Real-world implementations, Education of blockchain technology Employment, Cryptoeconomics, Research in cryptography, Interoperability efforts, Blockchain as a Service
Other challenges: Regulation, Dark side
Blockchain research: Smart contracts, Centralization issues, Limitations in cryptographic functions, Consensus algorithms, Scalability, Code obfuscation

Text Book:

[1] Imran Basir, Mastering Bockchain, 2nd ed., Packt Publishing Ltd., Birmingham –Mumbai, 2018.(chapters1,4,7to 16,19)

Reference Books:

[1] Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Crypto currency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).
[2] Josh Thompson, Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming, Create Space Independent Publishing Platform, 2017.
[3] Andreas Antonopoulos, Mastering Ethereum: Building Smart Contracts and Dapps, O'REILLY 2018
[4] Draft version of S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, Blockchain Technology: Crypto currency and Applications, Oxford University Press, 2019.

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: distinguish the type of Blockchain and consensus algorithm
CO2: install Bitcoin client and describe the functionality of various alternative coins
CO3: develop a smart contract using Ethereum development tools
CO4: explain Hyperledger Fabric and Corda architecture

Course Articulation Matrix (CAM): U18AI802C BLOCKCHAIN TECHNOLOGIES

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	U18AI802 C.1	1	2	2	2	1	-	-	-	-	1	-	2	1	1	3
CO2	U18AI802C.2	3	3	2	2	1	-	-	-	-	1	-	2	1	2	3
CO3	U18AI802 C.3	3	2	3	2	2	-	-	-	-	1	-	3	3	3	3
CO4	U18AI802 C.4	1	2	3	2	1	-	-	-	-	1	-	3	1	2	3
U18AI802C		**2**	**2.25**	**2.5**	**2**	**1.25**	**-**	**-**	**-**	**-**	**1**	**-**	**2.5**	**1.5**	**2**	**3**

U18OE803A OPERATIONS RESEARCH

Class: B.Tech. VIII – Semester

Branch(s): ME, CSE, CSE (AI &ML), CSE (IoT), IT, CE, EEE, ECE, EIE

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on

LO1: concepts to solve linear programming problems which arise in real life using various methods and their advantages

LO2: applications of linear programming namely transportation and assignment problems which arise in different engineering fields.

LO3: non-linearity in optimization problems, direct search techniques and iterative methods.

LO4: various queuing systems and their practical relevance.

UNIT – I (9)

Linear Programming Problem (LPP): Mathematical models and basic concepts of linear programming problem; Solution of linear programming problem - Graphical method, Simplex method, Artificial variable techniques, Duality in linear programming, dual simplex method

UNIT – II (9)

Special types of LPP: Mathematical model of transportation problem, Methods of finding initial basic feasible solution, optimal solution of transportation problem, Degeneracy in transportation problem; Exceptional cases in transportation problem- Unbalanced transportation problem, Maximization transportation problem; Assignment problem- Mathematical formulation of the problem, Hungarian method to solve an assignment problem, Special cases in assignment problem- Maximization assignment problem

UNIT – III (9)

Non-linear Programming Problem (NLPP): Classical method of optimization using Hessian matrix; Iterative methods - Random search methods-Random jump method, Random walk method, Steepest decent method and Conjugate gradient method; Direct methods - Lagrange's method, Kuhn-Tucker conditions

UNIT – IV (9)

Queueing Theory: Queueing system- Elements and operating characteristics of a queuing system; Probability distributions in queueing systems- Distribution of arrivals (Pure Birth Process); Page 47 of 60

Classification of queueing models; Poisson queueing systems- Study of various characteristics of single server queuing model having infinite population $\{(M/M/1):(\infty/FIFO)\}$ and single server queuing model having finite population $\{(M/M/1):(N/FIFO)\}$, Generalized model (Birth-Death process)

Textbooks:

[1] Kanti swarup et.al, *Operations Research*, 16th ed., New Delhi: S. Chand & Sons, 2013. *(Unit-I, Unit-II, Unit-IV)*

[2] Singiresu S. Rao, *Engineering Optimization Theory and Practice*, 4th ed., Hoboken, New Jersey: John Wiley & Sons, Inc, 2009 (*Unit-III)*

Reference Books:

[1] Hamdy. A. Taha, *Operations Research*, 7th ed., New Delhi: Prentice Hall of India Ltd, 2002.

[2] J.C. Pant, *Introduction to Optimization*, 7th ed., New Delhi: *Jain* Brothers, 2012.

Course Research Paper: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):
On completion of this course, the students will be able to…
CO1: model engineering real time problems and solve them using various LPP techniques
CO2: obtain the optimal solution of transportation, assignment problems and their real time applications
CO3: optimize the engineering problems using NLPP techniques
CO4 : apply various queuing models and their practical relevance

Course Articulation Matrix (CAM): U18OE803A - OPERATIONS RESEARCH																
Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18OE803A.1	2	2	-	-	-	-	-	-	-	1	-	1	-	-	-
CO2	U18OE803A.2	2	2	-	-	-	-	-	-	-	1	-	1	-	-	-
CO3	U18OE803A.3	2	2	-	-	-	-	-	-	-	1	-	1	-	-	-
CO4	U18OE803A.4	2	2	-	-	-	-	-	-	-	1	-	1	-	-	-
U18OE803A		2	2	-	-	-	-	-	-	-	1	-	1	-	-	-

U18OE803B MANAGEMENT INFORMATION SYSTEMS

Class: B.Tech. -VIII Semester

Branch: CSE, CSE (AI&ML), CSE (IoT) & IT

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on…

LO1: basic concepts and challenges of management information systems

LO2: e-business and decision support systems techniques

LO3: development process and design of management information systems

LO4: different applications of management information systems

UNIT – I (9)

Management Information Systems: Systems: An Overview : Introduction, Need for management information systems, A concept, MIS - A definition, Management information system and Information technology, Nature and scope of MIS, MIS characteristics, Structure of MIS, Types of MIS, Role of MIS in global business, Challenges of managing information systems, IT Infrastructure and emerging technology

UNIT - II (9)

Business Applications of Information Systems:

E-Commerce, E-Business and E-Governance: Introduction, E-commerce, E-commerce sales life cycle, E-commerce infrastructure, E-commerce applications, E-commerce payment systems, Management challenges and opportunities, E-business, E-governance

Decision Support Systems: Introduction, Decision-Making: A concept, Simon's model of decision-making, Types of decisions, Methods for decision-making, Decision support techniques, Decision-making and role of MIS, Decision support systems, Business intelligence, Knowledge management systems

UNIT - III (9)

Development process of MIS : Development of long range plans of the MIS, Ascertaining the class of information, Determining the information requirement, Development and implementation of the MIS, Management of information quality in the MIS, Organisation for development of MIS, MIS: Development process mode

Strategic Design of MIS : Strategic management of the business, Why strategic design of MIS, Balance score card, Score card and Dash board, Strategic design of MIS, Development process steps for strategic design (SD) of MIS, Illustrating SD of MIS for big bazaar, Strategic management of business and SD of MIS, Business strategy determination, Business strategy implementation

UNIT - IV (9)

Management of Global Enterprise : Enterprise management system, Enterprise resource planning (ERP) System, ERP model and modules, Benefits of the ERP, ERP product evaluation, ERP implementation, Supply chain management (SCM), Information management in SCM, Customer relationship management (CRM), Management of global enterprise, EMS and MIS

Applications in Manufacturing Sector: Introduction, Personnel management (PM), Financial management (FM), Production management (PM), Raw materials management (RMM), Marketing management, Corporate overview.

Text Books:

[1] D.P.Goyal, Vikas, *Management Information Systems–Managerial Perspective*, 4th ed., Addison-Wesley, 2014. *(Unit 1)*

[2] Waman S. Jawadekar, *Management Information Systems Text and Cases: a Global Digital Enterprise Perspective,* 5th ed., McGraw Hill, 2014 *(Unit 2,3,4)*

Reference Books:

[1] Kenneth C. Laudon & Jane P. Laudon, *Management Information Systems,12th ed.,* New Delhi: Prentice Hall, 2012.

[2] S. Sadagopan, *Management Information Systems,2nd ed.,* New Delhi: PHI Learning, 2014.

Course Research Paper: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students' will be able to…

CO1: examine the structure and importance of management information systems

CO2: analyze management information systems for decision making

CO3: apply the methodology to design and develop a management information system

CO4: asses the applications of management information systems in various manufacturing sectors

Course Articulation Matrix (CAM): U18OE803B MANAGEMENT INFORMATION SYSTEMS																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18OE803B.1	2	2	1	1	1	-	-	-	-	1	-	1	2	1	2
CO2	U18OE803B.2	2	2	2	1	1	-	-	-	-	1	-	1	2	1	2
CO3	U18OE803B.3	2	2	2	3	1	-	-	-	-	1	-	2	2	1	2
CO4	U18OE803B.4	2	2	3	3	1	-	-	-	-	1	-	2	3	1	3
U18OE803B		**2**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**1.5**	**2.25**	**1**	**2.25**

U18OE803C ENTREPRENEURSHIP DEVELOPMENT

Class: B.Tech. -VIII Semester

Branch: ME, CSE ,IT, CE,EEE, ECE, EIE, CSE(AI&ML), CSE (IoT)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on…

LO1: fundamental characteristics of entrepreneur and his role in development of the nation
LO2: optimize the creativity and business plan
LO3: analyze the functions of various managements/managers in industry
LO4: asses the legal issues in entrepreneurship and intellectual property rights

UNIT–I (9)

Entrepreneurship: Definition, Role of entrepreneurship in economic development, Characteristics and types of an entrepreneur, Forms of business organizations – agencies dealing with entrepreneurship and small scale Industries, Case studies of successful entrepreneurs- identification of business opportunities in various branches of engineering

UNIT-II (9)

Creativity and Business Idea: Sources of new ideas, Methods of generating ideas and Creative problem solving, Concepts of innovation and incubation

Business Plan: Definition, scope and value of business plan, Market survey and demand survey

Feasibility studies: Technical feasibility, Financial viability and Social acceptability, Preparation of preliminary and bankable project reports

UNIT-III (9)

Project Planning: Product planning and development process, Sequential steps in executing the project

Plant layout: Principles, Types and factors influencing layouts,

Material Management: Purchase procedures, Issues of Materials -LIFO, FIFO, HIFO and Base stock

Fundamentals of Production Management: Production Planning and Control (PPC)-Concepts and functions, Long & short run problems

Marketing Management: Definition, Functions and market segmentation

UNIT-IV(9)

Financial Management: Introduction, Sources of finance-internal and external

Human Resource Management: Introduction, importance, selection, recruitment, training, placement, development

Legal Issues in Entrepreneurship: Mechanisms for resolving conflicts, Industrial laws-Indian Factories Act, Workmen Compensation Act, Intellectual Property Rights (IPR) – patents, Trademarks and copyrights

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Text Book: -

[1] Robert D. Hisrich, Michael P.Peters,"Entrepreneurship",Tata Mc Graw-Hill,9th ed., 2014 (Chapters 1, 2, 4, 5, 6, 7, 8, 11 and 13).

Reference Books:

[1] David H. Holt, "*Entrepreneurship New venture creation*" 1st ed., New Delhi: Prentice Hall of India, 2004.

[2] Handbook for "*New Entrepreneurs*", 1st ed., New Delhi: Entrepreneurship Development Institute of India, 1999.

[3] T.R. Banga, "*Project Planning and Entrepreneurship Development*",1st ed.,New Delhi: *CBS Publishers*, 1984.

[4] S. Chand & Co., "*A Practical Guide to Industrial Entrepreneurs*", New Delhi: S Chand, 2018.

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, student's will be able to…

CO1: fundamental characteristics of entrepreneur and his role in economic development
CO2: apply creative problem solving methods to real time situations
CO3: analyze the functions of production and marketing managements
CO4: assess the legal issues in entrepreneurship and explain intellectual property rights

Course Articulation Matrix (CAM):U18OE803C ENTREPRENEURSHIP DEVELOPMENT																
Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18OE803C.1	2	-	-	-	-	1	-	1	1	1	1	1	1	-	-
CO2	U18OE803C.2	2	-	-	-	-	1	-	1	1	1	1	1	1	-	-
CO3	U18OE803C.3	2	-	-	-	-	1	-	1	1	1	1	1	1	-	-
CO4	U18OE803C.4	2	-	-	-	-	1	-	1	1	1	1	1	1	-	-
	U18OE803C	2	-	-	-	-	1	-	1	1	1	1	1	1	-	-

U18OE803D FOREX & FOREIGN TRADE

Class: B.Tech VIII Semester

Branch: ME, CSE, IT, CE, EEE, ECE, EIE, CSE (AI&ML), CSE(IoT)

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on…..

LO1: business, business system, objectives and types of companies
LO2: fundamentals of foreign trade and EXIM procedure
LO3: foreign exchange rate and methods of payments
LO4: foreign exchange control

UNIT–I (9)

Business: Nature and scope, Classification of business activities, Functions of commerce and trade

Business System: Characteristics and components of business system, objectives of business, classification of business objectives, Types of business

UNIT-II(9)

Foreign Trade: Introduction of international trade, Reasons for external trade, Special problems of foreign trade, EXIM-objectives, roles of EXIM in foreign trade, Stages in import procedure, Stages in export procedure-bill of lading, Mate's receipt, Certificate of origin.

Corporations Assisting Foreign Trade: State trading corporation of India, Export credit and guarantee corporation, Minerals and metals trading corporation of India

UNIT–III (9)

Foreign Exchange Rate: Meaning and importance of Foreign exchange rate, Methods of foreign payments; Exchange rates-Spot, Forward and Cross Rates, Demand and supply of foreign exchange rate, Equilibrium rate of foreign exchange, Theories of determining foreign exchange rate, International Parity condition - Balance of payments

Foreign Exchange Markets: Functions of exchange markets, Components and Players in Exchange Markets, FEMA-objectives and its role in Foreign Trade

UNIT–IV (9)

Foreign Exchange Control: Objectives, Characteristics, Advantages and disadvantages, Methods - intervention, Exchange restriction, Multiple exchange rates, Exchange clearing agreements, Method of operation, Exchange clearing agreements in practice, Payments agreements, Transfer moratoria, Indirect methods

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Text Books:

[1] C.B. Guptha, *Business Organization & Management,* 15th ed., New Delhi: Sultan Chand & Sons,2015.

[2] M.L. Seth, *Macro Economics,* 22nd ed., New Delhi: Lakshmi Narayan Agarwal Publishers, 2014.

[3] M.C. Vaish, Ratan Prakashan Mandir, *Monetary Theory,* 16th ed., New Delhi: Vikas Publications, 2016.

Reference Books:

[1] Y.K.Bhushan, Business Organization and Modern Management, 19th ed., New Delhi: Sultan & Sons Publishers, 2014.
[2] S.A. Sherlekhar, Business Organization and Management, 1st ed., New Delhi: Himalaya Publishing House, 2000.
[3] K.P.M. Sundaram, Money Banking, Trade & Finance, 1st ed., New Delhi: Sultan & Sons Publishers, 2015.
[4] P.N.Chopra, Macro Economics, 1st ed., New Delhi: Kalyani Publishers, 2014.

Course Research Paper: Research paper (indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patent: Patent relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course project titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

CO1: evaluate the objectives and types of industries and companies.
CO2: assess the procedure in imports and exports
CO3: analyse the foreign exchange rate and methods of foreign payments
CO4: adapt the methods of exchange contro

Course Articulation Matrix (CAM): U18OE803D FOREX AND FOREIGN TRADE																
Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18OE803D.1	-	-	-	-	-	-	-	-	-	2	2	1	1	-	-
CO2	U18OE803D.2	-	-	-	-	-	-	-	-	-	2	2	1	1	-	-
CO3	U18OE803D.3	-	-	-	-	-	-	-	-	-	2	2	1	1	-	-
CO4	U18OE803D.4	-	-	-	-	-	-	-	--	-	2	2	1	1	-	-
	U18OE803D		-	-	-	-	-	-	-	-	2	2	1	1	-	-

U18AI804 : MAJOR PROJECT WORK PHASE-II

Class: B.Tech. VII - Semester
Branch: Computer Science and Engineering (AI & ML)

Teaching Scheme:

L	T	P	C
-	-	6	3

Examination Scheme:

Continuous Internal Evaluation	60 marks
End Semester Examination	40 marks

Course Learning Objectives (LOs):

The major project work will develop students' knowledge on/in…

LO1: real-world complex engineering problems, literature review, problem formulation; and experimental and data analysis techniques

LO2: design/development of solutions to real-world engineering problems; conduct of investigations of complex problems; modern tool usage to design, build and test a prototype; impact of solution in society, environment and sustainability contexts

LO3: ethics, team work and project management skills such as budgeting, scheduling

LO4: oral, written and multimedia communication skills; self-directed independent learning and life-long learning

Major project work shall be continued in 8th semester as major project *phase-II*: All the major project teams shall take the *phase -I* work forward and complete the remaining work as *Phase-II* in the 8th semester.

1. Final Year Major Project work represents the culmination of study towards the B. Tech degree. **Major project offers an opportunity to integrate the knowledge acquired from various courses and apply it to solve real-world complex engineering problems**. The **student learning assessment process** (SLAP) shall include good number of presentations, demonstration of work undertaken, submission of a project report, writing project paper in scientific journal style & format, preparing project poster and creatingvideo pitch on the complete project

2. Activities of major project SLAP shall be planned in such a way to ensure that the students acquire theessential knowledge, skills and qualities (KSQ) of a professional engineer.

3. **Team work:** Major project work is a team work

(i) The students of a project team shall work together to achieve a common objective.

(ii) Every student of a project team is expected to function effectively as an individual, and also with others as a team member in an ecosystem of team having knowledge diversity, gender diversity, social and cultural diversity among its members.

4. Every student is expected to put approximately **168 hours of work** into the major project *phase-II* course over the 12 weeks of 8th semester.

5. **Major project work *Phase-II*: 8th semester**

(xii) The convener DPEC shall release complete schedule of *phase-II* CIE during last week of 7th semester (*well in advance before start of 8th semester*), immediately after completion of progress presentation-I, so that student teams would complete the scheduled works during inter-semester break and get ready with informative, confident and comfortable presentation for progress presentation-II.

(xiii) **The project supervisors**: The project supervisors are expected to guide the students to systematically continue the *phase-I* work, useful work during inter-semester break, meeting the deadlines as proposed in project timeline.

The project supervisors shall ensure students focus on the project objectives and expected **deliverables**

(xiv) The project supervisors shall ensure students have sufficient resources for successful project completion.

(xv) **The project supervisors shall continue guiding students on**

(n) *Knowledge, skills and qualities (KSQ) of a professional engineer to be acquired* to propose solutions and design the systems to the identified real-world problems.

(o) *Problem analysis* - to identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

(p) *Applying engineering knowledge* - to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

(q) *Design/development of solutions* - to design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental Considerations

(r) *Conduct investigations of complex problems* - to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

(s) *Modern tool usage* – to create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

(t) *Engineering and society* – to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

(u) *Environment and sustainability* – to understand the impact of the professional engineering solutions in societal and environmental contexts, demonstrate the knowledge of, and need for sustainable development

(v) *Ethics* – to apply ethical principles and commit to professional ethics, responsibilities, and norms of the engineering practice

(w) *Individual and team work* – to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

(x) *Communication* – to communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

(y) *Project management and finance* – to demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

(z) *Life-long learning* – to recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

(xi) **The project supervisors are also expected to continuously emphasize and guide the studentson**

(o) **Following project timeline**: completing the tasks as planned in project timeline

(p) Meeting Cadence:

i. **Regular meetings with supervisor:** Short and frequent meetings increase a team's work momentum. Regular meetings with supervisor to review the status of project are very essential. All students of the team shall participate in discussions and take notes.

ii. **Meeting Frequency: Semi-weekly cadence,** i.e., the meeting frequency shall be **twicea week.** Due weightage will be given to meeting cadence and considered for evaluation during presentations, i.e., number of planned meetings and number attended by students

(q) **Project Log Book:** The activity journaling in project log book is very important for asuccessful project.

vi. Project log book is a written record showing the daily project activity on project goals from the very first thing like starting the project (an introduction statement what the

project is all about), to the completion of the work (including the final results, and whether project met the core objectives / outcomes, etc.).

vii. In project log book, the activities like regular meetings with project supervisor, and work carried out on daily/weekly basis are to be recorded. This ensures that the student progress is being monitored well.

viii. The project supervisor shall regularly check the log book of every student of project team and endorse each and every activity by affixing his signature with date. With this, the number of planned meetings and number attended by the students will be also monitored.

ix. Log books are to be shown during all presentations and will be graded along with the project.

x. At the conclusion of the project work *phase-II*, the supervisor shall specifically comment, in the project log book, on whether the project team met each of the project work outcomes and to give evidence which describes the quality of work. For project teams, this also serves as self-assessment.

(r) **Writing down whatever is done and making notes of whatever is read**. Writing down the procedures / models followed, designs made, experiments conducted, simulations carried out, intermediate results obtained, ***difficulties faced and how they were fixed*** are very important. This kind of documenting the whole process as we go with project implementation is a very effective way and will help preparing a well documented report having original content. Note down and include information about all the resources that you used, magazines, Journals, patents, books, and so on. This information will be needed for the bibliography in your project report. On the other hand, documenting a report ***on the spur of the moment*** would end up copying things from other sources resulting in a plagiarized document.

(s) The relevant knowledge, skills and qualities (**KSQ**) an engineering graduate should possess, which can be specially acquired by participating in major project work

(t) **Good and sufficient literature review**: Literature review is a description and analysis of information related to the topic of project work. Reading good number of review articles, research articles published in recent issues of peer reviewed journals, technical magazines, patents, reference books on the topics of potential interest, will help one understand what has already been discovered and what questions remain to identify gaps in the literature.

(u) Completing the proposed work by the end of *phase-II*

(v) Right conduct of research to promote academic integrity, honesty and time management

(w) Preparing a well-documented overall project report in proper format, covering thecomplete work carried out during both the phases (*phase-I and phase-II*).

(x) Consequences of plagiarism, and use of anti-plagiarism software to detect plagiarismin the report

(y) Submission of major project work report within acceptable plagiarism levels, as per the Anti-plagiarism policy-2020 of our institute

(z) **Video pitch on complete project work**: Capturing short videos, photos, screenshots on experiments conducted, simulations carried out, prototype / working model / process / software package / system developed during course of project execution, photos showing interaction with supervisor for creating a short video pitch on the complete work done during both phases (phase-I and phase-II).

(aa) **Project Paper:** Writing a technical paper at the end of *phase-II* based on the solution(s) proposed, results obtained and prototype / working model /process / software package / system developed, for submission to a reputed non-predatory conference/non-paid peerreviewed journal.

(bb) Project poster: At the end of phase-II, the project teams shall have to present their project in the form of posters, at the time of demonstration of complete prototype / working model / software package / system developed.

(xviii) Phase – II evaluation: There shall be only Continuous Internal Evaluation (CIE) for major project work *phase-I* with following components

(a) Progress Presentation -II *(during third / fourth week of 8th semester):* The progress presentation-II shall include the identified problem, objective(s), literature review, expected outcome(s), results of work done as per project plan timeline.

i. **Following project timeline**: The project timeline shall be meticulously followed and the tasks shall be completed as planned in project timeline.

ii. 80-85% of work is expected to be completed

iii. Project teams shall compulsorily show the following as part of their progress presentation-II

1. *The slides on project timeline and*
2. *A table showing targeted tasks as per timeline and status – whether tasks accomplished?*

iv. **Project log book**: Every student of the Project team shall compulsorily show the activity journaling in the log book (with due signatures of project supervisor) during presentations

(b) Final Presentation ***(during penultimate week of 8th semester):*** **Project supervisor shall ensure thatthe project team has accomplished 100% of work proposed**. The project team shall

i. **Follow project timeline**: The project timeline shall be meticulously followed and thetasks shall be completed as planned in project timeline.

ii. compulsorily show the following as part of their final presentation

1. *The slides on project timeline and*
2. *A table showing targeted tasks as per timeline and whether all the identified tasksaccomplished?*

iii. **show project log book**: Every student of the Project team shall compulsorily show the complete activity journaling in the log book (*with due signatures of project supervisor*)

iv. present complete results & analysis

v. **demonstrate the completed project**: working model / process / software package / system developed

vi. demonstrate the completed project with the **project poster presentation**

(xix) Evaluation for Major project phase-II:

There shall be continuous internal evaluation (CIE) and end semester examination (ESE). The evaluationfor *phase-II* shall be as given below:

Assessment	Weightage
A. CIE **(i) Supervisor Assessment (10%)** **(ii) DPEC Assessment (50%)** *(a) Progress presentation-II (10%)* *(b) Final presentation (10%)* *(c) Working model / process / software package / system developed (20%)* *(d) Project video pitch (5%)* *(e) Project paper (5%)*	**60%**
B. ESE *(i) Well-documented project report (15%)* *(DPEC shall evaluate the project reports, as per the rubrics, well before the ESE. At the time of ESE, evaluated project report marks shall be posted in the award list, along with the ESE oral presentation marks. Students shall appear for Viva-Voce with project report)* *(ii) Oral presentation with PPTs and viva-voce (15%)* *(iii) Project poster (5%)* *(DPEC shall evaluate the project poster, as per the rubrics, well before the ESE. At the time of ESE, evaluated project poster marks shall be posted in the award list. Students shall appear for Viva-Voce with project poster)*	**40%**
Total Weightage	**100%**

(a) **Working Model:** Every project team shall be required to develop a working model/ process/software

package/system, on the chosen work. The completed working model/ process/software package/system shall be demonstrated during final presentation at the end of *phase-II*.

(b) **Video pitch**: Every project team shall be required to create a pitch video, which is a video presentation on their major project work *phase-I & phase-II*. The project team shall present the produced video pitch during Final presentation. The produced video pitch should

(i) be 3 to 5-minute-long video (no longer than 5 minutes)

(ii) be concise and to the point, on the problem, proposed solution and its salient features.

(iii) show project timeline and sample page of log book

(iv) highlight the various stages during project implementation with the help of short videos / photos / screenshots on experiments conducted, simulations carried out, prototype / working model / process / software package / system developed as part of proposed solution and also photos showing team interactions with supervisor and the team working in the lab on project.

(v) discuss the impact of proposed solution in *ethical, environmental, societal and sustainable development contexts*.

(vi) emphasize key points about *business idea, potential market for the proposed solution*

(f) **Project poster**: At the end, the project teams shall present their project in the form of posters (A2 size). The teams shall have to present their work during the poster presentation session scheduled at the end of the 8th semester, at the time of demonstration of complete porotype / working model / software package / system developed.

(g) **Well-documented plagiarism-cleared project report**: Every project team shall be required to submit a well-documented project report on the work carried out, as per the format specified by the DPEC.The report should clear plagiarism check as per the anti-plagiarism policy-2020 of the institute. The following shall compulsorily be included in the Results-Chapter of the project report

(i) Photos / screen shots taken at various stages during the development of working model/ process/software package/system as part of Results-Chapter

(ii) Snapshot of final working model/ process/software package/system developed

(iii) Pictures of the team working in the lab, the team discussing with the project supervisor, working on creative project, or an event they are attending for work.

(iv) All these photos / screen shots shall be properly referred in the project report by assigning figure numbers

(*h*) **Tangible outcomes of project work in Conclusions - Chapter:** These are the lessons learnt from doinga project work. The students have to describe in their own words what they learnt from the project work experience. They have to describe what specific KSQs are acquired by them, with reference to the expected COs, after successful completion of major project work. Finally, a table depicting systematic mapping of what they have learnt and the expected major project work COs, is to be shown in the conclusions chapter.

(i) **Student feedback on major project in Conclusions - Chapter:** To gather information on whether project work was useful and gave practical experience on chosen field of interest, and other learning, a well-defined feedback questionnaire (*made available by the dept*) with closed and open questions shall be kept in the conclusions chapter of the project report.

(xx) It is mandatory for

(a) every student of the team to appear for ESE oral presentation and viva-voce, to qualify for course evaluation

(b) every project team to write a technical paper based on the solution(s) proposed, results obtained and prototype / working model / process / software package / system developed,
for submission to a reputed non-predatory conference/non-paid peer reviewed journal

(c) every project team shall be required to create a pitch video, which is a video presentation on their major project work *phase-I & phase-II*

(d) every project team shall present their project in the form of a poster, during the demonstration of complete porotype / working model / software package / system developed

(xi) The student has to register for the Major project work *phase-II* as supplementary examination in the following cases:

(a) he/she is absent for oral presentation and viva-voce as part of ESE presentation
(b) he/she fails to fulfill the requirements of Major project work *phase-II* evaluation as per specified guidelines

(xii) Supplementary examination for Major project work *phase-II*

(a) The CoE shall send the list of students, registered for supplementary examination, to the HoDs concerned

(b) The DPEC, duly constituted by the HoD, shall conduct Major project *phase-II* supplementary exam and send the award list to the CoE within the stipulated time

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Course Learning Outcomes (COs):

Upon completion of the major project work, students will be able to…

CO1: review research literature, formulate problem, apply knowledge of mathematics, sciences, engineering fundamentals, experimental and data analysis techniques; synthesize technical knowledge and innovative approaches to generate suitable solutions for real-world complex engineering problems **(Technical skills)**

CO2: design a system or product based on product/customer specifications; develop, analyze, and critically evaluate the design alternatives in order to justify the solutions to a real-world problem guided by ethical, environmental, societal and sustainable development considerations; use modern engineering and IT tools to design, build and test a prototype within specified project timeline and budget **(Problem solving and critical thinking skills)**

CO3: apply project management and organizational skills; demonstrate integrity, leadership, creativity, professional and ethical responsibilities as an individual and as a member or leader to produce time- sensitive deliverables in a multi-disciplinary team **(Ethics and teamwork)**

CO4: collate the results, compare performance of prototype to design specifications and present clearly and effectively the proposed solution, conclusions and/or recommendations in written (report, poster, technical paper), oral (presentations) and multimedia formats (video pitch) and engage in self-directed independent learning and life-long learning demonstrating the KSQ of a professional engineer **(Communication skills and life-long learning)**

Course Articulation Matrix (CAM): U18AI804 MAJOR PROJECT WORK PHASE-II

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18AI804.1	2	2	2	2	-	-	-	3	-	2	-	3	3	3	3
CO2	U18AI804.2	1	2	2	-	2	2	2	3	-	-	-	3	3	3	3
CO3	U18AI804.3	-	-	-	-	-	-	-	3	2	-	2	3	3	3	3
CO4	U18AI804.4	-	-	2	2	-	-	-	3	-	2	-	3	3	3	3
	U18AI804	**1.5**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**2**	**2**	**2**	**3**	**3**	**3**	**3**