ISO 9001:2015 AICTE-CII: GOLD Category Institute NAAC - 'A' Grade Institute (CGPA : 3.19)

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
(An Autonomous Institute under Kakatiya University, Warangal)
Estd-1980 KITSW (Approved by AICTE, New Delhi; Recognised by UGC under 2(f) & 12(B); Sponsored by EKASILA EDUCATION SOCIETY)

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

• B.Tech. •

COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

Rules & Regulations for undergraduate Programme B.Tech. 4-Year Degree Programme (URR-18R23)

(Applicable from the Academic Year 2023-24)

SYLLABI (I to VI SEMESTERS)

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

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 & ENGINEERING (DATA SCIENCE)

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 (DATA SCIENCE)	
PROGRAM EDUCATIONAL OBJECTIVES (PEOs)	***Within first few years after graduation, the COMPUTER SCIENCE AND ENGINEERING (Data Science)*** *graduates will be able to …*
PEO1: Technical Expertise	*Demonstrate adept application of core computer science and data science knowledge to create impactful and transformative software solutions*
PEO2: Successful Career	*Attain excellence in the fields of software and data science, achieving success in one's profession, higher education, and entrepreneurship while staying up-to-date with the latest technologies*
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 (DATA SCIENCE)	
PROGRAM OUTCOMES (POs)	***At the time of graduation, the COMPUTER SCIENCE AND ENGINEERING (Data Science)*** *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)	
UG- COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)	
PSO1: ***Software Development and Quality Assurance***	*Utilize foundational knowledge in computer science and engineering and data science techniques to develop efficient computing solutions for complex real world engineering problems.*
PSO2: ***Maintenance***	*Design and implement solutions for diverse data science systems and cognitive applications, leveraging modern hardware and software tools for enhanced performance and efficiency*
PSO3: ***Immediate Professional Practice***	*Develop innovative and efficient data science applications that enhance the effectiveness of existing data processing systems through continuous adaptation and incorporation of emerging updates*

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 15
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URR-18R23

SCHEME OF INSTRUCTION & EVALUATION

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 = Practical's & C = Credits] EAA: Extra Academic Activity * indicates mandatory non-credit course

Total Contact Periods/Week: 29 Total Credits: 21

Stream-I: ME, CSE, IT, CSE (N), CSE (IoT) Stream-II: CE, EEE, ECE, ECI, CSE (AI&ML), CSE (DS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 15
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URR-18R23

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	U18CS202	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	U18CS207	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 = Practical's & C = Credits] **EAA: Extra Academic Activity** *** indicates mandatory non-credit course**

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

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 (DATA SCIENCE)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 15
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URR-18R23

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

[7Th+2P]

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	U18MH301	Engineering Mathematics – III	3	1	-	4	10	30	40	60	100
2	HSMC	U18TP302	Soft and Inter personal Skills	_	_	2	1	100	-	100	-	100
3	PCC	U18DS303	Object Oriented Programming through JAVA	3	1	-	4	10	30	40	60	100
4	PCC	U18DS304	Operating Systems	3	-	-	3	10	30	40	60	100
5	PCC	U18DS305	Computer Organization and Architecture	3	-	-	3	10	30	40	60	100
6	PCC	U18DS306	Advanced Data Structures	3	-	-	3	10	30	40	60	100
7	PCC	U18DS307	Formal Languages and Automata Theory	3	-	-	3	10	30	40	60	100
8	PCC	U18DS310	Object Oriented Programming through Java Laboratory	-	-	2	1	40	-	40	60	100
9	PCC	U18DS311	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 : 26 Total Credits: 23

Stream-I: ME, CSE, IT, CSE (N),CSE(IoT) Stream-II: CE, EEE, ECE, ECI, CSE(AI&ML), CSE (DS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL – 15
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URR-18R23

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	U18MH402	Professional English	-	-	2	1	100	-	100	-	100
3	OE	U18OE403	Open Elective-I	3	-	-	3	10	30	40	60	100
4	PCC	U18DS404	Artificial Intelligence	3	-	-	3	10	30	40	60	100
5	PCC	U18DS405	Database Management Systems	3	1	-	4	10	30	40	60	100
6	PCC	U18DS406	Python Programming	3	-	-	3	10	30	40	60	100
7	PCC	U18DS407	Database Management Systems Laboratory	-	-	2	1	40	-	40	60	100
8	PCC	U18DS408	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 R23: 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) U18OE401H: Essential Mathematics and statistics for Data Science(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)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL – 15
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URR-18R23

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	U18DS502	Professional Elective - I / MOOC-I	3	-	-	3	10	30	40	60	100
3	PCC	U18DS503	Design and Analysis of Algorithms	3	-	-	3	10	30	40	60	100
4	PCC	U18DS504	Software Engineering	3	-	-	3	10	30	40	60	100
5	PCC	U18DS505	Compiler Design	3	-	-	3	10	30	40	60	100
6	PCC	U18DS506	Data Mining and Data Warehousing	3	-	-	3	10	30	40	60	100
7	PCC	U18DS507	Advanced Java Programming Laboratory	-	-	2	1	40	-	40	60	100
8	PCC	U18DS508	Design and Analysis of Algorithms Laboratory	-	-	2	1	40	-	40	60	100
9	PCC	U18DS509	Data Mining and Data Warehousing Laboratory	-	-	2	1	40	-	40	60	100
10	PROJ	U18DS510	Seminar	-	-	2	1	100	-	100	-	100
Total:				17	-	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 : 25Total Credits : 19

Professional Elective-I / MOOC-I:
U18DS502A: Computer Networks
U18DS502B: Advanced Database Management System
U18DS502C: Computer Graphics
U18DS502M: 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 (DATA SCIENCE)
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URR-18R23

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	U18DS603	Professional Elective - II / MOOC-II	3	-	-	3	10	30	40	60	100
4	PCC	U18DS604	Big Data Analytics	3	-	-	3	10	30	40	60	100
5	PCC	U18DS605	Machine Learning	3	-	-	3	10	30	40	60	100
6	PCC	U18DS606	R Programming	3	1	-	4	10	30	40	60	100
7	PCC	U18DS607	Big Data Analytics Laboratory	-	-	2	1	40	-	40	60	100
8	PCC	U18DS608	Machine Learning Laboratory	-	-	2	1	40	-	40	60	100
9	PCC	U18DS609	R programming Laboratory	-	-	2	1	40	-	40	60	100
10	PROJ	U18DS610	Mini Project	-	-	2	1	100	-	100	-	100
Total:				**17**	1	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:
U18DS603A: Computer Vision and Image Processing
U18DS603B: Information Retrieval Systems
U18DS603C: Soft Computing
U18DS603M: MOOCs Course

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)
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URR-18R23

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	U18DS702	Professional Elective - III / MOOC-III	3	-	-	3	10	30	40	60	100
3	PE	U18DS703	Professional Elective - IV / MOOC-IV	3	-	-	3	10	30	40	60	100
4	PCC	U18DS704	Data Visualization	3	-	-	3	10	30	40	60	100
5	PCC	U18DS705	Internet of Things Laboratory	-	-	2	1	40	-	40	60	100
6	PCC	U18DS706	Data Visualization Laboratory	-	-	2	1	40	-	40	60	100
7	PROJ	U18DS707	Major Project - Phase – I	-	-	6	3	100	-	100	-	100
8	MC	U18DS708	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	U18DS702A: Reinforcement Learning U18DS702B: Cloud Computing U18DS702C: Social and Information Network Analysis U18DS702M: MOOCs course	U18DS703A:Robotics U18DS703B: Cognitive Computing Systems U18DS703C: Cryptography and Network Security U18DS703D: Internet of Things U18DS703M: MOOCs course

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL – 15
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URR-18R23

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	U18DS801	Professional Elective - V / MOOC-V	3	-	-	3	10	30	40	60	100
2	PE	U18DS802	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	U18DS804	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:
U18DS801A: Ethical Hacking U18DS801B: Virtual Reality Technologies U18DS801C: Robotic Process Automation U18DS801M: MOOCs course	U18DS802A: Natural Language Processing U18DS802B:Fog and Edge Computing U18DS802C: Block Chain Technologies U18DS802M: MOOCs course	U18OE803A: Operations Research U18OE803B: Management Information Systems U18OE803C: Entrepreneurship Development U18OE803D: Forex &Foreign Trade U18OE803M: MOOCs Course

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

SEMESTER Vs COURSE CATEGORY WEIGHTAGE

(in terms of Total No. of Courses / Total No. Credits)

Semester	Number of Courses / Number of Credits (*Course Category wise*)									
	BSC	ESC	HSMC	PCC	OE	PE	PROJ	MC	TOTAL	*B. Tech (Honours/Minor) Programme*
I	3/9	4/12	-	-	-	-	-	3/0	10/21	*Additional 20 credits through 8 courses out of the list of courses prescribed under Honours/Minor curricula*
II	3/9	5/10	1/3	-	-	-	-	1/0	10/22	
III	1/4	-	1/1	7/18	-	-	-	-	09/23	
IV	-	-	1/1	5/12	3/8	-	-	2/0	11/21	
V	-	-	-	7/15	-	1/3	1/1	1/0	10/19	
VI	-	-	2/4	6/13	-	1/3	1/1	-	10/21	
VII	-	-	-	3/5	1/3	2/6	1/3	1/0	08/17	
VIII	-	-	-	-	1/3	2/6	1/7	-	04/16	
Total	7/22	9/22	5/9	28/63	5/14	6/18	4/12	8/0	72/160	*(72+8) / (160+20)*
% Weightage of Course Category	13.75 % (22/160)	13.75 % (22/160)	5.625 % (9/160)	39.375% (63/160)	8.75 % (14/160)	11.25 % (18/160)	7.5 % (12/160)	0 %	100 % (160/160)	-

ISO 9001:2015 AICTE-CII: GOLD Category Institute NAAC - 'A' Grade Institute (CGPA : 3.19)

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
(An Autonomous Institute under Kakatiya University, Warangal)
Estd-1980 KITSW
(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-18R23)

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 Under 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 : 3.19)

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE
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काकतीय प्रैद्योगिकी एवं विज्ञान संस्थान, वरंगल - ५०६ ०१५ तेलंगाना, भारत
కాకతీయ సాంకేతిక విజ్ఞాన శాస్త్ర విద్యాలయం, వరంగల్ - ౫౦౬ ౦౧౫ తెలంగాణ, భారతదేశము
(An Autonomous Institute under Kakatiya University, Warangal)
Estd-1980 KITSW (Approved by AICTE, New Delhi; Recognised by UGC under 2(f) & 12(B); Sponsored by EKASILA EDUCATION SOCIETY)

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URR-18R23

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

Common for all Branches

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

URR-18R23

SCHEME OF INSTRUCTION & EVALUATION

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 = Practical's & C = Credits] EAA: Extra Academic Activity * indicates mandatory non-credit course

Total Contact Periods/Week: 29 Total Credits: 21

Stream-I: ME, CSE, IT, CSE (N), CSE (IoT) Stream-II: CE, EEE, ECE, ECI, CSE (AI&ML), CSE (DS)

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

URR-18R23

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	U18CS202	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	U18CS207	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 = Practical's & C = Credits] **EAA: Extra Academic Activity** *** indicates mandatory non-credit course**

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

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	U18MII101.4	3	3	2	--	--	--	--	--	--	--	--	1	-	-
U18MH101		**3**	**2.5**	**1.75**	--	--	--	--	--	--	--	--	**1**		

U18CS102 PROGRAMMING FOR PROBLEM SOLVING USING C

Class: B.Tech. I- Semester

Branch: ME, CSE, CSN, IT, CE, EEE, ECE, CSE (IoT), CSE (AI&ML), CSE (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", *Tata McGraw Hill*, 6th Ed, ISBN-13: 978-1- 25 - 90046 -2, 2012

Reference Books:

1. Kerninghan and Ritchie, "The C Programming Language", *Prentice Hall of India*, 2nd Edn., ISBN-13:007-6092003106, 1988
2. A.K.Sharma, "Computer Fundamentals and programming in C", *Universities Press*, 2/e, ISBN-9789386235299, 2018
3. Peter Norton, "Introduction to Computers", *Tata McGraw-Hill*, 6th Edn., ISBN-978-0-07-0593-74-9. 2008
4. Herbert Schildt, "Complete Reference with C", *Tata McGraw Hill*, 4th Edn., ISBN-13: 9780070411838, 2000
5. Yaswanth Khanetkar, "Let Us C", *BPB Publications*, 13th Edn., ISBN-13: 9788183331630, 2012

Course Learning Outcomes (COs):

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

CO1: draw the block diagram of a computer, enumerate programming development steps, design an algorithm and 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 with functions
CO4: implement structures, union, pointers and files in C programming

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 (DATA SCIENCE)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)

URR-18R23

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	U18CS202	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	U18CS207	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 = Practical's & C = Credits] **EAA: Extra Academic Activity** *** indicates mandatory non-credit course**

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

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: fundamentals data structures and their implementation with arrays
LO2: representation of data structures using stacks and various forms of queues
LO3: representing the data using linked lists
LO4: various sorting techniques on the given data and representing different hashing techniques

UNIT – I (9)

Introduction to Data Structures: Basic terminology, classification of data structures, operations on data structures, time and space complexity

Arrays: Operations on arrays-traversing an array, inserting an element in an array, deleting an element from an array, searching an element using linear search & binary search and their time complexities; sparse matrix representation.

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; Multiple stacks, applications of stacks-recursion, fibonacci series, tower of hanoi, evaluation of expressions (infix to postfix conversion, evaluation of postfix expression)

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

UNIT – III (9)

Linked Lists: Basic terminologies, linked list versus arrays, memory allocation and de-allocation for a linked list, singly linked list with header, circular linked lists with header, doubly linked lists with header, circular doubly linked lists with header (linked list operations: traversing, searching, inserting, deleting, reversing, concatenation); XOR-Linked List, skip list, representing stack and queue using linked list. Time Complexities of the above linked list operations.

UNIT – IV (9)

Sorting Techniques: bubble sort, selection sort, insertion sort, shell sort and radix sort; time complexities of above sorting techniques.

IIashing: Hashing techniques, collision resolution techniques, closed hashing, open hashing, comparison of collision resolution techniques

Text Book:

[1] Debasis Samanta, "Classic Data Structures", *Prentice Hall India*, 2nd Edn., ISBN-13:978-81-203-3731-2,2009.

Reference Books:

[1] Reema Thareja, "Data Structures Using C", Oxford University Press, 2nd Edn., ISBN-13: 978-0-19-809930-7, 2014.
[2] E Balagurusamy, "Data Structure Using C",*McGraw Hill Education*, 1st Edn.,ISBN-13: 978-125-902-9547, 2017.
[3] Richard F. Gilberg and Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", Cengage Learning, 2nd Edn., ISBN-13: 9788131503140, 2007.

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

Course Patents (CP): Patents relevant to the course content will be posted by the course faculty in Course Web page. Students have to write a two-page 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):

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

CO1: implement programs using static & dynamic arrays for performing different manipulations on homogeneous data

CO2: apply the linear data structures such as stacks and queues in manipulating the data with LIFO or FIFO order.

CO3: organize and retrieve the data through various linked list representations in non-contiguous memory storing

CO4: apply different sorting techniques on unsorted data and able to store the data using hashing techniques to retrieve the data very effectively

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	2	2	2	2	1	1	-	1	1	1	-	1	2	2	2
CO2	U18CS202R1.2	2	2	2	2	1	1	-	1	1	1	-	1	2	2	2
CO3	U18CS202R1.3	2	2	2	2	1	1	-	1	1	1	-	2	2	2	2
CO4	U18CS202R1.4	2	2	2	2	1	1	-	1	1	1	-	2	2	2	2
U18CS202R1		2	2	2	2	1	1	-	1	1	1	-	1.5	2	2	2

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/c, 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/c, 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

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
-	-	2	-

Examination Scheme :

Continuous Internal Evaluation	100
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 (DATA SCIENCE)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)

URR-18R23

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

[7Th+2P]

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	U18MH301	Engineering Mathematics – III	3	1	-	4	10	30	40	60	100
2	HSMC	U18TP302	Soft and Inter personal Skills	_	_	2	1	100	-	100	-	100
3	PCC	U18DS303	Object Oriented Programming through JAVA	3	1	-	4	10	30	40	60	100
4	PCC	U18DS304	Operating Systems	3	-	-	3	10	30	40	60	100
5	PCC	U18DS305	Computer Organization and Architecture	3	-	-	3	10	30	40	60	100
6	PCC	U18DS306	Advanced Data Structures	3	-	-	3	10	30	40	60	100
7	PCC	U18DS307	Formal Languages and Automata Theory	3	-	-	3	10	30	40	60	100
8	PCC	U18DS310	Object Oriented Programming through Java Laboratory	-	-	2	1	40	-	40	60	100
9	PCC	U18DS311	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 : 26 Total Credits: 23

Stream-I: ME, CSE, IT, CSE (N),CSE(IoT) Stream-II: CE, EEE, ECE, ECI, CSE(AI&ML), CSE (DS)

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 region of convergence (ROC), Laplace Transform of some commonly used signals-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] 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 INTERPERSONALSKILLS

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 teamwork*
LO2 : *acquiring spontaneity, presence of mind for effective communication*
LO3 : *identifying, analysing 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
Activity10 : "My Career Plan" Oral presentation
} Comprehensive Presentation

Text Books:

[1] Developing Communications Skills – Krishna Mohan & Meera Benerji
[2] Soft Skills -Alex.K
[3] Soft skills Cornerstone of Professional success – Raman & Meenakshi

References:

[4] https://onlinecourses.nptel.ac.in/noc19_hs20/preview
[5] https://onlinecourses.nptel.ac.in/noc18_hs30/preview

Course Outcomes (COs):

Course code: **U18TP302/U18TP402**Course Name: **Soft and Inter personal 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):

Coursecode:**U18TP302** Course Name: **Soft and Inter personal Skills**															
CO Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO2
U18TP302.1	-	-	-	-	-	-	-	-	2	3	-	-	1	1	1
U18TP302.2	-	-	-	-	-	-	-	2	3	3	-	-	1	1	1
U18TP302.3	-	-	-	-	-	-	-	-	2	3	-	-	1	1	1
U18TP302.4	-	-	-	-	-	-	-	1	2	3	-	-	1	1	1
U18TP302	-	-	-	-	-	-	-	**1.5**	**2.25**	**3**	-	-	**1**	**1**	**1**

U18DS303 OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Class: B.Tech. III- Semester

Branch: Computer Science and Engineering (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 student's 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 and *static* methods, Nested and inner classes, Command line arguments, Wrapper classes

Strings: Exploring String, StringBuffer, StringBuilder and StringTokenizer 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, and Inter thread 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 Edition, O'Reilly Publications,* ISBN-13: 978-0596009205, 2013.

[2] Uttam K. Roy, *Advanced JAVA Programming, 1st edition, Oxford Publications;* ISBN-13: 978-0199455508, 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,*1st ed., New Delhi: Khanna Publishing House, 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: 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): U18DS303 OBJECT ORIENTED PROGRAMMING THROUGH JAVA																
Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18DS303.1	2	1	1	1	1	1	-	1	1	1	-	2	2	1	2
CO2	U18DS303.2	2	2	2	2	1	1	-	1	1	1	-	2	2	1	2
CO3	U18DS303.3	2	2	2	2	2	1	-	1	1	1	-	2	2	2	2
CO4	U18DS303.4	2	3	2	2	2	1	-	1	1	1	-	2	2	2	2
U18DS303		2	1.75	1.75	1.75	1.5	1	-	1	1	1	-	2	2	1.5	2

U18DS304 OPERATING SYSTEMS

Class: B.Tech. III- Semester

Branch: Computer Science and Engineering (DS)

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: basics of operating systems and its structure
LO2: understanding scheduling and process synchronization techniques
LO3: exploring deadlocks, memory management and virtual memory techniques
LO4: discuss the file system organization, disk management and protection techniques.

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

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

UNIT - II (9)

Process Concept: Process concept, Process scheduling, Inter process communication

Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms – First come first serve, Shortest-job-first, Priority, Round-robin, Multilevel queue, Multilevel feedback queue

Synchronization: Background, Thecritical-section problem, Peterson's solution, Synchronization hardware, Mutex locks, Semaphores, Classic problems of synchronization, Monitors

UNIT - III (9)

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

Memory Management: Background, Swapping, Contiguous memory allocation, Segmentation, Paging, Structure of page table-Hierarchical paging, Hashed page tables, Inverted page tables

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

UNIT - IV (9)

File System: File concept, Access methods, Directory structure, Implementing File-Systems - Allocation Methods, Free-space management

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

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

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Text Book:

[1] Abraham Silberschatz, Peter B Galvin, Gerg Gagne, *Operating System Concepts, Wiley* , 9th Edition, ISBN-978-81-265-5427-0, 2016. *(Chapters 1 to 6)*

Reference Books:

[1] Ekta Walia *Operating Systems,* Khanna Publishing House, Delhi, 2nd Edition, ISBN-10: 9789380016658, ISBN-13: 978-9380016658, 2015.

[2] Dhananjay M. Dhamdhere, *Operating Systems A Concept-Based Approach,* McGraw Hill Education, ISBN-10: 0072957697 ISBN-13: 978-0072957693, 2008.

[3] William Stalling, *Operating Systems,* Maxwell, McMillan International Editions, ISBN 81- 203-1187-6, 1992.

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: demonstrate the architecture of an operating system, process concepts and system calls
CO2: implement the CPU scheduling and process synchronization algorithms
CO3: solve the deadlock related problems and memory management issues
CO4: explain the file, disk and system protection techniques

Course Articulation Matrix (CAM): U18DS304 OPERATING SYSTEMS																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18DS304.1	2	1	2	1	-	1	-	-	1	-	-	2	1	1	1
CO2	U18DS304.2	3	2	2	2	-	1	-	-	-	-	-	2	1	1	1
CO3	U18DS304.3	3	2	2	2	2	-	-	-	-	-	1	2	1	1	1
CO4	U18DS304.4	2	2	2	1	2	1	1	-	1	-	1	1	1	1	1
U18DS304		2.5	1.75	2	1.5	2	1	1	-	1	-	1	1.75	1	1	1

U18DS305 COMPUTER ORGANIZATIONAND ARCHITECTURE

Class: B. Tech. III – Semester

Branch: Computer Science and Engineering (DS)

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

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Text Books:

[1] Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, *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 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: *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): U18DS305 COMPUTER ORGANIZATION AND ARCHITECTURE

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18DS305.1	2	2	2	1	-	1	1	1	-	1	-	1	1	1	1
CO2	U18DS305.2	2	2	2	2	-	1	1	1	-	1	-	1	1	1	1
CO3	U18DS305.3	2	2	2	2	-	1	1	1	-	1	-	1	2	1	1
CO4	U18DS305.4	2	2	2	2	-	1	1	1	-	1	-	1	2	1	1
U18DS305		2	2	2	1.75	-	1	1	1	-	1	-	1	1.5	1	1

U18DS306 ADVANCED DATA STRUCTURES

Class: B.Tech. III- Semester

Branch: Computer Science and Engineering (DS)

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: 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: In-order, Pre-order, Post-order 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 to m-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: Naïve Algorithm, (Knuth Morris Pratt) Algorithm, Boyer Moore Algorithm, Rabin Karp Algorithm

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Text Book:

[1] Debasis Samanta, *Classic Data Structures*, Prentice Hall India, 2nd ed., New Delhi: Prentice Hall India, 2009. (*Chapters 7, 8, 10)*

Reference Books:

[1] Reema Thareja, *Data Structures Using C*, 2nd ed., Oxford University Press, 2014.
[2] Richard F. Gilberg and Behrouz A. Forouzan, *Data Structures: A Pseudocode Approach with C*, 2nd ed., Cengage Learning, 2007.
[3] Adam Drozdeck, *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: 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: 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): U18DS306 ADVANCED DATA STRUCTURES																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18DS306.1	2	2	2	2	1	1	-	1	1	1	-	1	2	2	2
CO2	U18DS306.2	2	2	2	2	1	1	-	1	1	1	-	1	2	2	2
CO3	U18DS306.3	2	2	2	2	1	1	-	1	1	1	-	2	2	2	2
CO4	U18DS306.4	2	2	2	2	1	1	-	1	1	1	-	2	2	2	2
U18DS306		2	2	2	2	1	1	-	1	1	1	-	1.5	2	2	2

U18DS307 FORMAL LANGUAGES AND AUTOMATA THEORY

Class: B.Tech. III- Semester

Branch: Computer Science and Engineering (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 student's knowledge in/on…

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, Extension 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 Books:

[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 Paper: Research papers (Journals/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: 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: design turing machine and examine possible solution for post's correspondence problem

Course Articulation Matrix (CAM): U18DS307 FORMAL LANGUAGES AND AUTOMATA THEORY

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18DS307.1	3	3	2	2	-	-	-	1	1	1	-	2	2	1	2
CO2	U18DS307.2	2	2	2	2	-	-	-	1	1	1	-	2	2	1	2
CO3	U18DS307.3	3	2	3	3	-	-	-	1	1	1	-	3	3	1	3
CO4	U18DS307.4	3	3	3	3	-	-	-	1	1	1	-	3	3	1	3
U18DS307		2.75	2.5	2.5	2.5	-	-	-	1	1	1	-	2.5	2.5	1	2.5

U18DS310 OBJECT ORIENTED PROGRAMMING THROUGH JAVA LABORATORY

Class: B.Tech. III- Semester **Branch:** Computer Science and Engineering (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: fundamentals of java
LO2: classes, methods and strings concepts
LO3: inheritance, dynamic method dispatch, interface and package concept
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 a 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 *StringBuffer* class.
3. Write a program to accept a line of text, tokenize the line using *StringTokenizer* 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-IV)

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* 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 First Java, 2nd Edition, O'Reilly Publications, ISBN-13: 978-0596009205, 2013.
[2] Uttam K. Roy, Advanced JAVA Programming, 1st edition, Oxford Publications; ISBN-13: 978-0199455508, 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, 1st ed., New Delhi: Khanna Publishing House, 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.

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/0), exception handling and multithreading concepts

Course Articulation Matrix (CAM): U18DS310 OBJECT ORIENTED PROGRAMMING THROUGH JAVA LABORATORY																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18DS310.1	2	1	1	1	1	1	-	1	2	1	-	2	2	1	2
CO2	U18DS310.2	2	2	2	2	1	1	-	1	2	1	-	2	2	1	2
CO3	U18DS310.3	2	2	2	2	2	1	-	1	2	1	-	2	2	2	2
CO4	U18 DS310.4	2	3	2	2	2	1	-	1	2	1	-	2	2	2	2
U18DS310		2	1.75	1.75	1.75	1.5	1	-	1	2	1	-	2	2	1.5	2

U18DS311 ADVANCED DATA STRUCTURES LABORATORY

Class: B.Tech. III-Semester

Branch: Computer Science & Engineering (DS)

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: 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 (Unit-I)

1. Program to perform following binary tree operations
   i) Creation ii) Insertion of a node iii) Traversal using recursion

Experiment-II (Unit-I)

2. Program to perform following binary search tree operations
   i) Creation ii) Deletion of a node iii) Traversal using recursion

Experiment III (Unit-I)

3. Program to perform following binary search tree traversal operations without recursion
   i) In-order ii) Pre-order iii) Post-order iv) Spiral order

Experiment-IV (Unit-II)

4. Program to implement AVL tree construction

Experiment-V (Unit-II)

5. Program to implement B-tree construction

Experiment-VI (Unit-III)

6. Program to implement search and insert operations on Trie
7. Program to implement Fibonacci search

Experiment-VII (Unit-III)

8. Program to implement Quick sort
9. Program to implement Merge sort

Experiment-VIII (Unit-III)

10. Program to implement heap sort
11. Program to implement Bitonic generator sort

Experiment-IX (Unit-IV)

12. Program to implement Topological sort
13. Program to implement the following graph traversal techniques
    a) Prim's algorithm b) Kruskal's algorithm

Experiment-X (Unit-IV)

14. Program to implement the following graph traversal techniques
    a) Depth first search b) Breadth first search
15. Program to implement Kosaraju's algorithm

Experiment-XI (Unit-IV)

16. Program to implement Naive Algorithm
17. Program to implement Knuth - Morris - Pratt (KMP) Algorithm

Experiment-XII (Unit-IV)

18. Program to implement Boyer Moore Algorithm
19. Program to implement Rabin Karp Algorithm

Laboratory Manual:

[1] Advanced Data Structures laboratory manual, *prepared by faculty of* Dept. of CSE (DS), KITSW.

Reference Books:

[1] Debasis Samanta, *Classic Data Structures*, 2nd ed., New Delhi: Prentice Hall India, 2009.
[2] Reema Thareja, *Data Structures Using C*, 2nd ed., New Delhi: Oxford University Press, 2014.
[3] E Balagurusamy, *Data Structure Using C*, McGraw Hill Education, 1st Edn., ISBN-13: 978-125-902-9547, 2017.

Course Learning Outcomes(COs):

On completion of this course, student's 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

Course Articulation Matrix(CAM):U18DS311 ADVANCED DATA STRUCTURES LABORATORY																
Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18DS311.1	1	1	3	1	1	1	1	1	-	1	-	2	1	1	3
CO2	U18DS311.2	1	1	2	2	1	1	1	1	-	1	-	2	1	1	2
CO3	U18DS311.3	1	1	3	3	2	1	1	1	-	1	-	3	1	1	3
CO4	U18DS311.4	1	1	3	2	3	2	2	2	-	2	-	3	1	1	3
U18DS311		**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 (DATA SCIENCE)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)

URR-18R23

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	U18MH402	Professional English	-	-	2	1	100	-	100	-	100
3	OE	U18OE403	Open Elective-I	3	-	-	3	10	30	40	60	100
4	PCC	U18DS404	Artificial Intelligence	3	-	-	3	10	30	40	60	100
5	PCC	U18DS405	Database Management Systems	3	1	-	4	10	30	40	60	100
6	PCC	U18DS406	Python Programming	3	-	-	3	10	30	40	60	100
7	PCC	U18DS407	Database Management Systems Laboratory	-	-	2	1	40	-	40	60	100
8	PCC	U18DS408	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 R23: 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) U18OE401H: Essential Mathematics and statistics for Data Science(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 APPLICABLE MATHEMATICS

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 semicircular 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 algebraic equations.

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 $1/3^{rd}$ rule and Simpson's $3/8^{th}$rule.

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", *JohnWiley&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: **APPLICABLEMATHEMATICS**		
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 Fourier series*
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 ELECTRONICSENGINEERING

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 breakdown 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 structure, 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 UniversityPress,*New Delhi, India.
[3] Neil storey, "Electronics: A systems Approach", *4/e-Pearson Education Publishing company Pvt. Ltd,* India

Course Outcomes (COs)

CourseCode:**U18EC401B** Course Name: **BASIC ELECTRONICSENGINEERING**		
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 ELECTRONICSENGINEERING**															
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 MECHANICALENGINEERING

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*, NewDelhi.
[3] Hazra Chowdary. S. K and Bose, "Workshop Technology, Vol. I & II", *Media Promoters and publishers Pvt Ltd*, India.

Course Outcomes (COs):

CourseCode:**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,NewDelhi.(*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):

CourseCode: **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):

CourseCode: **U18EI401D** Course Name: **FUNDAMENTALS OF MEASUREMENTS &INSTRUMENTATION**															
CO Code	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**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	1	-	4

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 Computer Networks**
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 ENERGYSOURCES

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 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- thermal systems.

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 of gasifiers

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

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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):

Coursecode:**U18OE401F** Course Name: **Renewable Energy Sources**															
CO Code	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
U18OE401F.1	3	-	-	-	-	-	1	-	-	-	-	-	3	-	-
U18OE401F.2	3	-	-	-	-	-	1	-	-	-	-	-	3	-	-
U18OE401F.3	3	-	-	-	-	-	1	-	-	-	-	-	3	-	-
U18OE401F.4	3	-	-	-	-	-	1	-	-	-	-	-	3	-	-
U18OE401F	**3**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

U18OE401H- ESSENTIAL MATHEMATICS AND STATISTICS FOR DATA SCIENCE

Class: B.Tech. III- Semester

Branch: Computer Science and Engineering (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 in/on…

LO1: concept of probability and probability distributions to interpret the data in experimental data science engineering problems

LO2: various statistical measures, curve fitting, correlation and regression to analyze the data in practical data science engineering problems

LO3: sampling and applications of exact sampling distributions in testing of hypothesis

LO4: principal components analysis, singular *value decomposition, direct and iterative methods to solve system of linear equations*

UNIT-I (9+3)

Probability: Definitions of various terms- Trial and event, Exhaustive events, Favorable events, Mutually exclusive events, Equally likely events, Independent events, Mathematical or classical probability, Probability function, Law of addition of probabilities, Multiplication law of probability and conditional probability, Baye's theorem

Random variables - distribution functions: Random variable, Discrete random variable, Probability mass function, Discrete distribution function, Continuous random variable, Probability density function, Expectation and variance, Joint probability mass function and marginal and conditional probability functions. Theoretical discrete and continuous probability distributions- Binomial, Poisson distributions, Rectangular and Normal distributions

UNIT-II (9+3)

Statistical measures: Measures of central tendency, Measures of dispersion, Skewness and Kurtosis.

Curve fitting and principle of least squares: Fitting of a straight line, Fitting second degree parabola, Most plausible solution to system of linear equations, Conversion of data to linear form

Correlation and Regression: Scatter Diagram, Karl Pearson's coefficient of correlation, Rank correlation, Multiple and partial correlation, Lines of regression, Regression coefficients, Properties of regression coefficients, Angle between two lines of regression

UNIT-III (9+3)

Sampling and Large Sample Tests: Types of sampling, Parameter and statistic, Null hypothesis, Alternative hypothesis, Errors in sampling, Critical region and level of significance, One tailed and two tailed tests, Procedure for testing of hypothesis, Test of significance for single mean, Test of significance for difference of means, Test of significance for difference of standard deviations

Applications of Exact sampling distributions: χ^2 - test for goodness of fit, t-test for single mean, t-test for difference of means, F-test for equality of population variances, F-test for equality of several means

UNIT-IV (9+3)

Linear algebra: Determinant and trace, Eigen systems and diagonalizability-The characteristic polynomial, Eigen values, Eigen vectors and diagonalizable matrices, Computing Eigen systems- The Power method and deflation, Cholesky factorization, Principal Components Analysis (PCA), Introduction to Singular Value Decomposition (SVD), SVD properties and applications

Solution to Linear Systems: Direct methods- LU decomposition method, solution of tridiagonal systems, Iterative methods- Jacobi's method and Gauss Seidel method

Text Books:

[1] S.C. Gupta V.K. Kapoor, *Fundamentals of Mathematical Statistics*, 12th ed., New Delhi: Sultan Chand & Sons Educational Publishers, 2020. *(Unit I, Unit II and Unit III)*

[2] Moshe Haviv , *Linear Algebra for Data Science*, 1st ed., Singapore: World Scientific Publishing Co. Pvt. Ltd, 2023. *(Unit IV)*

[3] S.S. Sastry, *Introductory Methods of Numerical Analysis*, 5th ed., New Delhi: Prentice Hall of India, 2012. (Unit IV)

Reference Books:

[1] Richard I. Levin, David S. Rubin, Masood Husain Siddiqui, Sanjay Rastogi, *Statistics for Management*, 8th ed., Noida: Pearson India Education services 2017.

[2] Miller & Miller, John E. Freund's, *Mathematical statistics*, 6th ed., New Delhi: PHI, 2003.

[3] S.P.Gupta, *Statistical Methods*, 46th ed., New Delhi: Sultan Chand & Sons, 2023.

[4] Marc Peter Deisenroth A. Aldo Faisal Cheng Soon Ong, *Mathematics for Machine Learning*, 1st ed., published by Cambridge 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: interpret the data using probability distributions.
CO2: analyze the data using various statistical measures
CO3: apply exact sampling distributions in testing of hypothesis
CO4: apply matrix decomposition concept and numerical methods to solve system of linear equations

Course Articulation Matrix (CAM): U18OE401H- ESSENTIAL MATHEMATICS STATISTICS FOR DATA SCIENCE

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18OE401H.1	2	2	--	1	-	-	-	1	-	1	-	1	1	1	1
CO2	U18OE401H.2	2	2	-	1	-	-	-	1	-	1	-	1	1	1	1
CO3	U18OE401H.3	2	2	-	1	-	-	-	1	-	1	-	1	1	1	1
CO4	U18OE401H.4	2	2	-	1	-	-	-	1	-	1	-	1	1	1	1
U18OE401H		2	2	-	1	-	-	-	1	-	1	-	1	1	1	1

U18MH402 PROFESSIONALENGLISH

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 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):

CourseCode: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 correctthem
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															
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**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; 1st edition, ISBN- 13: 978-0199455508.

Course Code: **U18OE403A** Course Name: **Object Oriented Programming**		
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	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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, meta center, 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, multistage 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] VictorStreeter 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):

CourseCode:**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):

CourseCode:**U18OE303B** Course Name: **Fluid mechanics and hydraulic machines**															
CO Code	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO12**	**PSO1**	**PSO2**	**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 :

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	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] NitaigourPremchandMahalik, 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, *Cengage Learning*, Inc. 2/e, ISBN-13: 978-1439061985,2010.

Course Outcomes (COs):

CourseCode: **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 DriverManager, 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] Uttam K.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	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**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: **MICROPROCESSORS**		
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	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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 OFMATERIALS

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 uniformbars.

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, impactloading.

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*", *7lhEdition*, S Chand andCompany.
[2] Gunneswara Rao T. D., MudimbyAndal, "*Strength of Materials*", *1stedn.2018*, Cambridge University Press.

Reference Books:

[1] Timoshenko and Gere, "*Mechanics of Materials*", *1stEdition* 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 University Press.
[4] Ramamrutham S., "*Strength of Materials*", *2nd Edition*, Dhanpat Rai & Sons, NewDelhi.

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):

Course code: **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**	-	-

U18DS404 ARTIFICIAL INTELLIGENCE

Class: B.Tech. IV- Semester

Branch: Computer Science and Engineering (DS)

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 applications

UNT – 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

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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 Paper: Research papers (Indexed journals/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 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 fundamentals of artificial intelligencefor 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 problemsand illustrate the software & hardware used inrobotics*

Course Articulation Matrix (CAM): U18DS404 ARTIFICIAL INTELLIGENCE																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18DS404.1	2	2	2	2	1	1	-	1	1	1	-	2	2	1	2
CO2	U18DS404.2	2	3	3	2	1	1	-	1	1	1	-	2	3	1	1
CO3	U18DS404.3	2	3	3	2	1	1	-	1	1	1	-	2	3	1	1
CO4	U18DS404.4	2	2	2	3	1	1	-	1	1	1	-	2	3	1	1
U18DS404		2	2.5	2.5	2.25	1	1	-	1	1	1	-	2	2.75	1	1.25

U18DS405 DATABASE MANAGEMENT SYSTEMS

Class: B.Tech. IV- Semester

Branch: Computer Science and Engineering(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 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, database modeling and different database models

LO3: distinct normalization techniques on database systems and query optimization technique

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

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, Multi valued 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, 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 Book:

[1] Ramez Elmasri and Shamkanth B. Navathe, *Fundamentals of Database Systems*, 6th ed.,Pearson Education, 2010. *(Chapters 1 to 9, 10 to 22)*

Reference Books:

[1] Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems*, 3rd ed., McGraw-Hill Education, 2002.

[2] Abraham Silberschatz, Henry F.Korth and S.Sudarshan, *Database System Concepts*, 3rd ed., McGraw-Hill Education, 1997.

[3] Thomas Connolly and Carolyn Begg, *Database Systems*, 3rd ed., Pearson Education, 2003.

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 the database management system effectively

CO2: design the databases, which includes Enhanced Entity Relationship model

CO3: outline the database by using normalization and query optimization techniques to avoid redundancy and maintain the performance of database.

CO4: manage multi-level security, correctness of data and control over access on database

Course Articulation Matrix (CAM):U18DS405 DATABASE MANAGEMENT SYSTEMS																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18DS405.1	2	2	1	1	1	2	--	--	1	--	1	1	2	2	2
CO2	U18DS405.2	2	2	2	2	1	2	--	1	1	--	1	1	2	2	2
CO3	U18DS405.3	2	2	2	2	1	--	--	--	1	1	1	1	2	2	2
CO4	U18DS405.4	2	2	2	2	1	2	--	1	1	--	1	1	2	2	2
U18DS405		2	2	1.75	1.75	1	2	--	1	1	1	1	1	2	2	2

U18DS406 PYTHON PROGRAMMING

Class: B.Tech. IV- Semester

Branch: Computer Science and Engineering(DS)

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: 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

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Text Books:

[1] Reema Thareja, *Python Programming using problem solving approach*, New Delhi: Oxford University Press, 2017.*(Chapters 1 to 7)*

[2] Jake VanderPlas, *Python Data Science Handbook- Essential Tools for Working with Data*, California: O'Reilly Media Inc., 2016. (*Chapters 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: Apress, 2005.

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

Course Patent: 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):U18DS406 PYTHON PROGRAMMING

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18DS406.1	1	1	1	1	2	1	-	1	1	1	-	2	2	1	1
CO2	U18DS406.2	1	1	2	1	2	1	-	1	1	1	-	2	2	1	1
CO3	U18DS406.3	2	2	2	2	3	1	-	1	1	1	-	2	2	2	1
CO4	U18DS406.4	2	2	2	2	3	1	-	1	1	1	-	2	2	2	2
U18DS406		**1.5**	**1.5**	**1.75**	**1.5**	**2.5**	1	**-**	1	1	1	-	**2**	**2**	**1.5**	**1.25**

U18DS407 DATABASE MANAGEMENT SYSTEMS LABORATORY

Class:B.Tech.IV-Semester **Branch:** Computer Science and Engineering (DS)

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 students' knowledge in/on
LO1: Data Definition Language (DDL) commands, Data Manipulation Language (DML) commands, Transaction Control Languages (TCL) and Data Control Languages (DCL)
LO2: Structured Query Language(SQL) functions, sub queries, indexes, user defined data types, views and sequences
LO3: basic Procedural Structured Query Language (PL/SQL) programs and Cursors
LO4: stored procedures/functions, exception handling, packages and triggers

List of Experiments

Structured Query Language (SQL):

Experiment-I
1. Queries on DDL and DML statements.
2. Queries on TCL and DCL commands.
3. Queries on column level and table level constraints.

Experiment -II
4. Queries using built-in functions of NUMBER, CHARACTER, DATE Data types.
5. Queries on Data type conversion functions.

Experiment -III
6. Queries on single row functions and operators.

Experiment -IV
7. Queries on aggregate functions.

Experiment -V
8.Queries on joins and nested queries.

Experiment -VI
9. Write SQL statements to create simple, composite indexes, user-defined data types, views, sequences.

PL/SQL Programs:

Experiment –VII
10. Write sample PL/SQL programs using conditional and iterative statements.

Experiment -VIII
11. Write PL/SQL programs using cursors.

Experiment -IX
12. Write PL/SQL programs using parameterized cursors.

Experiment-X
13. Write PL/SQL programs to handle exceptions.
14. Write PL/SQL programs using stored procedures and functions.

Experiment –XI
15. Write PL/SQL programs for creating packages.

Experiment -XII
16. Write PL/SQL programs for creating triggers.

Laboratory Manual :

[1] Database Management Systems Laboratory Manual, *Prepared by the faculty of Department of CSE.*

Text Book:

[1] Ivan Bayross, "SQL, PL/SQL: The Programming Language of Oracle", *BPB publications*, 4th Edition, ISBN: 978-8176569644, 2010.

[2] SQL and PL/SQL for Oracle 11g Black Book 1st Edition by P S Deshpande

Course Learning Outcomes(COs):

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

CO1: evaluate SQL queries using DDL/DML/TCL/DCL commands to create and manipulate data in database by enforcing constraints

CO2: demonstrate various database objects using SQL queries

CO3: implement block structured programming with cursors to enable traversal over the records of the database

CO4: implement pre-compiled stored programs, run-time errors checking, database objects collection in PL/SQL packages and high-level security using triggers

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

Course code:**U18DS407**Course Name: **DATABASE MANAGEMENT SYSTEMS LABORATORY**

CO Code	PO 1	PO2	PO 3	PO 4	PO 5	PO6	PO7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
U18DS407.1	2	2	1	1	1	2	--	--	1	--	1	1	2	2	2
U18DS407.2	2	2	2	2	1	2	--	1	1	--	1	1	2	2	2
U18DS407.3	2	2	2	2	1	--	--	--	1	1	1	1	2	2	2
U18DS407.4	2	2	2	2	1	2	--	1	1	--	1	1	2	2	2
U18DS407	2	2	1.75	1.75	1	2	--	1	1	1	1	1	2	2	2

U18DS408 PYTHON PROGRAMMING LABORATORY

Class: B.Tech. IV-Semester

Branch: Computer Science & Engineering (DS)

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

List of Experiments

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 the 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(Unit-I)

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) (Unit-I)

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 (Unit-II)

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 (Unit-II)

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 (Unit-II)

1. Write a program to demonstrate tuple, set and related functions
2. Write a program to demonstrate dictionaries
3. Write a program to demonstrate Regex functions
4. 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 (Unit-III)

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 (Unit-IV)

1. Install and setup pandas environment
2. Write a python pandas program to create a series from an ndarray
3. Write a python pandas program to demonstrate indexing and selecting data
4. Twitter data analysis using Pandas

Experiment-XII (Unit-IV)

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*, Prepared by Dept. of CSE (AI & ML), KITSW

Reference Books:

[1] Reema Thareja, *Python Programming using problem solving approach*, New Delhi: Oxford university press, 2017. *(Chapters 1 to 7)*

[2] Jake VanderPlas, *Python Data Science Handbook- Essential Tools for Working with Data*, California: O'Reilly Media, Inc., 2016. (*Chapters 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):U18DS408 PYTHON PROGRAMMING LAB																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18DS408.1	2	2	2	2	2	1	-	1	2	1	-	2	2	2	2
CO2	U18DS408.2	2	2	2	2	2	1	-	1	2	1	-	1	2	2	2
CO3	U18DS408.3	2	2	2	2	3	1	-	1	2	1	-	2	2	2	2
CO4	U18DS408.4	2	2	2	2	3	1	-	1	2	1	-	2	2	2	2
U18DS408		**2**	**2**	**2**	**2**	**2.5**	1	**-**	1	2	1	**-**	**1.75**	**2**	**2**	**2**

U18OE411D WEBPROGRAMMINGLABORATORY

Class: B.Tech. IV-Semester **Branch:** Computer Science & Engineering (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: static web page using HTML Tags, CSS properties, inter activity 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 webpages required for an online book's website.

a) HOMEPAGE:
b) LOGINPAGE
c) CATALOGUEPAGE

DESCRIPTION:

a. HOMEPAGE

The static home page must contain three frames.

- *Top frame:* Logo and the college name and links to Homepage, 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:* The pages to the links in the left frame must be loaded here. Initially this page contains a description of the website.

Logo	Website Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIV	*Description of website*			

b. LOGINPAGE

Logo	Website Name			
Home	Login	Registration	Catalogue	Cart

EXPERIMENT–3(UNIT-1)

c. CATALOGUEPAGE:

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:

- Snapshot 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-mail id (should not contain any in valid and must follow the standard pattern (name@domain.com)
d) Phone number (Phone number should contain 10 digits only).

Note: You can also validate the login page with the separators.

4. CSS

AIM: Write a program illustrating various methods in cascading stylesheets

a) Use different font, styles and set a background image
b) Control their petition of the image
c) Define styles for links
d) Work with layers and add a customized cursor

DESCRIPTION: Design a webpage 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 the 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 validatethatallinputfieldsarerequiredanddisplayerrormessagesiftheabovevalidations do not hold using JSP

EXPERIMENT-7(UNIT-II)

17. Create a JSP Page with and run in JSP Engines
18. Demonstrate Session racking 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, Multidimensional)
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 and 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 way that 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 (AI & ML), KITS Warangal.

Textbooks:

[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] 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 webpages 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

.

URR-18 R23

Syllabi of B.Tech. (V & VI Semester)

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				
								CIE			ESE	Total Marks
				L	T	P	C	TA	MSE	Total		
1	MC	U18MH501	Universal Human Values–II	2	-	-	-	10	30	40	60	100
2	PE	U18DS502	Professional Elective-I/MOOC-I	3	-	-	3	10	30	40	60	100
3	PCC	U18DS503	Design and Analysis of Algorithms	3	-	-	3	10	30	40	60	100
4	PCC	U18DS504	Software Engineering	3	-	-	3	10	30	40	60	100
5	PCC	U18DS505	Compiler Design	3	-	-	3	10	30	40	60	100
6	PCC	U18DS506	Data Warehousing and Data Mining	3	-	-	3	10	30	40	60	100
7	PCC	U18DS507	Advanced Java Programming Laboratory	-	-	2	1	40	-	40	60	100
8	PCC	U18DS508	Design and Analysis of Algorithms Laboratory	-	-	2	1	40	-	40	60	100
9	PCC	U18DS509	Data Warehousing and Data Mining Laboratory	-	-	2	1	40	-	40	60	100
10	PROJ	U18DS510	Seminar	-	-	2	1	100	-	100	-	100
Total:				17	-	8	19	280	180	460	540	1000
Additional Learning*:*Maximum credits allowed f or 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: 25 Total Credits: 19

Professional Elective-I / MOOC-I:
U18DS502A: Computer Networks
U18DS502B: Advanced Database Management System
U18DS502C: Computer Graphics
U18DS502M: 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 & Engineering (Data Science)

Teaching Scheme :

L	T	P	C
2	-	-	-

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	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 between intention 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

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Text Book:

[1] R .R. Gaur, R. Sangal and G. P. Bagaria, *Human Values and Professional Ethics*, New Delhi: Excel Books, 2010.

Reference Books:

[1] A. Nagaraj, JeevanVidya: EkParichaya, *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.

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

Course Patent: 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: 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 fulfillment

CO4: assess the understanding of harmony, adapt professional ethics and take part in augmenting universal human order

Course Articulation Matrix (CAM): U18MH501 UNIVERSAL HUMAN VALUES – II															
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**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

U18DS502A COMPUTER NETWORKS

Class: B.Tech. V-Semester **Branch:** Computer Science & Engineering (Data Science)

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: 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

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Text Book:

[1] Andrew S.Tannenbaum, David J.Wetherall, *Computer Networks*, 5th ed., Pearson Education, ISBN-13: 978-0-13-212695-3, 2011.

Reference Books:

[1] William Stallings, *Data and Computer Communications*, 9th ed., Prentice-Hall of India (PHI), ISBN-81-203-1240-6, 2011.

[2] Forouzan, *Data Communication and Networking*, 5th ed., Tata McGraw Hill , ISBN: 978-0-07-296775-3, 2012.

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

Course Patent: 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 OSI & TCP/IP reference models for data transmission

CO2: analyze different 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): U18DS502A COMPUTER NETWORKS														
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	**U18DS502A.1**	2	2	2	2	2	1	1	1	1	-	1	2	2	2
CO2	**U18DS502A.2**	2	2	2	2	2	1	1	1	1	-	1	2	2	2
CO3	**U18DS502A.3**	2	2	2	2	2	1	1	1	1	-	1	2	2	2
CO4	**U18DS502A.4**	1	2	2	1	1	1	1	1	1	-	1	2	2	2
U18DS502A		**1.75**	**2**	**2**	**1.75**	**1.75**	**1**	**1**	**1**	**1**	**-**	**1**	**2**	**2**	**2**

U18DS502B ADVANCED DATABASE MANAGEMENT SYSTEM

Class: B.Tech. V-Semester **Branch:** Computer Science & Engineering (Data Science)

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: 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, XQuery 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, Redundant arrays of independent 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: Static hashing, Extendible hashing, Linear hashing, Extendible versus linear 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 operator evaluation, Introduction to query optimization, what a typical optimizer does
Evaluating Relational Operators: The selection operation, General selection conditions, The projection operation, The join operation, The set operations, Aggregate operations

UNIT-IV (9)

Deductive Databases: Introduction to recursive queries, Recursive queries with negation, Data log to SQL, Evaluating recursive queries

Web Databases: Introduction to information retrieval, indexing for text search, Web search engines, Managing text in DBMS, A data model for XML

XQuery: 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

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Text Books:

[1] Raghu Ramakrishnan, Johannes Gehrke, *Database Management Systems*, 4th ed., Hyderabad: Mc-Graw Hill, 2014. *(Chapters 7 to 10, 12, 13, 21, 22, 25, 26, 27)*

Reference Books:

[1] Hector Garcia Molina, Jeffery D Ullman, and Jennifer Widom, *Database Systems: The CompleteBook*, 2nd ed., New Jersey: Pearson, 2008.

[2] RamezElmasri, Shamkanth B. Navathe, *Fundamentals of Database Systems*, 7th ed., New Delhi: Pearson Education, 2017.

[3] Abraham Siberschatz, Henry F.Korth, and S.Sudarshan, *Database System Concepts*, 6th ed., New Delhi: McGraw-Hill, 2011.

[4] R. P. Mahapatra, Govind Verma, *Database Management Systems*, 1st ed., New Delhi: Khanna publications, 2016.

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

Course Patent: 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: 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 database systems

CO4: make use of the data management in deductive databases, web databases, X Queries & spatial databases analysis & data handling

Course Articulation Matrix (CAM): U18DS502B ADVANCED DATABASE MANAGEMENT SYSTEM														
Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	U18DS502B.1	2	2	2	2	1	-	1	-	1	-	2	2	1	2
CO2	U18DS502B.2	2	2	2	2	1	-	1	-	1	-	2	2	1	2
CO3	U18DS502B.3	2	2	2	2	1	-	1	-	1	-	1	2	1	2
CO4	U18DS502B.4	2	2	2	2	1	-	1	-	1	-	2	2	1	2
U18DS502B		2	2	2	2	1	-	1	-	1	-	1.75	2	1	2

U18DS502C COMPUTER GRAPHICS

Class: B.Tech. V-Semester **Branch:** Computer Science & Engineering (Data Science)

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: 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

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Text Books:

[1] Steven Harrington, *Computer Graphics, A Programming Approach*, 2nd ed., India: McGraw Hill Education, 2017.

[2] Ralf Steinmetz, Klara Nahrstedt, *Multimedia: Computing, Communications & Applications*, New Delhi: Pearson First Impression, 2006. *(Chapters 2, 3, 17)*

Reference Books:

[1] James D.FoleyAndries Van Dam Steven K. Fernier, John Hugs, *Computer Graphics Principles & Practice*, 2nd ed., New Delhi: Pearson Education, 2002.

[2] Donad Hearn, Pauline Baker, *Computer Graphics*, 2nd ed., New Delhi: Pearson Education, 1997.

[3] Fabio Ganovelli, Massimiliano Corsini, SumantaPattanaik, Marco Di Benedetto, *Introduction to computer graphics a practical learning approach*, Newyork: Chapman and Hall, 2014.

[4] Dr Rajiv chopra, *Computer graphics: a practical approach, concepts, principles, case studies, experiments*, 4th ed., New Delhi: S Chand, 2011.

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

Course Patent: 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: 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): U18DS502C COMPUTER GRAPHICS														
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	**U18DS502C.1**	2	2	2	1	-	-	1	1	1	-	2	2	2	-
CO2	**U18DS502C.2**	2	2	2	1	-	-	1	1	1	-	2	2	2	-
CO3	**U18DS502C.3**	2	2	1	1	-	-	1	1	1	-	1	2	1	-
CO4	**U18DS502C.4**	1	1	-	-	1	-	1	1	1	-	2	1	1	1
U18DS502C		**1.75**	**1.75**	**1.66**	**1**	**1**	**-**	**1**	**1**	**1**	**-**	**1.75**	**1.75**	**1.5**	**1**

U18DS503 DESIGN AND ANALYSIS OF ALGORITHMS

Class: B.Tech. V-Semester **Branch:** Computer Science & Engineering (Data Science)

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: 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 sales person 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 Books:

[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*, 4th ed. Rajput: Khanna Publishing, 2019.
[3] S.Sridhar, *Design and Analysis of Algorithms*, 3rd ed. India: Oxford University Press, 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 papers (Indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in Course Web page.

Course Patent: 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: 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): U18DS503 DESIGN AND ANALYSIS OF ALGORITHMS															
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	**U18DS503.1**	3	3	2	2	1	-	1	1	1	-	1	2	1	2
CO2	**U18DS503.2**	3	3	3	2	1	-	1	1	1	-	1	2	1	2
CO3	**U18DS503.3**	3	3	3	2	1	-	1	1	1	-	1	2	1	2
CO4	**U18DS503.4**	2	2	2	2	1	-	1	1	1	-	1	2	1	2
U18DS503		**2.75**	**2.75**	**2.5**	**2.5**	**2**	**-**	**1**	**1**	**1**	**-**	**1**	**2**	**1**	**2**

U18DS504 SOFTWARE ENGINEERING

Class: B.Tech. V-Semester **Branch:** Computer Science & Engineering (Data Science)

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 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 webapps, 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

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Text Books:

[1] Roger S.Pressman and Bruce R.Maxim, *Software Engineering: A Practitioner's Approach*, 8th ed., New Delhi: McGraw Hill, 2019. *(Chapters 1 to 5, 12, 13, 15, 22, 25, 30, 32, 34 and 35)*

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

Course Patent: 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: 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): U18DS504 SOFTWARE ENGINEERING															
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	**U18DS504.1**	1	1	1	1	-	-	-	1	1	2	1	2	1	2
CO2	**U18DS504.2**	1	1	1	1	-	-	-	1	1	2	1	1	1	2
CO3	**U18DS504.3**	2	2	1	1	-	1	-	1	1	2	1	2	1	2
CO4	**U18DS504.4**	2	2	2	1	-	1	-	1	1	2	1	2	1	2
U18DS504		**1.5**	**1.5**	**1.25**	**1**	**-**	**1**	**-**	**1**	**1**	**2**	**1**	**1.75**	**1**	**2**

U18DS505 COMPILER DESIGN

Class: B.Tech. V-Semester **Branch:** Computer Science & Engineering (Data Science)

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: 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

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Text Books:

[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 papers (Indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in Course Web page.

Course Patent: 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: 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): U18DS505 COMPILER DESIGN															
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	**U18DS505.1**	3	3	2	2	1	-	1	1	1	-	2	1	1	1
CO2	**U18DS505.2**	3	3	2	2	1	-	1	1	1	-	2	1	1	1
CO3	**U18DS505.3**	3	3	3	3	1	-	1	1	1	-	3	1	1	1
CO4	**U18DS505.4**	3	3	3	3	1	-	1	1	1	-	3	1	1	1
U18DS505		**3**	**3**	**2.5**	**2.5**	**1**	**-**	**1**	**1**	**1**	**-**	**2.5**	**1**	**1**	**1**

U18DS506 DATA WAREHOUSING AND DATA MINING

Class: B.Tech. V-Semester **Branch:** Computer Science & Engineering (Data Science)

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: data warehouse architecture, multidimensional modeling & preprocessing
LO2: algorithms for mining frequent patterns &associations rules
LO3: classification models and relevant evaluation techniques
LO4: clustering techniques and data mining applications on web, finance & retail business

UNIT-I (9)

Data Warehouse: Basic concepts, Multitier architecture, Data warehouse models, ETL tools, Metadata repository

Multidimensional Data Modeling: Data cube, Star, Snowflake and Fact constellation schemas, Dimensions, Measures, OLAP operations, Star net query model

Data Warehouse Implementation: Efficient data cube computation, Indexing OLAP, Efficient processing of OLAP queries, OLAP servers

Data Preprocessing: Data cleaning, Integration, Reduction and Transformation

UNIT-II (9)

Data Mining: Introduction, Types of data and patterns can be mined, Technologies Used, Applications Targeted, Major issues in data mining

Association Rule Mining: Basic concepts, Apriori algorithm, Generating association rules from frequent item sets, Improvements of Apriori algorithm, Patten-Growth approach, Mining frequent Item sets using vertical data format, Mining closed frequent item sets, Correlation analysis, Patten mining in multilevel and multidimensional space, Constraint based frequent pattern mining

UNIT-III (9)

Classification: Basic Concepts, Classification by decision tree induction, Bayesian classification, Rule based classification, Model evaluation and Selection

Advanced Classification: Classification by back propagation, Associative classification, K Nearest Neighbor classifiers, Rough set and Fuzzy set approaches

UNIT-IV (9)

Cluster Analysis: Introduction, Types of data in cluster analysis, Partitioning methods by K-Means and K-Medoids, Agglomerative versus Divisive hierarchical clustering, BIRCH Multiphase hierarchical clustering, Density based method with DBSCAN algorithm, Grid based method with STING, Evaluation of clusters, Outlier Analysis and detection methods, Why outlier analysis, Identifying and handling of outliers, Clustering-Based Outlier Detection.
Data Mining Trends: Mining sequence data, Web data mining, Data mining applications with Finance data analysis, Retail industry and Recommender systems

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Text Books:

[1] Jiawei Han, Micheline Kamber, *Data Mining Concepts and Techniques*, 3rd ed., Singapore: Morgan Kaufmann Publishers, 2016.

Reference Books:

[1] Sam Anahory, Dennis Murray, *Data warehousing in the real world*, New Delhi: Pearson Education, 2003.
[2] C.S.R.Prabhu, *Data Warehousing Concepts, Techniques, Products and Applications*, 2nd ed., New Delhi: Prentice-Hall of India, 2002.
[3] Arun K.Pujari, *Data Mining Techniques*, 2nd ed. Hyderabad: Universities press, 2010.

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

Course Patent: 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: design multi dimensional models & preprocessing strategies for data warehouses applications
CO2: apply frequent pattern mining techniques on data sets for association rules extraction
CO3: analyze efficiency of classification algorithms
CO4: evaluate clustering techniques and design data mining applications on web & financial domains.

Course Articulation Matrix (CAM): U18DS506 DATA WAREHOUSING AND DATA MINING														
Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	U18DS506.1	1	2	2	2	1	-	-	-	1	1	1	2	1	2
CO2	U18DS506.2	1	2	2	2	-	-	-	-	1	-	1	2	1	2
CO3	U18DS506.3	1	2	2	2	1	-	-	1	1	-	1	2	1	2
CO4	U18DS506.4	1	2	2	2	-	-	-	1	1	-	1	2	1	2
U18DS506		1	2	2	2	1	-	-	1	1	1	1	2	1	2

U18DS507 ADVANCED JAVA PROGRAMMINGLABORATORY

Class: B.Tech. V-Semester **Branch: C**omputer Science & Engineering (Data Science)

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: 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 component

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 inheritances in generics

Experiment-VI

1. Write a java program to perform following operations on ArrayList, LinkedList, HashSet and LinkedHashSet
    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 sorting 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 LaboratoryManual*, Prepared by 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, Student's 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

Course Articulation Matrix (CAM): U18DS507 ADVANCED JAVA PROGRAMMING LABORATORY															
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	**U18DS507.1**	2	2	2	1	2	-	1	2	1	-	2	3	1	3
CO2	**U18DS507.2**	2	2	2	1	-	-	1	2	1	-	2	3	1	2
CO3	**U18DS507.3**	2	2	2	1	2	-	1	2	1	-	2	3	3	3
CO4	**U18DS507.4**	2	2	2	1	-	-	1	2	1	-	2	3	1	2
U18DS507		**2**	**2**	**2**	**1**	**2**	**-**	**1**	**1**	**1**	**-**	**2**	**3**	**1.5**	**2.5**

U18DS508 DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY

Class: B.Tech. V-Semester **Branch:** Computer Science & Engineering (Data Science)

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: 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

1. Program to implement binary search algorithm
2. Program to implement min-max algorithm

Experiment-II

1. Program to implement merge sort algorithm
2. Program to implement quick sort algorithm

Experiment-III

1. Apply strassen's matrix multiplication to multiply following matrix

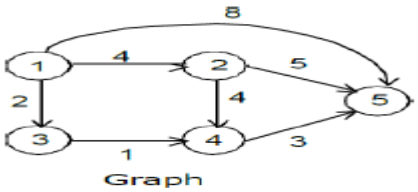
$$A=\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \qquad B=\begin{pmatrix} 2 & 1 \\ 4 & 3 \end{pmatrix}$$

Experiment-IV

1. Program to implement 0/1 knapsack problem
2. Program to implement Job sequencing with deadlines

Experiment-V

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

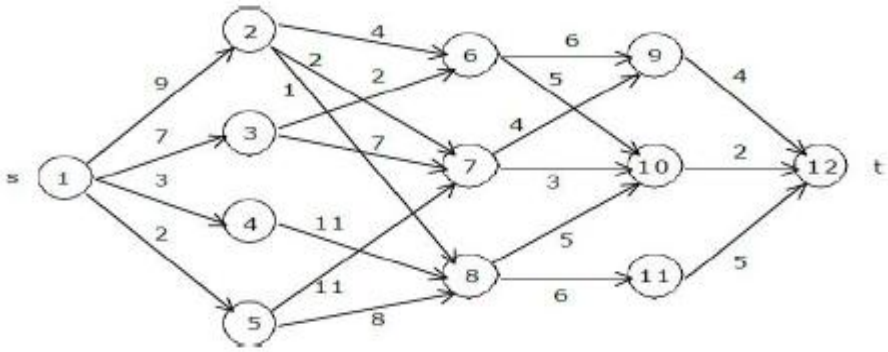
1. Program to implement sum of subsets

Experiment-VII

1. Implement Single source shortest paths using bellman ford algorithm

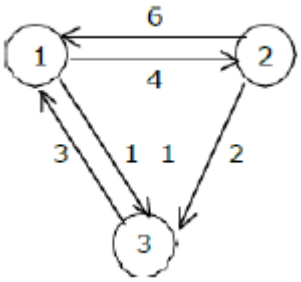
Experiment-VIII

1. Apply Multistage graph algorithm and find shortest path



Experiment-IX

1. Apply All pairs shortest paths algorithm and find shortest path



Experiment-X

1. Program to implement Optimal binary search trees

Experiment-XI

1. Apply travelling sales person algorithm using dynamic programming and find shortest path

$$\begin{pmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{pmatrix}$$

Experiment-XII

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*, Prepared by Dept. of CSE (AI & ML), 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, merge sort, quick sort 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): U18DS508 DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	U18DS508.1	3	3	2	2	1	-	1	1	1	-	1	2	1	2
CO2	U18DS508.2	3	3	3	2	1	-	1	1	1	-	1	2	1	2
CO3	U18DS508.3	3	3	3	2	1	-	1	1	1	-	1	2	1	2
CO4	U18DS508.4	2	2	2	2	1	-	1	1	1	-	1	2	1	2
U18DS508		**2.75**	**2.75**	**2.5**	**2**	**1**	**-**	**1**	**1**	**1**	**-**	**1**	**2**	**1**	**2**

U18DS509 DATA WAREHOUSING AND DATA MINING LABORATORY

Class: B.Tech. V-Semester **Branch: C**omputer Science & Engineering (Data Science)

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: designing data warehouse & OLAP operations
LO2: understanding ETL &OLAP tools
LO3: evaluating data processing techniques using WEKA tool
LO4: programming data mining techniques

List of Experiments

Experiment-I
1. SQL queries to implement multidimensional data models (Star, snowflake and Fact constellation schemes) using SQL queries

Experiment-II
1. SQL queries to implement Cube operations on multidimensional data models

Experiment-III
1. SQL queries to implement Set operations on multidimensional data models

Experiment-IV
1. Develop a data warehouse application for sales management using ETL tool

Experiment-V
1. Demonstrate OLAP operations using for sales data analytics using OLAP server

Experiment-VI
1. Demonstrate different options of handling missing values
2. Demonstrate elimination of data noise using various kinds of binning functions

Experiment-VII
1. Perform data preprocessing/analysis tasks using WEKA Tool
2. Write a program in any programming language to create a file in ARFF format consisting of at least 10,000 transactions with at least three items

Experiment-VIII

1. Write a program to implement Apriori algorithm for association rule mining
2. Generate association rules using Apriori and FP-Growth methods in WEKA Tool on German credit card dataset
3. Compare efficiency of Apriori and FP-Growth methods in WEKA Tool on German credit card dataset

Experiment-IX

1. Write a program to implement ID3 classification algorithm
2. Generate and compare different classification functions of WEKA Tool on German credit card dataset
3. Generate the significance of attributes Foreign worker and social status of German credit card dataset in classification process using WEKA Tool

Experiment-X

1. Generate and compare significance of Ten cross fold and Fifty cross fold options of testing data generation for classification using WEKA Tool
2. Generate and compare significance of Cross validation and boot strapping techniques of evaluation using WEKA Tool
3. Evaluate the significance of attributes Foreign worker and social status of German credit card dataset using cross validation techniques of WEKA Tool

Experiment-XI

1. Write a program to implement simple K-means Clustering algorithm using WEKA Tool
2. Generate and compare different clustering functions of WEKA Tool on German credit card dataset
3. Generate the significance of attributes Foreign worker and social status of German credit card dataset in clustering process using WEKA Tool

Experiment-XII

1. Perform data visualization of German credit card dataset using R-Open Tool
2. Generate synthetic data set and evaluate different classification algorithms using R-Open Tool
3. Evaluate on different clustering algorithms on synthetic dataset using R-Open Tool

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Laboratory Manual:

[1] *Data Warehousing and Data Mining Laboratory Manual*, Prepared by Dept. of CSE (AI & ML), KITSW

Text Book:

[1] Jiawei Han, Micheline Kambler, *Data Mining Concepts and Techniques*, 3rd ed., Singapore: Morgan Kaufmann Publishers, 2016.

Course Learning Outcomes (COs):

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

CO1: design data warehouse and implement OLAP operations
CO2: apply ETL &OLAP tools for data analysis
CO3: evaluate different data processing techniques using WEKA tool
CO4: implement data mining techniques on various data sets

Course Articulation Matrix (CAM): U18DS509 DATA WAREHOUSING AND DATA MINING LABORATORY														
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	**U18DS509.1**	1	2	2	2	1	-	-	1	1	1	1	2	2	2
CO2	**U18DS509.2**	1	2	2	2	-	-	-	1	1	-	1	2	2	2
CO3	**U18DS509.3**	1	2	2	2	1	-	-	1	1	-	1	2	2	2
CO4	**U18DS509.4**	1	2	2	2	-	-	-	1	1	1	1	2	2	2
U18DS509		**1**	**2**	**2**	**2**	**1**	**-**	**-**	**1**	**1**	**1**	**1**	**2**	**2**	**2**

U18DS510 SEMINAR

Class: B.Tech. V-Semester **Branch:** Computer Science & Engineering (Data Science)

Teaching Scheme :

L	T	P	C
-	-	2	1

Examination Scheme :

Continuous Internal Evaluation	100 marks
End Semester Examination	-

Course Learning Objectives(LOs):

This course will develop student's knowledge in/on…
LO1: selecting topic, referring to peer reviewed journals / technical magazines / conference proceedings
LO2: literature review and well-documented report writing
LO3: creating PPTs and effective technical presentation
LO4: preparing a technical paper in scientific journal style & format

Student has to give independent seminar on the state-of-the-art technical topics relevant to their program of study, which would supplement and complement the program assigned to each student.

Guidelines:

1. The HoD shall constitute a Department Seminar Evaluation Committee (DSEC)
2. 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
3. There shall be only Continuous Internal Evaluation (CIE) for seminar
4. 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 student to appear for oral presentation and viva-voce to qualify for course evaluation

(a) **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
(b) **Report:** Each student is required to submit a well-documented report on the chosen seminar topic as per the format specified by DSEC.
(c) **Anti-Plagiarism Check:** The seminar report should clear plagiarism check as per the Anti-Plagiarism policy of the institute.

(d) **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

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

(f) i) The CoE shall send a list of students 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

Course Learning Outcomes (COs):

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

CO1: select current topics in their engineering discipline & allied areas from peer reviewed journals / technical magazines/ conference proceedings

CO2: demonstrate the skills for performing literature survey, identify gaps, analyze the technical content and prepare a well-documented seminar report

CO3: create informative PPT and demonstrate communication skills through effective oral presentation showing knowledge on the subject & sensitivity towards social impact of the seminar topic

CO4: write a "seminar paper" in scientific journal style & format from the prepared seminar report

Course Articulation Matrix (CAM): U18DS510 SEMINAR															
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	**U18DS510.1**	1	1	-	1	1	1	2	2	2	1	2	1	1	1
CO2	**U18DS510.2**	1	1	-	-	-	-	2	2	2	-	2	1	1	1
CO3	**U18DS510.3**	-	-	-	-	-	1	2	2	2	-	2	1	1	1
CO4	**U18DS510.4**	-	-	-	-	-	-	2	2	2	-	2	1	1	1
U18DS510		1	1	-	1	1	1	2	2	2	1	2	1	1	1

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL– 15
(AnAutonomousInstituteunderKakatiyaUniversity,Warangal)

URR-18R23

SCHEMEOFINSTRUCTION&EVALUATION
VI-SEMESTEROF4-YEARB.TECHDEGREEPROGRAM

[6Th+3P+Miniproject]

Sl. No	Category	CourseCode	CourseTitle	Periods/week			Credits	Evaluationscheme				
								CIE			ESE	Total Marks
				L	T	P	C	TA	MSE	Total		
1	HSMC	U18TP601	QuantitativeAptitude&LogicalReasoning	2	-	-	1	10	30	40	60	100
2	HSMC	U18MH602	ManagementEconomicsandAccountancy	3	-	-	3	10	30	40	60	100
3	PE	U18DS603	ProfessionalElective-II/MOOC-II	3	-	-	3	10	30	40	60	100
4	PCC	U18DS604	BigDataAnalytics	3	-	-	3	10	30	40	60	100
5	PCC	U18DS605	MachineLearning	3	-	-	3	10	30	40	60	100
6	PCC	U18DS606	RProgramming	3	1	-	4	10	30	40	60	100
7	PCC	U18DS607	BigDataAnalyticsLaboratory	-	-	2	1	40	-	40	60	100
8	PCC	U18DS608	MachineLearningLaboratory	-	-	2	1	40	-	40	60	100
9	PCC	U18DS609	RprogrammingLaboratory	-	-	2	1	40	-	40	60	100
10	PROJ	U18DS610	MiniProject	-	-	2	1	100	-	100	-	100
Total:				17	1	8	21	280	180	460	540	1000
***AdditionalLearning*:** *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] **TotalContactPeriods/Week:26** **TotalCredits:21**

ProfessionalElective-II/MOOC-II:
U18DS603A: Computer Vision and Image Processing
U18DS603B: Information Retrieval Systems
U18DS603C: Soft Computing
U18DS603M:MOOCsCourse

U18TP601 QUANTITATIVE APTITUDE & LOGICAL REASONING

Class:B.Tech. VI-Semester **Branch:**Computer Science & Engineering (Data Science)

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: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 (9)

Quantitative Aptitude-I: Number system, Averages, Percentages, Ratios & proportions, Time, Speed &distance, Time and work, Data interpretation

UNIT-II (9)

Quantitative Aptitude-II: Simple Interest, Compound Interest, Profit & loss, Ages, Permutations &Combinations, Probability

UNIT-III (9)

Logical Reasoning-I: Series completion, Analogy, Coding and decoding, Blood relations, Number, Ranking & Time sequence test, Linear & Circular arrangements

UNIT-IV (9)

Logical Reasoning-II: Data sufficiency, Logical Venn diagram, Syllogisms, Statement & Arguments, Statement & Assumptions, Direction sense test

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Text Book:

[1] R S Agarwal, *Quantitative Aptitude for Competitive Examinations*, 3rd ed., New Delhi: S. Chand Publications, 2019. *(Chapters 1,6,7,8,10,11,12,15,17,21,22,30,31)*
[2] R S Agarwal, *A Modern Approach to Verbal and Non-Verbal Reasoning*, 3rd ed., New Delhi: 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 papers (Indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in Course Web page.

Course Patent: 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: solve arithmetic relationships and interpret data using mathematical models
CO2:compute abstract quantitative information
CO3: apply basic mathematics & critical thinking skillsto 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 & LOGICAL REASONING

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	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.Tech. VI-Semester **Branch:**Computer Science & Engineering (Data Science)

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: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 andextrinsic), 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 Text1)

UNIT-II (9)

Economics: Meaning and definition, Scope, Micro and Macro Economics, Methods ofEconomics, 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 papers (Indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in Course Web page.

Course Patent: 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: 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):U18MH602 MANAGEMENT ECONOMICS AND ACCOUNTANCY														
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**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**	**1.25**	**1**	**1**	**1**	**-**	**-**

U18DS603ACOMPUTER VISION AND IMAGE PROCESSING

Class:B.Tech. VI-Semester **Branch:**Computer Science & Engineering (Data Science)

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 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)

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)

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)

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)

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

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Text Books:

[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 papers (Indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in Course Web page.

Course Patent: 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: 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): U18DS603A COMPUTER VISION AND IMAGE PROCESSING															
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	**U18DS603A.1**	2	2	2	2	1	-	1	1	1	-	1	1	1	1
CO2	**U18DS603A.2**	3	3	3	3	1	-	1	1	1	-	3	1	1	1
CO3	**U18DS603A.3**	3	3	3	3	1	-	1	1	1	-	3	1	1	1
CO4	**U18DS603A.4**	3	3	3	3	1	-	1	1	1	-	3	1	1	1
U18DS603A		**2.75**	**2.75**	**2.75**	**2.75**	**1**	**-**	**1**	**1**	**1**	**-**	**2.5**	**1**	**1**	**1**

U18DS603BINFORMATION RETRIEVAL SYSTEMS

Class:B.Tech. VI-Semester **Branch:**Computer Science & Engineering (Data Science)

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: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, 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*, 2nd ed., Kluwer Academic Publishers (Springer Publisher), ISBN-10: 058532090X, ISBN-13: 9788181284976, 2009.

Reference Books:

[1] Ricardo Baeza-Yates, Berthier Ribeiro-Neto, *Modern Information Retrieval*, 1st ed., Addison Wesley Publication, ISBN-10: 020139829X, ISBN-13: 9780321416919, 2011.

[2] Christopher D. Manning, Prabhakar Raghavan, Hinrich Schutze, *Introduction to Information Retrieval*, 1st ed., Cambridge University Press, ISBN-10: 0521865719, ISBN-13: 978-0521865715, 2008.

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

Course Patent: 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: apply all the IRS capabilities and perform information extraction operation usingcataloging and indexing

CO2:identify suitable data structure and indexing mechanism for manual and automaticclustering

CO3: choose index to define the searchable concepts that represent the items received by asystem and viewing the results of a search using a hierarchical paradigm

CO4:select appropriate search algorithm, apply different measures for evaluation andcompare the measurement results of the designed IRS system

Course Articulation Matrix(CAM):U18DS603B INFORMATION RETRIEVAL SYSTEMS															
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	**U18DS603B.1**	2	1	1	-	-	-	1	-	1	-	-	1	-	-
CO2	**U18DS603B.2**	1	1	2	1	-	-	1	-	1	-	2	2	1	-
CO3	**U18DS603B.3**	1	2	1	2	1	-	1	-	1	-	2	2	2	1
CO4	**U18DS603B.4**	2	2	2	2	1	-	1	-	1	-	2	2	2	2
U18DS603B		**1.5**	**1.5**	**1.5**	**1.6**	**1**	**-**	**1**	**-**	**1**	**-**	**2**	**1.75**	**1.66**	**1.5**

U18DS603CSOFT COMPUTING

Class:B.Tech. VI-Semester **Branch:**Computer Science & Engineering (Data Science)

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: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 ComputingCharacteristics

Genetic Programming: Introduction to Genetic Programming (GP) – Applications of GP- Other Evolutionary computing methods such as Ant Colony Optimization and SwarmOptimization

UNIT-II (9)

Neural Networks: Adaptive Networks – Architecture- Backpropagation for Feed ForwardNetworks –Recurrent Neural Networks

Supervised Learning Neural Networks: Perceptron -Adaline- Backpropagation forMultilayer erceptron-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 FuzzyReasoning – Fuzzy Inference Systems

UNIT-IV (9)

Neuro-Fuzzy Modeling: Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-FuzzyModeling – Classification and Regression Trees – Data Clustering Algorithms – Rule basedStructure Identification

Text Books:

[1] Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani, *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 papers (Indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in Course Web page.

Course Patent: 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: identify the differences between conventional AI and computational Intelligence and apply geneticprogramming to solve optimization problems

CO2:apply supervised learning concepts to design neural networks that provide robust solutions forclassification and predictive analysis

CO3: design fuzzy inference system for data classification and decision analysis using fuzzy logic, fuzzyrules and fuzzy reasoning

CO4:design neuro fuzzy models for feature extraction, solving classification and regression problems

Course Articulation Matrix(CAM):U18DS603C SOFT COMPUTING															
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	**U18DS603C.1**	2	2	2	2	1	-	1	1	1	-	1	1	1	1
CO2	**U18DS603C.2**	2	2	2	2	1	-	1	1	1	-	1	1	1	1
CO3	**U18DS603C.3**	3	2	3	3	1	-	1	1	1	-	1	1	1	1
CO4	**U18DS603C.4**	3	2	3	3	1	-	1	1	1	-	1	1	1	1
U18DS603C		**2.5**	**2**	**2.5**	**2.5**	**1**	**-**	**1**	**1**	**1**	**-**	**1**	**1**	**1**	**1**

U18DS604BIG DATA ANALYTICS

Class:B.Tech. VI-Semester **Branch:**Computer Science & Engineering (Data Science)

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 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

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

Course Patent: 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: 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):U18DS604 BIG DATA ANALYTICS															
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	**U18DS604.1**	2	2	1	1	1	-	1	1	1	-	1	2	1	2
CO2	**U18DS604.2**	2	2	2	1	1	-	1	1	1	-	1	2	1	2
CO3	**U18DS604.3**	2	2	2	2	1	-	1	1	1	-	2	2	1	2
CO4	**U18DS604.4**	2	2	2	2	2	-	1	1	1	-	2	2	2	2
U18DS604		**2.75**	**2.75**	**2.5**	**2.5**	**2**	**-**	**1**	**1**	**1**	**-**	**1.5**	**2**	**1.25**	**2**

U18DS605MACHINELEARNING

Class:B.Tech. VI-Semester **Branch:**Computer Science & Engineering(Data Science)

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: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 machinelearning, 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 componentsanalysis (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 machinealgorithm, Extensions to the SVM
Case Study: Disease prediction using SVM

UNIT-III (9)

Artificial Neural Networks: Introduction, Neural network representation, Appropriateproblems for neural network learning, Perceptron, Multilayer networks and the backpropagation 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 theMLP, 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 andQ-Learning, Uses of Reinforcement learning
Ensemble Learning: Boosting, Bagging, Random forests, Different ways to combineclassifiers
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] StephenMarsland, Taylor & Francis, *Machine Learning: An Algorithmic Perspective*, CRC, ISBN -13: 978-1420067187, 2009.

Reference Books:

[1] Tom M. Mitchell, *Machine Learning*, Indian Edition, MGH, 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*, 1st ed., John Wiley & Sons, 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 papers (Indexed Journals/conference papers) relevant to the course content will be posted by the course faculty in Course Web page.

Course Patent: 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: 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: analyze the 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):U18DS605 MACHINE LEARNING															
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	**U18DS605.1**	2	2	2	3	3	2	1	1	1	-	2	2	2	2
CO2	**U18DS605.2**	3	3	3	2	2	2	1	1	1	-	2	3	2	3
CO3	**U18DS605.3**	2	2	2	3	3	1	1	1	1	-	2	2	2	3
CO4	**U18DS605.4**	3	2	3	3	3	2	1	1	1	-	2	3	2	3
U18DS605		**2.5**	**2.5**	**2.5**	**2.75**	**2.75**	**1.75**	**1**	**1**	**1**	**-**	**2**	**2.5**	**2**	**2.75**

U18DS606R PROGRAMMING

Class:B.Tech. VI-Semester **Branch:**Computer Science & Engineering (Data Science)

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 student's knowledge in/on…
LO1:understand the fundamentals of R Programming in terms of vectors and matrices
LO2:comprehend the working of arrays, lists, data frames and tables
LO3:familiarize with the control statements , object oriented programming and I/O concepts
LO4: perform string manipulation and interfacing with R

UNIT-I (9+3)

Vectors in R: Introduction to R, R Data Structures, Help functions in R, Vectors, Scalars, Declarations, Recycling, Common vector operations, Using all and any, Vectorised operations, NA and NULL values, Filtering, Vectorised if-then else, Vector Equality, Vector element names

Matrices: Creating matrices, Matrix operations, Applying functions to matrix rows and columns, Adding and deleting rows and columns, Vector/Matrix Distinction

UNIT-II (9+3)

Arrays and Lists: Avoiding dimension reduction, Higher dimensional arrays, lists, Creating lists, General list operations, Accessing list components and values, Applying functions to lists, Recursive lists

Data Frames and Tables: Creating data frames, Matrix-like operations in frames, Merging data frames, Applying functions to data frames, Factors and tables, factors and levels, Common functions used with factors, Working with tables, Other factors and table related functions

UNIT-III (9+3)

Control Statements: Control statements, Arithmetic and boolean operators and values, Default values for arguments, Returning boolean values, Functions are objects, Environment and scope issues, Writing upstairs, Recursion, Replacement functions, Tools for composing function code, Math and simulations in R

Object Oriented Programming and I/O: S3 Classes, S4 Classes, S3 Vs S4 classes, Managing Objects, Accessing keyboard and monitor, Reading and writing files, Accessing the internet

UNIT-IV (9+3)

String Manipulation and Graphics: String manipulation, Graphics, Creating graphs, Customizing graphs, Saving graphs to files, Creating three-dimensional plots

Interfacing: Interfacing R to other languages, Parallel R, Basic statistics, Linear model, Generalized linear models, Non-linear models, Time series and auto-correlation, Clustering

Case Study: Health care, Retail and finance real time applications using R Programming

Text Books:

[1] Norman Matloff , *The Art of R Programming: A Tour of Statistical Software Design*, No Starch Press, 2011.
[2] K.G. Srinivas, GM Siddesh and Chethan Shetty, B J Sowmya *Statistical Programming in R*, Oxford University Press, 2017.

Reference Books:

[1] Zumel, N., Mount, J., &Porzak, J., *Practical data science with R*, 2nd ed., Shelter Island, NY: Manning, 2019.
[2] Wickham, H. & Grolemund, G., *R for Data Science*. O'Reilly, New York, 2018.
[3] Roger D. Peng, *R programming for data science,* Lean pub, 2016. *(pp. 86-181)*

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

Course Patent: 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 vectors and matrices for writing R programs
CO2:develop programs using arrays, lists, data frames and tables
CO3: apply object oriented programming concepts and perform I/O
CO4:design systems by interfacing R with other programming

Course Articulation Matrix(CAM):U18DS606 R PROGRAMMING															
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	**U18DS606.1**	2	2	2	2	2	1	1	1	1	-	2	3	3	3
CO2	**U18DS606.2**	2	2	2	2	2	1	1	1	1	-	2	3	3	3
CO3	**U18DS606.3**	2	2	2	2	2	1	1	1	1	-	2	3	3	3
CO4	**U18DS606.4**	2	2	2	2	2	1	1	1	1	-	2	3	3	3
U18DS606		**2**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**-**	**2**	**3**	**3**	**3**

U18DS607 BIG DATA ANALYTICS LABORATORY

Class: B.Tech. VI-Semester **Branch: C**omputer Science & Engineering (Data Science)

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: Demonstrate the ability to use big data frameworks such as Hadoop and Spark for distributed data processing and analysis

LO2: Apply data preprocessing techniques and query tools like Hive and Pig to manage and analyze large datasets

LO3:Design and implement scalable algorithms for machine learning and statistical analysis on big data platforms

LO4: Create meaningful visualizations and generate insightful reports to support data-driven decision making

List of Experiments

Experiment-I

1. Install, configure, and run Hadoop and HDFS.
2. Use HDFS commands to interact with files: copyFromLocal, ls, cat, mkdir, delete, get
3. Understand HDFS file storage, block size, and replication
4. Perform file operations such as uploading, reading, and deleting files in HDFS

Experiment-II

1. Implement Frequent Item set algorithm using Map-Reduce
2. Implement a MapReduce program that processes a dataset
3. Implement MapReduce jobs using YARN

Experiment-III

1. Implement column databases using Cassandra

Experiment-IV

1. Implement basic Hive commands: CREATE, SELECT, INSERT, LOAD
2. Implement tables, partitions, and HiveQL

Experiment-V

1. Perform basic operations such as creating tables, inserting, updating, and deleting data in HBase

Experiment-VI

1. Use MongoDB Hadoop Connector to integrate MongoDB with Hadoop
2. Ingest and retrieve data between MongoDB and HDFS using MapReduce jobs
3. Perform data operations (such as querying and updating) on MongoDB from within a Hadoop job

Experiment-VII
1. Import/export data between Hadoop and relational databases using Sqoop

Experiment-VIII
1. Set up a Flume agent to capture log data from a source (e.g., syslog) and store it in HDFS

Experiment-IX
1. Execute workflows to run a series of MapReduce, Hive, and other jobs using Oozie

Experiment-X
1. Write and execute Pig Latin scripts for data transformation
2. Implement Pig's built-in functions and operators for data processing

Experiment-XI
1. Run Spark jobs using Spark Context and work with RDDs (Resilient Distributed Datasets)
2. Integrate Spark with Hadoop's HDFS for distributed data processing

Experiment-XII
1. Set up Kafka producers and consumers
2. Integrate Kafka with Hadoop to ingest and process streaming data

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Laboratory Manual:

[1] *Big Data Analytics LaboratoryManual*, Prepared by Dept. of CSE (AI & ML), KITSW

Reference Books:

[1] Tom White, *Hadoop: The Definitive Guide*, 4th ed., O'Reilly Media, 2015.

[2] Jeff Carpenter and Eben Hewitt, *Apache Cassandra: The Definitive Guide*, 2nd ed., O'Reilly Media, 2016.

Course Learning Outcomes(COs):

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

CO1: understand and apply the core principles of big data technologies like Hadoop, Spark, and NoSQL databases to process and analyze large datasets efficiently

CO2:develop skills in using distributed computing frameworks such as MapReduce, YARN, and Spark to handle real-time and batch processing tasks in a big data environment

CO3: design and implement data models and queries using tools like Hive, Pig, and Cassandra for storing and retrieving big data in a distributed storage system

CO4: evaluate the performance of big data processing algorithms and optimize them for large-scale data analysis, ensuring scalability and fault tolerance in real-world applications

Course Articulation Matrix(CAM):U18DS607 BIG DATA ANALYTICS LABORATORY															
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	**U18DS607.1**	2	2	2	1	2	-	1	2	1	-	2	3	1	3
CO2	**U18DS607.2**	2	2	2	1	-	-	1	2	1	-	2	3	1	2
CO3	**U18DS607.3**	2	2	2	1	2	-	1	2	1	-	2	3	3	3
CO4	**U18DS607.4**	2	2	2	1	-	-	1	2	1	-	2	3	1	2
U18DS607		**2**	**2**	**2**	**1**	**2**	**-**	**1**	**1**	**1**	**-**	**2**	**3**	**1.5**	**2.5**

U18DS608 MACHINE LEARNING LABORATORY

Class: B.Tech. VI-Semester **Branch: C**omputer Science & Engineering (Data Science)

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: 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

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

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

1. Implement prediction of lung pneumonia disease to demonstrate multi label classification

Experiment-IV

1. Implement Linear discriminant analysis (LDA) using an appropriate binary dataset

Experiment-V

1. Implement Independent components analysis (ICA) on any appropriate data set
2. Implement Principal components analysis (PCA) on any appropriate data set

Experiment-VI

1. Implement logistic regression on any appropriate data set

Experiment-VII

1. Implement linear regression on any appropriate data set

Experiment-VIII

1. Build linear SVM model for any appropriate data set
2. Build anon linear SVM model for any appropriate data set

Experiment-IX

1. Build a Multi layer perceptron network for handwritten digit recognition

Experiment-X

1. Build an Artificial Neural Network by implementing the back propagation algorithm and test the same using appropriate data sets

Experiment-XI

1. Implement Recommendation system using reinforcement learning

Experiment-XII

1. Build an ensemble classifier for disease prediction and tune the model using hyper parameter optimization

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Laboratory Manual:

[1] *Machine Learning LaboratoryManual*, Prepared by 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*, Indian Edition, MGH, ISBN 1259096955, 2013.

[2] S. Russell and P. Norvig, *Artificial Intelligence – A Modern Approach*, 2nd ed., PearsonEducation, ISBN: 978-0137903955, 2003.

[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, Student's 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):U18DS608 MACHINE LEARNING LABORATORY

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	**U18DS608.1**	2	2	2	3	3	2	1	1	1	-	2	2	2	2
CO2	**U18DS608.2**	3	3	3	2	2	2	1	1	1	-	2	3	2	3
CO3	**U18DS608.3**	2	2	2	3	3	1	1	1	1	-	2	2	2	3
CO4	**U18DS608.4**	3	2	3	3	3	2	1	1	1	-	2	3	2	3
U18DS608		**2.5**	**2.5**	**2.5**	**2.75**	**2.75**	**1.75**	1	1	1	-	2	**2.5**	**2**	**2.75**

U18DS609 R PROGRAMMING LABORATORY

Class: B.Tech. VI-Semester **Branch: C**omputer Science & Engineering (Data Science)

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 R programming such as vectors and matrices
LO2: concepts such as arrays, lists, data frames and tables in R
LO3:object oriented programming and I/O with R
LO4: string manipulation and interfacing using R

List of Experiments

Experiment-I
1. Installation of R-Programming environment and basic packages
2. Develop R programs using data types, variables and operators

Experiment-II
1. Implement common vector operations in R
2. Implement matrix operations in R

Experiment-III
1. Given two numeric vectors, a = c(10, 20, 30) and b = c(1, 2, 3), perform the following operations:
   i)Addition
   ii)Subtraction
   iii)Multiplication
   iv)Division
2. Create a 3x3 matrix using rbind() and cbind() functions and perform the following operations
   i)Adding and deleting rows and columns
   ii)Extract the element at the 2nd row and 3rd column
   iii)Replace the element at the 1st row and 1st column of a matrix with 10

Experiment-IV
1. Write a R program to implement multi-dimensional array operations
2. Write a R program to perform below list operations
   i)accessing list components and values
   ii)apply functions to lists
   iii)apply functions to recursive lists

Experiment-V

1. Write a R program to implement matrix-like operations in frames and merging data frames
2. Write a R program to implement factors ,levels and tables

Experiment-VI

1. Create a data frame and perform the following operations
   i)Accessing Data Frame Elements
   ii)Adding and Removing Columns
   iii)Filtering Rows
2. Create a table and perform the following operations
   i)Converting a Data Frame to a Table
   ii)Creating a Contingency Table
   iii)Manipulating the tables

Experiment-VII

1. Write an R program to check if a number is a perfect number. A perfect number is a number whose sum of factors (excluding itself) equals the number itself. Example: 6 is perfect because 1 + 2 + 3 = 6.
2. Write an R program to simulate rolling a dice 10 times. Use a loop to generate random numbers between 1 and 6, and print the result of each roll
3. Write an R program to generate a random password of length 12 using letters, numbers, and special characters

Experiment-VIII

1. Write an R program to simulate a random walk for 20 steps, where each step is either +1 or -1. Print the final position
2. Write an R program to shuffle a deck of 52 cards and deal 5 cards. Represent cards as combinations of ranks and suits
3. Write an R program to simulate the Monty Hall problem 1000 times. Compare the win rates when the player switches doors versus when they don't

Experiment-IX

1. Create an S3 class called Shape with a type attribute (circle, square). Write a generic function area() that calculates the area based on the shape type(method dispatch)
2. Create an S3 class Employee that inherits from Person. Add an additional attribute, salary. Write a method to display the employee's details.(inheritance)
3. Create an S4 class called Vehicle with slots: brand (character), year (numeric). Write a method to display the vehicle's details. Add a validation function to ensure year is non-negative in the Vehicle class

Experiment-X

1. Write a R program to implement the below I/O operations
   i)Reading and Writing Files
   ii)Working with Text Files
      a)Saving R Objects
      b)Custom Logging
      c)Reading JSON files

2. Write a R program to implement operating relating to the internet access
   i)Fetching a web page
   ii)Downloading a file
   iii)Making an API call
   iv)Posting data to an API
   v)Scraping data from a website

Experiment-XI

1. Write R Programs for String manipulation
   i)Creation ad concatenation of strings
   ii)Pattern matching and regular expressions
   iii)Splitting and Joining strings
2. Write a R program to perform advanced string manipulations operations using Stringr package

Experiment-XII

1. Write a R program to implement input and output data visualization using graphs
2. Write a R program for performing analytics of a linear model

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Laboratory Manual:

[1] *R Programming Laboratory Manual*, Prepared by Dept. of CSE (AI & ML), KITSW

Text Book:

[1] Norman Matloff , *The Art of R Programming: A Tour of Statistical Software Design*, No Starch Press, 2011.

[2] Wickham, H. & Grolemund, G., *R for Data Science*. O'Reilly, New York, 2018.

Reference Book:

[1] Zumel, N., Mount, J., &Porzak, J., *Practical data science with R*, 2nd ed., Shelter Island, NY: Manning, 2019.

[2] Roger D. Peng, *R programming for data science,* Lean pub, 2016. *(pp. 86-181)*

Course Learning Outcomes(COs):

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

CO1: develop R programs using vectors and matrices
CO2:make use of arrays, lists, data frames and tables of R for writing programs
CO3: develop R programs to implement object oriented programming and I/O operations
CO4:design R programs for String manipulation and interfacing

Course Articulation Matrix (CAM):U18DS609 R PROGRAMMING LABORATORY														
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	**U18DS609.1**	2	1	1	1	1	1	1	2	1	-	2	2	1	2
CO2	**U18DS609.2**	2	2	2	2	1	1	1	2	1	-	2	2	1	2
CO3	**U18DS609.3**	2	2	2	2	2	1	1	2	1	-	2	2	2	2
CO4	**U18DS609.4**	2	2	2	2	2	1	1	2	1	-	2	2	2	2
U18DS609		**2**	**1.75**	**1.75**	**1.75**	**1.5**	**1**	**1**	**2**	**1**	**-**	**2**	**2**	**1.5**	**2**

U18DS610MINI PROJECT

Class:B.Tech. VI-Semester **Branch:**Computer Science & Engineering (Data Science)

Teaching Scheme :

L	T	P	C
-	-	2	1

Examination Scheme :

Continuous Internal Evaluation	100 marks
End Semester Examination	-

Course Learning Objectives(LOs):

This course will develop student's knowledge in/on…
LO1:implementing a project independently by applying knowledge to practice
LO2:literature review and well-documented report writing
LO3:creating PPTs and effective technical presentation skills
LO4: writing technical paper in scientific journal style & format and creating video pitch

Student has to take up independent mini project on innovative ideas, innovative solutions to common problems using their knowledge relevant to courses offered in their program of study, which would supplement and complement the program assigned to each student.

Guidelines:

1. The HoD shall constitute a Department Mini Project Evaluation Committee (DMPEC)
2. 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
3. There shall be only Continuous Internal Evaluation (CIE) for mini project
4. The CIE for seminar 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 student to appear for oral presentation and viva-voce to qualify for course evaluation

(a) 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

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

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

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

(e) 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

(f) 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

(g) The student has to register for the Mini project as supplementary examination in the following cases:
i) he/she is absent for oral presentation and viva-voce
ii) he/she fails to submit the report in prescribed format
iii) he/she fails to fulfill the requirements of Mini project evaluation as per specified guideline

(h) i) The CoE shall send a list of students registered for supplementary to the HoD concerned
ii) The DSEC, duly constituted by the HoD, shall conduct Mini project evaluation and send the award list to the CoE within the stipulated time

(i) i) The DSEC, duly constituted by the HoD, shall conduct Mini project evaluation and send the award list to the CoE within the stipulated time

Course Learning Outcomes(COs):

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

CO1: apply knowledge to practice to design & conduct experiments and utilize modern tools for developing working models / process / system leading to innovation & entrepreneurship

CO2:demonstrate the competencies to perform literature survey, identify gaps, analyze the problem and prepare a well documented Mini project report

CO3: make an effective oral presentation through informative PPTs, showing knowledge on the subject & sensitivity towards social impact of the Mini project

CO4:Write a Mini Project Paper" in scientific journal style & format the Prepared Mini Project report and create a video pitch on Mini Project

Course Articulation Matrix(CAM):U18DS610 MINI PROJECT															
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	**U18DS610.1**	1	1	2	2	1	1	2	2	2	1	2	2	2	2
CO2	**U18DS610.2**	1	1	-	2	-	-	2	2	2	-	2	2	2	2
CO3	**U18DS610.3**	-	-	-	-	-	1	2	2	2	-	2	2	2	2
CO4	**U18DS610.4**	-	-	-	-	-	-	2	2	2	-	2	2	2	2
U18DS610		1	1	2	2	1	1	2	2	2	1	2	2	2	2