

Revised Curriculum Structure
(to be effective from 2018-19 admission batch)

Department: Information Technology

Curriculum for B. Tech

Under Autonomy (GR A: ECE, EE, EIE, BME; GR B: CSE, IT, ME, CE, FT)

1 st Semester								
				Contact Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	BS	M 101	Mathematics -I	3	1	0	4	4
2	BS	CH 101/ PH 101	Chemistry (Gr. A) / Physics- I (Gr. B)	3	0	0	3	3
3	ES	EE 101/ EC 101	Basic Electrical Engineering (Gr. A) / Basic Electronics Engineering (Gr. B)	3	0	0	3	3
4	HS	HU 101	English	2	0	0	2	2
Total of Theory							12	12
B. PRACTICAL								
5	BS	CH 191/ PH191	Chemistry Lab (Gr. A) / Physics- I Lab (Gr. B)	0	0	3	3	1.5
6	ES	EE 191/ EC 191	Basic Electrical Engineering Lab (Gr. A) / Basic Electronics Engineering Lab (Gr. B)	0	0	3	3	1.5
7	ES	ME 191/ ME 192	Engineering Graphics & Design (Gr A) / Workshop / Manufacturing Practices (Gr-B)	0	0	3	3	1.5
8	PROJ	PR 191	PROJECT-IA	0	0	1	1	0.5
9	PROJ	PR 192	PROJECT-IB	0	0	1	1	0.5
C. MANDATORY ACTIVITIES / COURSES								
10	MC	MC 181	Induction Program	0	0	0	0	
Total of Theory, Practical & Mandatory Activities/Courses							22	17.5

2 nd Semester								
				Credit Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	BS	M 201	Mathematics -II	3	1	0	4	4
2	BS	CH 201/ PH 201	Chemistry - (Gr. B) / Physics – I (Gr. A)	3	0	0	3	3
3	ES	EE 201/ EC 201	Basic Electrical Engineering (Gr. B) / Basic Electronics Engineering (Gr. A)	3	0	0	3	3
4	ES	CS 201	Programming for Problem Solving	3	0	0	3	3
5	ES	ME 201	Engineering Mechanics	3	0	0	3	3
Total of Theory							16	16
B. PRACTICAL								
6	ES	CS291	Programming for Problem Solving Lab	0	0	3	3	1.5
7	BS	CH 291/ PH 291	Chemistry Lab (Gr. B) / Physics - I Lab (Gr. A)	0	0	3	3	1.5
8	ES	EE 291/ EC 291	Basic Electrical Engineering Lab (Gr. B) / Basic Electronics Engineering Lab (Gr. A)	0	0	3	3	1.5
9	ES	ME 291/ ME 292	Engineering Graphics & Design (Gr B) / Workshop/Manufacturing Practice (Gr-A)	0	0	3	3	1.5
10	HS	HU 291	Language Lab	0	0	2	2	1
11	PROJ	PR 291	Project-II	0	0	1	1	0.5
12	PROJ*	PR 292	Innovative activities-I	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
13	MC	MC 281	NSS/ Physical Activities/Meditation & Yoga/Photography/ Nature Club	0	0	0	3	
Total of Theory, Practical & Mandatory Activities/Courses							34	24.0

* Inter/ Intra Institutional Activities viz; Training with higher Institutions; Soft skill training organized by Training and Placement Cell of the respective institutions; contribution at incubation/ innovation /entrepreneurship cell of the institute; participation in conferences/ workshops/ competitions etc.; Learning at Departmental Lab/ Tinkering Lab/ Institutional workshop; Working in all the activities of Institute's Innovation Council for eg: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc. (evaluation by Programme Head through certification)

Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

3rd Semester									
SL No	Type	Code	THEORY	Contact Hours/Week				Credit Points	
				L	T	P	Total		
A. THEORY									
1	PC	IT301	Data Structure and Algorithm	3	0	0	3	3	
2	PC	IT 302	Analog and Digital Electronics	3	0	0	3	3	
3	BS	M (IT)301	Mathematics -III	3	1	0	4	4	
4	BS	PH 301	Physics-II	3	0	0	3	3	
5	ES	M(IT)302	Numerical Methods and Statistics	3	0	0	3	3	
Total of Theory								16	16
B. PRACTICAL									
6	PC	IT391	Data Structure Lab	0	0	3	3	1.5	
7	PC	IT 392	Analog and Digital Electronics Lab	0	0	3	3	1.5	
8	BS	PH391	Physics-II Lab	0	0	3	3	1.5	
9	ES	M(IT)392	Numerical Methods and Statistics Lab	0	0	3	3	1.5	
10	PROJ	PR 391	Project-III	0	0	2	2	1	
11	PROJ*	PR 392	Innovative activities-II	0	0	0	1	0.5	
C. MANDATORY ACTIVITIES / COURSES									
12	MC	MC 381	Behavioural and Interpersonal Skills	0	0	3	3		
Total of Theory, Practical & Mandatory Activities/Courses								33	23.5

*Students may choose either to work on participation in all the activities of Institute's Innovation Council for eg: IPR workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

4 th Semester								
				Contact Hours /Week				
				L	T	P	Total	
A. THEORY								
1	PC	IT401	Computer Organization & Architecture	3	0	0	3	3
2	PC	IT402	Object Oriented Programming using Java	3	0	0	3	3
3	PC	IT403	Formal Language and Automata Theory	3	0	0	3	3
4	PC	IT404	Communication Engineering & Coding Theory	3	0	0	3	3
5	HS	HU 401	Values & Ethics in Profession	2	0	0	2	2
Total of Theory							14	14
B. PRACTICAL								
6	PC	IT491	Computer Organization & Architecture Lab	0	0	3	3	1.5
7	PC	IT492	Object Oriented Programming Lab	0	0	3	3	1.5
8	PC	IT493	Programming Skill Development Lab	0	0	3	3	1.5
9	PROJ	PR 491	Project-IV	0	0	2	2	1
10	PROJ*	PR 492	Innovative activities-III	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
11	MC	MC 401	Environmental Science	0	0	3	3	
Total of Theory, Practical & Mandatory Activities/Courses							28	20

*Students may choose either to work on participation in all the activities of Institute's Innovation Council for eg: IPR workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

5 th Semester								
				Contact Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	PC	IT501	Design & Analysis of Algorithm	3	0	0	3	3
2	PC	IT502	Software Engineering	3	0	0	3	3
3	PC	IT503	Operating System	3	0	0	3	3
4	HS	HU503	Industrial & Financial Management	2	0	0	2	2
			A. Programming practice with C++					
			B. Artificial Intelligence and Expert System					
			C. Microprocessor Microcontroller					
Total of Theory							14	14
B. PRACTICAL								
6	PC	IT591	Algorithm Lab	0	0	3	3	1.5
7	PC	IT592	Software Engineering Lab	0	0	3	3	1.5
8	PC	IT593	Operating System Lab	0	0	3	3	1.5
			A. Programming practice with C++ Lab					
			B. Artificial Intelligence and Expert System Lab					
			C. Microprocessor Microcontroller Lab					
10	PROJ	PR 591	Project-V	0	0	2	2	1
11	PROJ*	PR 592	Innovative activities-IV	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
12	MC	MC 501	Constitution of India	3	0	0	3	
Total of Theory, Practical & Mandatory Activities/Courses							31	21.5

* Students may choose either to work on participation in Hackathons etc. Development of new product/ Business Plan/ registration of start-up.

Students may choose to undergo Internship / Innovation / Entrepreneurship related activities. Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry/ Long Term goals under rural Internship. (Duration 4-6 weeks)

Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

6 th Semester								
				Contact Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	PC	IT601	Database Management System	3	0	0	3	3
2	PC	IT602	Web Technology	3	0	0	3	3
3	PC	IT603	Computer Networking	3	0	0	3	3
			A. E-Commerce and ERP					
			B. Digital Image Processing					
			C. Soft Computing					
Total of Theory							12	12
B. PRACTICAL								
5	PC	IT691	Database System Lab	0	0	3	3	1.5
6	PC	IT692	Web Technology Lab	0	0	3	3	1.5
7	PC	IT693	Computer Networking Lab	0	0	3	3	1.5
			A. E-Commerce and ERP Lab					
			B. Digital Image Processing Lab					
			C. Soft Computing Lab					
9	PROJ	PR 691	Project-VI	0	0	2	2	1
10	PROJ*	PR 692	Innovative activities-V	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
11	MC	MC 681	Technical Lecture Presentation & Group Discussion-I	0	0	3	3	
Total of Theory, Practical & Mandatory Activities/Courses							29	19.5

*Students may choose either to work on participation in all the activities of Institute's Innovation Council for eg: IPR workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

7 th Semester								
				Contact Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
			A. Cloud Computing					
			B. Computer Graphics and Multimedia					
			C. Distributed System					
			D. Machine Learning					
			A. Cryptography and Network Security					
			B. Data Warehousing and Data Mining					
			C. Advanced Computer Architecture					
			D. Compiler Design					
			A. Sensor Network					
			B. Pattern Recognition					
			C. Internet Technology					
			D. Robotics					
			A. Modeling and Simulation					
			B. Microelectronics and VLSI Design					
			C. Mobile Communication					
			D. Operations Research					
Total of Theory							12	12
B. PRACTICAL								
			A. Cloud Computing Lab					
			B. Computer Graphics and Multimedia Lab					
			C. Distributed System Lab					
			D. Machine Learning using R Programming Lab					
6	PROJ	PR 791	Project-VII	0	0	9	9	4.5
7	PROJ*	PR 792	Innovative activities-VI	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
7	MC	MC 781	Seminar/GD/ Presentation Skill/ Foreign Language	0	0	3	3	
Total of Theory, Practical & Mandatory Activities/Courses							27	18.5

*Students may choose either to work on participation in Hackathons etc. Development of new product/ Business Plan/ registration of start-up.

Students may choose to undergo Internship / Innovation / Entrepreneurship related activities. Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry/ Long Term goals under rural Internship. (Duration 4-6 weeks)

Innovative activities to be evaluated by the Programme Head / Event Coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

8 th Semester								
				Contact Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	HS	HU804	Principles of Management	2	0	0	2	2
			A. Block Chain					
			B. Big Data Analytics					
			C. Virtual Reality					
			D. Natural Language Processing					
			A. Bio-Informatics					
			B. Embedded System					
			C. Internet of Things (IoT)					
			D. Deep Learning					
			A. Data Sciences					
			B. Cyber Law and IPR					
			C. Cluster and Grid Computing					
			D. Entrepreneurship Development					
Total of Theory							11	11
B. PRACTICAL								
5	PROJ	PR 891	Project-VIII	0	0	9	9	4.5
C. MANDATORY ACTIVITIES / COURSES								
6	MC	MC 801	Essence of Indian Knowledge Tradition	3	0	0	3	
Total of Theory, Practical & Mandatory Activities/Courses							23	115.5

Mandatory Credit Point=160

For Honors additional 20 Credit Point is to be earned (1st Sem to 8th Sem) through MOOCs courses. All the Certificates received by the students across all semester for MOOCs Courses from approved organization (Appendix A**) is to be submitted to CoE office prior to 8th Semester Examination.**

Credit Distribution Ratio:

Category	Credit Allocation As per Autonomy	Credit Allocation As per AICTE
Humanities, Social Sciences & Management Courses	9	12*
Basic Sciences Courses	25.5	25*
Engineering Sciences Courses including Workshop, Drawing, Basics of Electrical/Mechanical/Computer etc	24	24*
Professional Core Courses	52.5	48*
Professional Elective Courses relevant to chosen specialization/Branch	16.5	18*
Open Elective Courses-Electives from other technical and / or emerging subjects	15	18*
Project work, seminar and internship in industry or elsewhere	17.5	15*
Mandatory Courses [Environmental Science, Induction Training, Indian Constitution, Essence of Indian Knowledge Tradition and other Co & extracurricular activities		Non-credited
Total	160	160

* Minor Variation is allowed as per need of the respective disciplines.

A range of credits from 150 to 160 for a student to be eligible to get Under Graduate degree in Engineering.

For Honors additional 20 Credit Point is to be earned (1st Sem to 8th Sem) through MOOCs courses. All the Certificates received by the students across all semester for MOOCs Courses from approved organization (Listed by AICTE / MAKAUT) is to be submitted to CoE office prior to 8th Semester Examination and the Credit earned through MOOCs courses will be reflected in their DGPA.

Subject Distribution in Different Category:

A. Humanities, Social Sciences & Management Courses (HS)							
			Contact Hours /Week				Credit Points
			L	T	P	Total	
1	HU 101	English	2	0	0	2	2
2	HU 291	Language Lab	0	0	2	2	1
3	HU 401	Values & Ethics in Profession	2	0	0	2	2
4	HU 503	Industrial & Financial Management	2	0	0	2	2
5	HU 804	Principles of Management	2	0	0	2	2
		Total Credit:					9
B. Basic Sciences Courses (BS)							
1	M 101	Mathematics -I	3	1	0	4	4
2	CH 101/ PH	Chemistry (Gr. A) / Physics- I (Gr. B)	3	0	0	3	3
3	CH 191/ PH191	Chemistry Lab (Gr. A) / Physics- I Lab (Gr. B)	0	0	3	3	1.5
4	M 201	Mathematics -II	3	1	0	4	4
5	CH 201/ PH 201	Chemistry - (Gr. B) /	3	0	0	3	3
6	CH 291/ PH 291	Chemistry Lab (Gr. B) / Physics - I Lab (Gr. A)	0	0	3	3	1.5
7	M (IT)301	Mathematics -III	3	1	0	4	4
8	PH 301	Physics-II	3	0	0	3	3
9	PH391	Physics-II Lab	0	0	3	3	1.5
		Total Credit:					25.5
C. Engineering Sciences Courses including Workshop, Drawing, Basics of Electrical/Mechanical/Computer etc (ES)							
1	EE 101/ EC 101	Basic Electrical Engineering (Gr. A) / Basic Electronics Engineering (Gr. B)	3	0	0	3	3
2	EE 191/ EC 191	Basic Electrical Engineering Lab (Gr. A) / Basic Electronics Engineering Lab (Gr. B)	0	0	3	3	1.5
3	ME 191/ ME 192	Engineering Graphics & Design (Gr A) / Workshop/Manufacturing Practices (Gr-B)	0	0	3	3	1.5
4	EE 201/ EC 201	Basic Electrical Engineering (Gr. B) / Basic Electronics Engineering (Gr. A)	3	0	0	3	3
5	CS 201	Programming for Problem Solving	3	0	0	3	3
6	ME 201	Engineering Mechanics	3	0	0	3	3
7	CS291	Programming for Problem Solving Lab	0	0	3	3	1.5
8	EE 291/ EC 291	Basic Electrical Engineering Lab (Gr. B) / Basic Electronics Engineering Lab (Gr. A)	0	0	3	3	1.5
9	ME 291/ ME 292	Engineering Graphics & Design (Gr B) / Workshop/Manufacturing Practice (Gr-A)	0	0	3	3	1.5
10	M(IT)302	Numerical Methods and Statistics	3	0	0	3	3
11	M(IT)392	Numerical Methods and Statistics Lab	0	0	3	3	1.5
		Total Credit:					24
D. Professional Core Courses (PC)							
1	IT301	Data Structure and Algorithm	3	0	0	3	3
2	IT 302	Analog and Digital Electronics	3	0	0	3	3
3	IT391	Data Structure Lab	0	0	3	3	1.5
4	IT 392	Analog and Digital Electronics Lab	0	0	3	3	1.5
5	IT401	Computer Organization & Architecture	3	0	0	3	3
6	IT402	Object Oriented Programming using Java	3	0	0	3	3
7	IT403	Formal Language and Automata Theory	3	0	0	3	3

8	IT404	Communication Engineering & Coding Theory	3	0	0	3	3
9	IT491	Computer Organization & Architecture Lab	0	0	3	3	1.5
10	IT492	Object Oriented Programming Lab	0	0	3	3	1.5
11	IT493	Programming Skill Development Lab	0	0	3	3	1.5
12	IT501	Design & Analysis of Algorithm	3	0	0	3	3
13	IT502	Software Engineering	3	0	0	3	3
14	IT503	Operating System	3	0	0	3	3
15	IT591	Algorithm Lab	0	0	3	3	1.5
16	IT592	Software Engineering Lab	0	0	3	3	1.5
17	IT593	Operating System Lab	0	0	3	3	1.5
18	IT601	Database Management System	3	0	0	3	3
19	IT602	Web Technology	3	0	0	3	3
20	IT603	Computer Networking	3	0	0	3	3
21	IT691	Database System Lab	0	0	3	3	1.5
22	IT692	Web Technology Lab	0	0	3	3	1.5
23	IT693	Computer Networking Lab	0	0	3	3	1.5
		Total Credit:					52.5

E. Professional Elective Courses relevant to chosen specialization/Branch (PE)

		A. Programming practice with C++					
		B. Artificial Intelligence					
		C. Microprocessor Microcontroller					
		A. Programming practice with C++ Lab					
		B. Artificial Intelligence Lab					
		C. Microprocessor Microcontroller Lab					
		A. E-Commerce and ERP					
		B. Digital Image Processing					
		C. Soft Computing					
		A. E-Commerce and ERP Lab					
		B. Digital Image Processing Lab					
		C. Soft Computing Lab					
		A. Cloud Computing					
		B. Computer Graphics and Multimedia					
		C. Distributed System					
		D. Machine Learning					
		A. Cryptography and Network Security					
		B. Data Warehousing and Data Mining					
		C. Advanced Computer Architecture					
		D. Compiler Design					
		A. Cloud Computing Lab					
		B. Computer Graphics and Multimedia Lab					
		C. Distributed System Lab					
		D. Machine Learning using R Programming Lab					
		Total Credit:					16.5

F. Open Elective Courses-Electives from other technical and / or emerging subjects (OE):							
		A. Sensor Network					
		B. Pattern Recognition					
		C. Internet Technology					
		D. Robotics					
		A. Modeling and Simulation					
		B. Microelectronics and VLSI Design					
		C. Mobile Communication					
		D. Operations Research					
		A. Block Chain					
		B. Big Data Analytics					
		C. Virtual Reality					
		D. Natural Language Processing					
		A. Bio-Informatics					
		B. Embedded System					
		C. Cluster and Grid Computing					
		D. Control System					
		A. Data Sciences					
		B. Cyber Law and IPR					
		C. Cluster and Grid Computing					
		D. Entrepreneurship Development					
		Total Credit:					15
G. Project work, seminar and internship in industry or elsewhere (PW)							
1	PR 191	Project-IA	0	0	1	1	0.5
2	PR 192	Project-IB	0	0	1	1	0.5
3	PR 291	Project-II	0	0	1	1	0.5
4	PR 292	Innovative activities-I	0	0	0	0	0.5
5	PR 391	Project-III	0	0	2	2	1
6	PR 392	Innovative activities-II	0	0	0	1	0.5
7	PR 491	Project-IV	0	0	1	1	1
8	PR 492	Innovative activities-III	0	0	0	0	0.5
9	PR 591	Project-V	0	0	2	2	1
10	PR 592	Innovative activities-IV	0	0	0	0	0.5
11	PR 691	Project-VI	0	0	2	2	1
12	PR 692	Innovative activities-V	0	0	0	0	0.5
13	PR 791	Project-VII	0	0	9	9	4.5
14	PR 792	Innovative activities-VI	0	0	0	0	0.5
15	PR 891	Project-VIII	0	0	9	9	4.5
		Total Credit:					17.5

H. Mandatory Courses [Environmental Science, Induction Training, Indian Constitution, Essence of Indian Knowledge Tradition and other Co & extracurricular activities (MC)]

1	MC181	Induction Program	0	0	6	6	
2	MC 281	NSS/ Physical Activities/Meditation & Yoga/Photography/ Nature Club	0	0	3	3	
3	MC 381	Behavioural & Interpersonal skills	0	0	3	3	
4	MC 401	Environmental Science	3	0	0	3	
5	MC 501	Constitution of India	3	0	0	3	
6	MC 681	Technical Lecture Presentation & Group Discussion-I	0	0	3	3	
7	MC 781	Seminar/GD/ Presentation Skill/ Foreign Language	0	0	3	3	
8	MC 801	Essence of Indian Knowledge Tradition	3	0	0	3	

Format for Project Work Evaluation (B.Tech)**College Name:****Department :****Paper Name :****Paper Code :****STREAM :****Semester :**

University Roll No.	Name of the Student	Title of the Project	Semester Examination								
			Project Report (10)	Development of Prototype/ Model (20)	Power point presentation (15)	Viva-Voice (15)	Usage of Modern Tool / Technology (10)	Innovative- ness (10)	Individual contribution (10)	Group activity (10)	Total (100)

(Signature of the Project Supervisor(s))

(Signature of the HoD)

**MOOCs Courses
For B.Tech Students for AY 2018-19
(1st Semester to 8th Semester)**

Total Credit for MOOCs Subjects will be 20.

List of websites which offers online certification Courses

List of Websites which offers online certification courses:

1. Swayam- <https://swayam.gov.in/>
2. NPTEL- <https://onlinecourses.nptel.ac.in/>
3. Mooc- <http://mooc.org/>
4. Edx - <https://www.edx.org/>
5. Coursera- <https://www.coursera.org/>
6. Udacity - <https://in.udacity.com/>
7. Udemy - <https://www.udemy.com/>
8. Khan academy - <https://www.khanacademy.org/>
9. Skill sahare - <https://www.skillshare.com/>
10. Harvard University - <https://online-learning.harvard.edu/>
11. Ted - <https://ed.ted.com/>
12. Alison - <https://alison.com/>
13. Future learn - <https://www.futurelearn.com/>
14. Web Development - <https://digitaldefynd.com/best-free-web-development-courses-tutorials-certification/>
15. Digital Marketing - <https://digitaldefynd.com/best-free-digital-marketing-certifications/>
16. ios app development - <https://digitaldefynd.com/best-ios-app-development-course-tutorial/>
17. Open Learn - <http://www.open.edu/openlearn/>
18. Future Learn - <https://www.futurelearn.com/>
19. Tuts Plus - <https://tutsplus.com/>
20. Open Culture - <http://www.openculture.com/>

For Honors additional 20 Credit Point is to be earned (1st Sem to 8th Sem) through MOOCs courses. All the Certificates received by the students across all semester for MOOCs Courses from approved organization, should be submitted to CoE office prior to 8th Semester Examination.

The distribution of the credit with respect to weeks are as follows:

- 4 to 7 weeks: 2 Credit
- 8 to 11 weeks: 3 Credits
- 12 to 15 weeks: 4 Credits
- 16 or more than that: 6 Credits

20 credit for Honors, should be earned by the students from the MOOC Basket and any other subjects related to the specific program of the respective departments.

MOOCs Basket for Information Technology

Sl No	MOOCs Equivalent (Theory)
1	Analog Electronic Circuits
2	Digital Electronics
3	Programming Data Structures and Algorithms Using Python
4	Data Structure
5	Numerical Methods
6	Automata Theory
7	Computer Organization and Architecture: A Pedagogical Aspect
8	Computer Architecture
9	Design and Analysis of Algorithms
10	Microprocessors & Microcontrollers
11	Discrete Mathematics
12	Circuits and Systems
13	Data Communication and Network Services
14	Digital Signal Processing
15	Robotics
16	Object Oriented Programming in Java
17	Computer Networks and Internet Protocol
18	Computer Networks
19	Database Management System
20	Introduction to Operating Systems
21	Information Theory
22	Information Theory Coding and Cryptography
23	Computer Graphics
24	Introduction to Operations Research
25	Introduction to Multimedia System and Processing
26	Software Engineering
27	Compiler Design
28	Pattern Recognition
29	Soft Computing
30	Artificial Intelligence
31	Artificial Intelligence: Search Methods for Problem Solving
32	Fundamentals of Digital Image and Video Processing
33	Digital Image Processing
34	Cloud Computing
35	Data Mining
36	Data Mining Specialization
38	Mobile Computing
39	Internet Technology
40	VLSI Physical Design
41	Control System
42	Computer Architecture
43	Natural Language Processing
44	Cryptography and Network Security
45	Business Analytics & Data Mining Modeling Using R
46	Low Power VLSI Circuits and Systems

Appendix B**Mandatory Additional Requirement (MAR):**

List of Activity Heads and Sub-Activity Heads along with their capping of the Activity Points that can be earned by the students during the entire B.Tech duration.

Sl. No.	Name of the Activity	Points	Maximum Points Allowed
1.	MOOCS (SWAYAM/NPTEL/Spoken Tutorial) (per course)	20	40
	Tech Fest/Teachers Day/Freshers Welcome		
	Organizer	5	10
	Participants	3	6
5.	Rural Reporting	5	10
6.	Tree Plantation (per tree)	1	10
7.	Participation in Relief Camps	20	40
8.	Participation in Debate/Group Discussion/ Tech quiz	10	20
9.	Publication of Wall magazine in institutional level (magazine/article/internet)	10	20
10.	Publication in News Paper, Magazine & Blogs	10	20
11.	Research Publication (per publication)	15	30
12.	Innovative Projects (other than course curriculum)	30	60
	Blood donation	8	16
	Blood donation camp Organization	10	20
	Participation in Sports/Games		
	College level	5	10
	University Level	10	20
	District Level	12	24
	State Level	15	30
	National/International Level	20	20
21.	Cultural Programme (Dance, Drama, Elocution, Music etc.)	10	20
22.	Member of Professional Society	10	20
23.	Student Chapter	10	20
24.	Relevant Industry Visit & Report	10	20
25.	Photography activities in different Club (Photography club, Cine Club, Gitisansad)	5	10
26.	Participation in Yoga Camp (Certificate to be submitted)	5	10
27.	Self-Entrepreneurship Programme	20	20
28.	Adventure Sports with Certification	10	20
29.	Training to under privileged/Physically challenged	15	30
30.	Community Service & Allied Activities	10	20

Department: Information Technology
LIST OF MOOCS COURSES FOR MAR

MOOCs Equivalent(Theory)	Minimum Duration	Suggested MAR Point
Ethics in Engineering Practice	8weeks	16
Environmental Studies: A Global Perspective	6weeks	12
Introduction To Biology: The Secret of Life	12weeks	20
Engineering Econometrics	12weeks	20
Management in Engineering	8weeks	16
Human Resource Development	12 weeks	20
Organizational Behaviour	7 weeks	16
Project Management for Managers	12weeks	20
International Cyber Conflicts	5weeks	10
Fundamentals of Digital Marketing, Social Media, and E-Commerce	6weeks	12
Developing Soft Skills and Personality	8 weeks	16
History of English Language and Literature	12 weeks	20
Interpersonal Skills	8 weeks	16
Soft skills	12 weeks	20
Technical English for engineers	8 weeks	16
Better Spoken English	12 weeks	20
Business English Communication	4 weeks	8
Calculus of One Real Variable	8 weeks	16
Educational leadership	8 weeks	16

Economics of IPR	4 weeks	8
Enhancing Soft Skills and Personality	8 weeks	16
Human Resource Development	12 weeks	20
Indian Philosophy	12 weeks	20
Intellectual Property	12 weeks	20
Introduction on Intellectual Property to Engineers and Technologists	8 weeks	16
Literature, Culture and Media	12 weeks	20
Science, Technology and Society	12 weeks	20
Soft Skill Development	8 weeks	16
Speaking Effectively	8 weeks	16
Strategic Performance Management	8 weeks	16
Water, Society and Sustainability	4 weeks	8
Calculus of Several Real Variables	8 weeks	16
Higher Engineering Mathematics	12 weeks	20
Introduction to Abstract and Linear Algebra	8 weeks	16

Note: This is a basic guideline for MAR point. More courses can be taken in consultation with the Department.

Record of Activities for Mandatory Additional Requirement

College Name (College Code):				Department:									
Student Name:		University Roll No:		Registration No:									
				Points Earned									
				Sem1	Sem2	Sem3	Sem4	Sem5	Sem6	Sem7	Sem8	Total	
	<i>MOOCS (SWAYAM/NPTEL/Spoken Tutorial) per course</i>												
	For 12 weeks duration	20											
	For 8 weeks duration	16											
	<i>Tech Fest/Teachers Day/Freshers Welcome</i>												
	Organizer	5	10										
	Participants	3	6										
3	Rural Reporting	5	10										
4	Tree Plantation and up keeping (per tree)	1	10										
5	Participation in Relief Camps	20	40										
6	Participation in Debate/Group Discussion/ Tech quiz	10	20										
	<i>Publication of Wall magazine in institutional level (magazine/article /internet)</i>												
	Editor	10	20										
	Writer	6	12										
8	Publication in News Paper, Magazine & Blogs	10	20										
9	Research Publication (per publication)	15	30										
10	Innovative Projects (other than course curriculum)	30	60										
	Blood donation	8	16										
	Blood donation camp Organization	10	20										

Record of Activities for Mandatory Additional Requirement (Contd.)

SI No	Activity	Points	Max. Points Allowed	Points Earned									
				Sem1	Sem2	Sem3	Sem4	Sem5	Sem6	Sem7	Sem8	Total	
	<i>Participation in Sports/Games</i>												
	College level	5	10										
	University Level	10	20										
	District Level	12	24										
	State Level	15	30										
	National/International Level	20	20										
13	Cultural Programme (Dance, Drama, Elocution, Music etc.)	10	20										
14	Member of Professional Society	10	20										
15	Student Chapter	10	20										
16	Relevant Industry Visit & Report	10	20										
17	Photography activities in different Club(Photography club, Cine Club, Gitisansad)	5	10										
18	Participation in Yoga Camp (Certificate to be submitted)	5	10										
19	Self-Entrepreneurship Programme	20	20										
20	Adventure Sports with Certification	10	20										
21	Training to under privileged / Differently abled	15	30										
22	Community Service & Allied Activities	10	20										
Total Points													
Signature of Mentor													
Signature of HoD													

Department: Information Technology

Curriculum Structure & Syllabus

(Effective from 2018-19 admission batch)

Under Autonomy (GR A: ECE, EE, EIE, BME; GR B: CSE, IT, ME, CE, FT)

1 st Semester								
Sl No	Course Type	Course Code	Theory	Contact Hours				Credit Points
				L	T	P	Total	
A. THEORY								
1	BS	M 101	Mathematics -I	3	1	0	4	4
2	BS	CH 101/ PH 101	Chemistry (Gr. A) / Physics- I (Gr. B)	3	0	0	3	3
3	ES	EE 101/ EC 101	Basic Electrical Engineering (Gr. A) / Basic Electronics	3	0	0	3	3
4	HS	HU 101	English	2	0	0	2	2
Total of Theory							12	12
B. PRACTICAL								
5	BS	CH 191/ PH191	Chemistry Lab (Gr. A) / Physics- I Lab (Gr. B)	0	0	3	3	1.5
6	ES	EE 191/ EC 191	Basic Electrical Engineering Lab (Gr. A) / Basic Electronics	0	0	3	3	1.5
7	ES	ME 191/ ME 192	Engineering Graphics & Design (Gr A) / Workshop/Manufacturing	0	0	3	3	1.5
8	PROJ	PR 191	PROJECT-IA	0	0	1	1	0.5
9	PROJ	PR 192	PROJECT-IB	0	0	1	1	0.5
C. MANDATORY ACTIVITIES / COURSES								
10	MC	MC 181	Induction Program	0	0	0	0	
Total of Theory, Practical & Mandatory Activities/Courses							23	17.5

Syllabus- 1st Semester**Course Name: Mathematics-I****Course Code: M 101****Contact: 3:1:0****Total Contact Hours: 48****Credits: 4****Prerequisites:**

The students to whom this course will be offered must have the concept of (10+2) standard matrix algebra and calculus.

Course Objectives:

The objective of this course is to disseminate the prospective engineers with techniques in matrix algebra and calculus. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes:

COs	DESCRIPTIONS
CO1	Recall the distinctive characteristics of matrix algebra and calculus.
CO2	Understand the theoretical working of matrix algebra and calculus.
CO3	Apply the principles of matrix algebra and calculus to address problems in their disciplines.
CO4	Examine the nature of system using the concept of matrix algebra and calculus.

Course Content:**Module I: Matrix Algebra (11)**

Echelon form and Normal (Canonical) form of a matrix; Inverse and rank of a matrix; Consistency and inconsistency of system of linear equations, Solution of system of linear equations; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton theorem.

Module II: Differential Calculus and Infinite Series (10)

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Concept of sequence and series, Tests for convergence of infinite series: Comparison test, D'Alembert's ratio test, Raabe's test, Cauchy's root test, Power series; Taylor's series, Series for exponential, trigonometric and logarithm functions.

Module III: Multivariable Calculus (Differentiation) - I (9)

Function of several variables, Concept of limit, continuity and differentiability; Partial derivatives, Total derivative and its application; Chain rules, Derivatives of implicit functions Euler's theorem on homogeneous function, Jacobian.

Module IV: Multivariable Calculus (Differentiation) - II (7)

Maxima and minima of functions of two variables, Method of Lagrange multipliers; Directional derivatives, Gradient, Divergence, Curl.

Module V: Integral Calculus (11)

Evolutes and involutes; Evaluation of definite integrals and its applications to evaluate surface areas and volumes of revolutions; Improper integrals; Beta and Gamma functions and their properties.

Text Books:

1. Kreyszig, E., Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Ramana, B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. Veerarajan, T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
5. Bali, N.P. and Goyal, M., A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

Reference Books:

1. Thomas, G.B. and Finney, R.L., Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Apostol, M., Calculus, Volumes 1 and 2 (2nd Edition), Wiley Eastern, 1980.
3. Kumaresan, S., Linear Algebra - A Geometric approach, Prentice Hall of India, 2000.
4. Poole, D., Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
5. Bronson, R., Schaum's Outline of Matrix Operations. 1988.
6. Piskunov, N., Differential and Integral Calculus, Vol. I & Vol. II, Mir Publishers, 1969

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	2	-	-	-	-	-	-	-	-	-	1
CO2	3	2	-	-	-	-	-	-	-	-	-	1
CO3	3	2	2	-	-	-	-	-	-	-	-	1
CO4	2	3	1	-	-	-	-	-	-	-	-	1

Course Name: Physics –I
Course Code: PH 101
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Pre requisites: Knowledge of Physics up to 12th standard.

Course Objective:

The aim of courses in Physics is to provide an adequate exposure and develop insight about the basic physics principles along with the possible applications. The acquaintance of basic principles of physics would help engineers to understand the tools and techniques used in the industry and provide the necessary foundations for inculcating innovative approaches. It can also create awareness of the vital role played by science and engineering in the development of new technologies. It also gives necessary exposure to the practical aspects, which is an essential component for learning sciences.

Course Outcomes:

CO1: Describe various types mechanical resonance and its electrical equivalence

CO2: Explain basic principles of Laser, Optical fibers and various types of semiconductors

CO3: Apply superposition to explain interference and diffraction as well as apply wave mechanics to attainment of Heisenberg's uncertainty principle

CO4: Analyze importance of light as a carrier of information and examine different crystallographic structures according to their co-ordination number and packing factors

CO5: Justify the need of a quantum mechanics as remedy to overcome limitations imposed by classical physics

Course Content:

Module 1 (6L):

Waves & Oscillations:

Simple Harmonic Motion (only preliminary idea), damped harmonic motion-over damped, critically damped and under damped motion, energy decay, logarithmic decrement, force vibration and resonance (amplitude, velocity resonance), sharpness of resonance, quality factor, related numerical problems.

Module 2 (8L):

Classical Optics:

2.01- Interference of light: Huygens's principle, superposition of waves, conditions of sustained interference, Newton's ring (qualitative descriptions of working principles and procedures-no deduction required). Engineering applications, Numerical Problems.

2.02- Diffraction of light: Fresnel and Fraunhofer class, Fraunhofer diffraction of a single slit, multiple slits, intensity distributions, missing order, Rayleigh criterion (no deduction) and resolving power of grating and microscope (no deduction), related numerical problems.

Module 3 (8L):**Quantum Mechanics-I:**

3.01 Quantum Theory: Inadequacy of classical physics and its modifications by Planck's quantum hypothesis-qualitative (no deductions), particle concept of electromagnetic wave (example: photoelectric and Compton Effect; no derivation required, origin of modified and unmodified lines), wave particle duality; phase velocity and group velocity; de Broglie hypothesis; Davisson and Germer experiment.

3.02 Quantum Mechanics 1: Concept of wave function, physical significance of wave function, probability interpretation; normalization of wave functions; uncertainty principle, relevant numerical problems.

Module 4 (7L):**Solid State Physics-I:**

4.01 Crystal Structure: Structure of solids, amorphous and crystalline solids (definition and examples), lattice, basis, unit cell, Fundamental types of lattices –Bravais lattice, simple cubic, fcc and bcc lattices, Miller indices and miller planes, co-ordination number and atomic packing factor, Bragg's equation, applications, numerical problems.

4.02 Semiconductor: Physics of semiconductors, electrons and holes, metal, insulator and semiconductor, intrinsic and extrinsic semiconductor, p-n junction.

Module 5 (7L):**Modern Optics-I:**

5.01- Laser: Concepts of various emission and absorption process, Einstein A and B coefficients and equations, working principle of laser, metastable state, population inversion, condition necessary for active laser action, optical resonator, illustrations of Ruby laser, He-Ne laser, Semiconductor laser, applications of laser.

5.02-Fibre optics: Principle and propagation of light in optical fibres- Numerical aperture and Acceptance angle, Numerical problems.

Text Books:**Waves & Oscillations:**

1. Sound-N. K. Bajaj (TMH)
2. Advanced Acoustics-D. P. Roy Chowdhury (Chayan Publisher)
3. Principles of Acoustics-B.Ghosh (Sridhar Publisher)
4. A text book of sound-M. Ghosh (S. Chand publishers)
5. A text book of Light- K.G. Mazumder & B.Ghoshs, (Book & Allied Publisher)
6. Physics of Oscillations and Waves- R.P. Singh
7. College Physics Vol. II - A.B. Gupta
8. Vibration, Waves and Acoustics- Chattopadhyay and Rakshit

Classical & Modern Optics:

1. A text book of Light- K.G. Mazumder & B.Ghoshs (Book & Allied Publisher)
2. A text book of Light-Brijlal & Subhramanium, (S. Chand publishers)

3. Modern Optics-A. B. Gupta (Book & Allied Publisher)
4. Optics-Ajay Ghatak (TMH)
5. Optics-Hecht
6. Optics-R. Kar, Books Applied Publishers
7. Physical Optics Möler
8. Optics -F.A. Jenkins and H.E White

Quantum Mechanics-I

1. Introduction to Quantum Mechanics-S. N. Ghoshal (Calcutta Book House)
2. Quantum Mechanics-Bagde and Singh (S. Chand Publishers)
3. Perspective of Quantum Mechanics-S. P. Kuilla (New Central Book Agency)
4. Quantum Mechanics-Binayak Datta Roy (S. Chand Publishers)
5. Quantum Mechanics-Bransden (Pearson Education Ltd.)
6. Perspective of Modern Physics-A. Beiser (TMH)
7. Quantum mechanics -A.K. Ghatak and S Lokenathan
8. Modern Physics -E.E. Anderson
9. Physics Volume 2 -Haliday, Resnick & Krane, Published by Wiley India

Solid State Physics-I:

1. Solid state physics-Puri & Babbar (S. Chand publishers)
2. Materials Science & Engineering-Kakani Kakani
3. Solid state physics- S. O. Pillai
4. Introduction to solid state physics-Kittel (TMH)
5. Solid State Physics and Electronics-A. B. Gupta and Nurul Islam (Book & Allied Publisher)
6. Problem in Solid state physics -S.O. Pillai (a. b.)

Reference Books:

1. Refresher courses in physics (Vol. 1, Vol. 2 & Vol. 3)-C. L. Arora (S. Chand Publishers)
2. Basic Engineering Physics-Amal Chakraborty (Chaya Prakashani Pvt. Ltd.)
3. Perspective & Concept of Modern Physics -Arthur Baiser
4. Principles of engineering physics – Md. N Khan and S Panigrahi.

CO-PO Mapping:

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

Course Name: Basic Electronics Engineering

Course Code: EC101

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisites:

Electric current and voltage-D.C and A.C., Complex impedance, conductivity, resistivity, transformer charging and discharging of capacitor, active and passive elements.

Course Objective:

1. To understand the behavior of Conductors, Insulators, and Semiconductors based on energy-band theory and relevant problems.
2. To instill the knowledge of working principles of P-N Junction Diode, Zener diode and analyze their applications in the rectifier, clipper, clamper, regulator etc.
3. To familiarize with the characteristics of Bipolar junction transistor(BJT) under CE, CE, CC mode of operation and its biasing mechanisms.
4. To understand working principles of JFET, MOSFET and perform operations under CG, CS, CD configurations for parametric observation.
5. To determine the parameters due to the effect of feedback in amplifier to ,adder circuit , integrator and differentiator circuit using Operational Amplifier

Course Outcomes:

CO1	Students able to describe the fundamentals of Semiconductors
CO2	Students able to explain V-I characteristics of P-N Junction Diode, zener diode , working of diode rectifier, clipper, clamper, and regulator circuit
CO3	Students able to analyze characteristics of Bipolar junction transistor(BJT) under CE, CB, CC mode of operation and its biasing therein
CO4	Students able to illustrate the operations of JFET, MOSFET and the CS,CD , CG configuration using JFET
CO5	Students able to determine parameters due to effect of feedback in amplifier
CO6	Students able to construct inverting amplifier circuit , non-inverting amplifier circuit ,adder circuit , integrator and differentiator circuit using Operational Amplifier IC

Course Content:

Module-I: Basics of semiconductor (6L)

Conductors, Insulators, and Semiconductors- crystal structure, Fermi Dirac function, Fermi level, Energy band diagrams, valence band, conduction band, and band gap; intrinsic, and extrinsic (p-type and n-type) semiconductors, position of Fermi level in intrinsic and extrinsic semiconductor, drift and diffusion current – expression only (no derivation) , mass action law , charge neutrality in semiconductor, Einstein relationship in semiconductor , Numerical problems.

Module-II: P-N Junction Diode and its applications (8L)

p-n junction formation and depletion region, energy band diagram of p-n junction at equilibrium and barrier energy, built in potential at p-n junction, energy band diagram and current through p-n junction at

forward and reverse bias, Static and Dynamic resistance of Diode, Transition capacitance and diffusion capacitance, V-I characteristics and current expression of diode, temperature dependencies of V-I characteristics of diode, p-n junction breakdown – conditions, avalanche and Zener breakdown, Concept of Junction capacitance, Zener diode and characteristics.

Diode half wave and full wave rectifiers (centre tapped and bridge) circuits and operation (I_{DC} , I_{rms} , V_{DC} , V_{rms}), ripple factor without filter, efficiency, PIV, TUF; Reduction of ac ripples using filter circuit (Qualitative analysis); Design of diode clipper and clamper circuit - explanation with example, application of Zener diode in regulator circuit. Numerical problems.

Module-III: Bipolar junction transistor (6L)

Concept of “Transistor”, Formation of PNP/NPN Transistors, energy band diagram, current conduction mechanism, CE, CB, CC configurations, transistor static characteristics in CE, CB and CC mode, junction biasing condition for active, saturation and cut-off modes, current gain α , β and γ , early effect. Biasing and bias stability; biasing circuits - fixed bias; voltage divider bias; collector to base bias, D.C. load line and Quiescent point, calculation of stability factors for different biasing circuits. BJT as an amplifier and as a switch – Graphical analysis; Numerical Problems.

Module-IV: Field effect transistor (6L)

Concept of “field effect”, Classification of FETs-JFET, MOSFET, operating principle of JFET. Drain and transfer characteristics of JFET (n-channel and p-channel), CS, CG, CD configurations, Relation between JFET parameters. FET as an amplifier and as a switch– graphical analysis. E-MOSFET (n-channel and p-channel), D-MOSFET (n-channel and p-channel), Numerical Problems.

Module-V: Feedback and Operational Amplifier (8L)

Concept of feedback with block diagram, positive and negative feedback, gain with feedback. Feedback topologies, effect of feedback on input and output impedance, distortion, concept of oscillation and Barkhausen criterion.

Operational amplifier – electrical equivalent circuit, ideal characteristics, non-ideal characteristics of op-amp – offset voltages; bias current; offset current; Slew rate; CMRR and bandwidth, Configuration of inverting and non-inverting amplifier using Op-amp, closed loop voltage gain of inverting and non-inverting amplifier, Concept of virtual ground, Applications op-amp – summing amplifier; differential amplifier; voltage follower; basic differentiator and integrator, Numerical Problems.

Module-VI: Cathode Ray Oscilloscope (2L)

Operating principle of CRO with block diagram, measurement of voltage, frequency and phase.

Text Books :

- 1.D. Chattopadhyay, P. C. Rakshit, Electronics Fundamentals and Applications, New Age International
- 2.Millman & Halkias, Integrated Electronics, Tata McGraw Hill.
- 3.Sedra & Smith, Microelectronics Engineering

Reference Books :

- 1.John D. Ryder, Electronic Fundamentals and Applications, PHI
- 2.J.B.Gupta, Basic Electronics, S.K. Kataria.
- 3.Malvino: Electronic Principle.
- 4.Boyelstad & Nashelsky: Electronic Devices & Circuit Theory, McGraw Hill, 1976.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	-	-	-	-	-	2	-	1
CO2	3	3	3	1	-	-	-	-	1	1	1	2
CO3	3	1	1	1	-	-	-	-	1	1	1	1
CO4	3	2	1	1	-	-	-	-	1	1	2	2
CO5	3	2	3	1	-	-	-	-	1	1	1	2
CO6	3	3	3	1	-	-	-	-	2	1	2	3

Course Name: English
Course Code: HU101
Contact: 2:0:0
Total Contact Hours: 24
Credits: 2

Prerequisites: The course presupposes a high school level knowledge of English grammar, punctuation, and elementary to intermediate reading and writing skills.

Course Objectives: The basic objectives of this course are to impart professional communication skills in the globalized workplace context, to enable functional competence in reading and writing so as to create industry-ready personnel.

Course Outcomes:

- CO1:** Know about and employ communication in a globalized workplace scenario.
- CO2:** Understand and apply functional grammar, reading skills and sub-skills.
- CO3:** Acquire a working knowledge of writing strategies, formats and templates of professional writing.
- CO4:** Apply and make use of the modalities of intercultural communication.

Course Content:

Module 1: Communication in a Globalized World	4L
1.1 Definition, Process, Types of Communication	
1.2 Verbal and Non-Verbal Communication	
1.3 Barriers to Communication	
1.4 Workplace Communication	
Module 2: Functional Grammar	4L
2.1 Articles, Prepositions and Verbs	
2.2 Verb-Subject Agreement	
2.3 Voice, Modality and Modifiers	
2.4 Direct and Indirect Speech	
2.5 Common Errors in English	
Module 3: Vocabulary and Reading	6L
3.1 Word Roots, Prefixes and Suffixes	
3.2 Antonyms, Synonyms and one word Substitution	
3.3 Reading—Purposes and Skills (Skimming, Scanning & Intensive Reading)	
3.4 Reading Comprehension (Fictional and Non-fictional prose)	
Module 4: Professional Writing	10L
4.1 Writing Functions: Describing, Defining, Classifying	
4.2 Structuring—coherence and clarity	
4.3 Business Writing—Letters (Enquiry, Order, Sales, Complaint, Adjustment, Job Application letters), Memos, Notices, Circulars, Agendas and Minutes of Meetings).	
4.4 E-mails—types, conventions, jargons and modalities.	

- 4.5 Reports and Proposals
- 4.6 Précis writing
- 4.7 Essay writing
- 4.8 Punctuation and its importance in writing
- 4.9 Writing for an Audience

Text Books:

1. Ruskin Bond: The Night Train at Deoli OR Khushwant Singh: The Portrait of a Lady
2. Roald Dahl: Lamb to the Slaughter OR Somerset Maugham: The Man with the Scar
3. Anne Frank: The Diary of a Young Girl (Letters of 3rd February 1944, 12th February 1944 and 13th February 1944) OR Jawaharlal Nehru: “How Britain Ruled India” (Glimpses of World History, Chap 112)

Reference Books:

1. Raymond Murphy. English Grammar in Use. 3rd Edn. CUP, 2001.
2. A. J Thomson and A. V. Martinet. A Practical English Grammar Oxford: OUP, 1980.
3. Michael Swan. Practical English Usage. Oxford: OUP, 1980.
4. Simeon Potter. Our Language. Oxford: OUP, 1950.
5. Pickett, Laster and Staples. Technical English: Writing, Reading & Speaking. 8th ed. London: Longman, 2001.
6. Ben Heasley and Liz Hamp-Lyons. Study Writing. Cambridge: CUP, 2006.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	-	-	-	-	-	1	-	-	3	-	2
CO2	2	3	2	-	-	2	2	-	-	3	-	3
CO3	1	3	-	-	-	3	3	-	-	3	-	3
CO4	-	-	-	-	-	3	3	-	-	3	-	3

Course Name: Physics I Lab

Course Code: PH 191

Contact: 0:0:3

Credits: 1.5

Pre requisites: Knowledge of Physics upto 12th standard.

Course Outcomes:

CO1 : Demonstrate experiments allied to their theoretical concepts

CO2 : Conduct experiments using LASER, Optical fiber, Torsional pendulum, Spectrometer

CO3 : Participate as an individual, and as a member or leader in groups in laboratory sessions actively

CO4 : Analyze experimental data from graphical representations , and to communicate effectively them in Laboratory reports including innovative experiments

List of Experiments:

General idea about Measurements and Errors (One Mandatory):

- i) Error estimation using Slide calipers/ Screw-gauge/travelling microscope for one experiment.
- ii) Proportional error calculation using Carrey Foster Bridge.

Any 6 to be performed from the following experiments

Experiments on Waves & Oscillations:

1. Study of Torsional oscillation of Torsional pendulum & determination of time period using various load of the oscillator.
2. Determination of elastic moduli of different materials (Young's modulus /Rigidity modulus)

Experiments on Classical Optics:

3. Determination of wavelength of light by Newton's ring method.
4. Determination of wavelength of light by Laser diffraction method.

Experiments on Quantum Physics-I:

5. Determination of Planck's constant using photoelectric cell.
6. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.
7. Determination of Stefan's Constant

Experiments on Solid State Physics-I:

8. Determination of Band gap of a semiconductor

In addition it is **recommended that each student should carry out at least one experiment beyond the syllabus/one experiment as Innovative experiment.

Probable experiments beyond the syllabus:

1. Determination of wavelength of light by Fresnel's bi-prism method (beyond the syllabus).
3. Study of dispersive power of material of a prism.

4. Study of viscosity using Poiseuille's capillary flow method/using Stoke's law.
5. Measurement of nodal and antinodal points along transmission wire and measurement of wave length.
6. Any other experiment related to the theory.

CO-PO Mapping:

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

Course Name: Basic Electronics Engineering Lab**Course Code: EC 191****Contact: 0:0:3****Credit: 1.5**

Prerequisites: A basic course in electronics and Communication engineering Progresses from the fundamentals of electricity, active and passive components, basic electronics laws like Ohm's law, Ampere's law.

Course Objective:

The objectives of this course are

1. To prepare the students to have a basic knowledge of active and passive components.
2. To build knowledge to distinguish pure and impure DC signals.
3. To grow measuring ability of signals through multi meter and CRO
4. To understand characteristics of proper biasing for BJT and FET.
5. To encourage in developing circuits using diodes, transistors, FETs and OPAMPs.

Course Outcomes:

CO1	Knowledge of Electronic components such as Resistors, Capacitors, Diodes, Transistors measuring equipment like DC power supply, Multimeter, CRO, Signal generator, DC power supply.
CO2	Analyse the characteristics of Junction Diode, Zener Diode, BJT & FET and different types of Rectifier Circuits.
CO3	Determination of input-offset voltage, input bias current and Slew rate, Common- mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.
CO4	Able to know the application of Diode, BJT & OPAMP.

List of Experiments:

1. Familiarization with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, millimeters etc.
2. Familiarization with measuring and testing equipment like CRO, Signal generators etc.
3. Study of I-V characteristics of Junction diodes.
4. Study of I-V characteristics of Zener diodes.
5. Study of Half and Full wave rectifiers with Regulation and Ripple factors.
6. Study of I-V characteristics of BJTs.
7. Study of I-V characteristics of Field Effect Transistors.
8. Determination of input-offset voltage, input bias current and Slew rate of OPAMPs.
9. Determination of Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.
10. Study of OPAMP circuits: Inverting and Non-inverting amplifiers, Adders, Integrators and Differentiators.
11. Study of Logic Gates and realization of Boolean functions using Logic Gates.
12. Study of Characteristic curves for CB, CE and CC mode transistors.
13. Innovative Experiment

Text Books:

- 1.D. Chattopadhyay, P. C. Rakshit, Electronics Fundamentals and Applications, New Age International
- 2.Millman & Halkias, Integrated Electronics, Tata McGraw Hill.
- 3.Sedra & Smith, Microelectronics Engineering

Reference Books:

- 1.John D. Ryder, Electronic Fundamentals and Applications, PHI
- 2.J.B. Gupta, Basic Electronics, S.K. Kataria.
- 3.Malvino: Electronic Principle.
- 4.Boyelstad & Nashelsky: Electronic Devices & Circuit Theory, McGraw Hill, 1976.

CO-PO Mapping:

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

Course Name: Workshop/Manufacturing Practices

Course Code: ME 192

Contact: 0:0:3

Credit: 1.5

Prerequisite: Higher Secondary with Mathematics, Physics and Chemistry

Course Objectives:

To understand the basic knowledge of Workshop Practice and Safety. To identify and use of different hand tools and other instruments like Hack Saw, Jack Plane, Chisels etc. and operations like Marking, Cutting etc. To expose students to different types of manufacturing/fabrication processes

Course Outcomes:

CO1: Fabricate components with their own hands.

CO2: Get practical knowledge of the dimensional accuracies and tolerances applicable for different manufacturing processes.

CO3: Produce small devices of their interest for project or research purpose.

Course Content:

(i) Theoretical discussion & videos: (3)

Detailed contents:

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods
2. Fitting operations & power tools
3. Carpentry
4. Welding (arc welding & gas welding), brazing
5. Electrical & Electronics
6. Metal casting
7. CNC machining, Additive manufacturing
8. Plastic moulding& Glass Cutting.

(ii) Workshop Practice:

Module 1 - Machine shop (6)

Typical jobs that may be made in this practice module:

- i. To make a pin from a mild steel rod in a lathe.
- ii. To make rectangular and vee slot in a block of cast iron or mild steel in a shaping and / or milling machine.

Module 2 - Fitting shop (6)

Typical jobs that may be made in this practice module:

- i. To make a Gauge from MS plate.

Module 3 - Carpentry (6)

Typical jobs that may be made in this practice module:

- i. To make wooden joints and/or a pattern or like.

Module 4 - Welding shop (Arc welding 3P + gas welding 3P) (3)

Typical jobs that may be made in this practice module:

- i. ARC WELDING (3P): To join two thick (approx 5mm) MS plates by manual metal arcwelding.
- ii. GAS WELDING (3P): To join two thin mild steel plates or sheets by gas welding.

Module 5 - Electrical & Electronics (3P)

House wiring, soft Soldering

Module 6 – Smithy (3P)

Typical jobs that may be made in this practice module:

- i. A simple job of making a square rod from a round bar or like.

For further study (Optional)

Module 7 - Casting

Typical jobs that may be made in this practice module:

- i. One/ two green sand moulds to prepare, and a casting be demonstrated.

Module 8 - Plastic moulding & Glass Cutting (3P)

Typical jobs that may be made in this practice module:

- i. For plastic moulding, making at least one simple plastic component should be made.
- ii. At least one sample shape on glass should be made using laser cutting machine.

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Text Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., “Elements of Workshop Technology”, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Rao P.N., “Manufacturing Technology”, Vol. I and Vol. II, Tata McGrawHill House, 2017.

Reference Books:

1. Gowri P., Hariharan and A. Suresh Babu, Manufacturing Technology – I, Pearson Education, 2008.
2. Roy A. Lindberg, “Processes and Materials of Manufacture”, 4th edition, Prentice Hall India, 1998.
3. Kalpakjian S. and Steven S. Schmid, Manufacturing Engineering and Technology, 4th edition, Pearson Education India Edition, 2002.
4. Manufacturing Science by A.Ghosh and A.K.Mallick, Wiley Eastern.
5. Principles of Metal Cutting/Principles of Machine Tools by G.C.Sen and A.Bhattacharya, New Central Book Agency, Kolkata.

CO-PO Mapping:

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

Curriculum for B.Tech 2nd Semester

Under Autonomy (GR A: ECE, EE, EIE, BME; GR B: CSE, IT, ME, CE, FT)

2 nd Semester								
Sl No	Course Type	Course Code	Theory	Credit Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	BS	M 201	Mathematics -II	3	1	0	4	4
2	BS	CH 201/ PH 201	Chemistry - (Gr. B) / Physics – I (Gr. A)	3	0	0	3	3
3	ES	EE201/ EC201	Basic Electrical Engineering (Gr. B) / Basic Electronics Engineering (Gr. A)	3	0	0	3	3
4	ES	CS 201	Programming for Problem Solving	3	0	0	3	3
5	ES	ME 201	Engineering Mechanics	3	0	0	3	3
Total of Theory							16	16
B. PRACTICAL								
6	ES	CS291	Programming for Problem Solving Lab	0	0	3	3	1.5
7	BS	CH 291/ PH 291	Chemistry Lab (Gr. B) / Physics - I Lab (Gr.	0	0	3	3	1.5
8	ES	EE 291/ EC 291	Basic Electrical Engineering Lab (Gr. B) /	0	0	3	3	1.5
9	ES	ME 291/ ME 292	Engineering Graphics & Design (Gr B) / Workshop/Manufacturing	0	0	3	3	1.5
10	HS	HU 291	Language Lab	0	0	2	2	1
11	PROJ	PR 291	Project-II	0	0	1	1	0.5
12	PROJ*	PR 292	Innovative activities-I	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
13	MC	MC 281	NSS/ Physical Activities/Meditation & Yoga/Photography/ Nature Club	0	0	0	3	
Total of Theory, Practical & Mandatory Activities/Courses							34	24

* Inter/ Intra Institutional Activities viz; Training with higher Institutions; Soft skill training organized by Training and Placement Cell of the respective institutions; contribution at incubation/ innovation /entrepreneurship cell of the institute; participation in conferences/ workshops/ competitions etc.; Learning at Departmental Lab/ Tinkering Lab/ Institutional workshop; Working in all the activities of Institute's Innovation Council for eg: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc. (evaluation by Programme Head through certification)
Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

Syllabus- 2nd Semester

Course Name: Mathematics - II

Course Code: M 201

Contact: 3:1:0

Total Contact Hours: 48

Credit: 4

Prerequisites: The students to whom this course will be offered must have the concept of (10+2) standard calculus.

Course Objectives: The objective of this course is to disseminate the prospective engineers with techniques in multivariable calculus, ordinary differential equations and Laplace transform. It aims to equip the students with concepts and tools at an intermediate to advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes:

CO1	Use mathematical tools to evaluate multiple integrals and vector integrals
CO2	Apply effective mathematical tools for the solutions of ordinary differential equations that model physical processes.
CO3	Recall the properties of Laplace Transform to evaluate multiple integrals and their usage
CO4	Understand the concept of Laplace transform to solve ordinary differential equations.

Course Content:

Module I: Multivariable Calculus (Integration): (12 L)

Double integration, Change of order of integration in double integrals, Triple integrals, vector line integrals, scalar surface integrals, vector surface integrals, Green's theorem, Gauss divergence theorem and Stokes' theorem.

Module II: First Order Ordinary Differential Equations: (10 L)

Solution of first order and first degree ODE: Exact ODE, Rules for finding Integrating factors, Linear ODE, Bernoulli's equation, Solution of first order and higher degree ODE: solvable for p , solvable for y solvable for x and Clairaut's equation.

Module III: Second Order Ordinary Differential Equations: (12 L)

Solution of second order ODE with constant coefficients: C.F. & P.I., Method of variation of parameters, Cauchy-Euler equations, Reduction of 2nd order ODE to a pair of first order ODEs, Solution of simultaneous linear ODEs.

Module IV: Laplace Transform: (14L)

Definition and existence of LT, LT of elementary functions, First and second shifting properties, Change of scale property, LT of $t f(t)$, LT of $\frac{f(t)}{t}$, LT of derivatives of $f(t)$, LT of $\int f(t)dt$, Evaluation of improper integrals using LT, LT of periodic and step functions, Inverse LT: Definition and its properties, Convolution theorem (statement only) and its application to the evaluation of inverse LT, Solution of linear ODE with constant coefficients (initial value problem) using LT.

Text Books:

1. Kreyszig, E., Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Ramana, B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. Veerarajan, T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
5. Bali, N.P. and Goyal, M., A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

Reference Books:

1. Thomas, G.B. and Finney, R.L., Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Boyce, W. E. and DiPrima, R. C., Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.
3. Ross, S. L., Differential Equations, 3rd Ed., Wiley India, 1984.
4. Piskunov, N., Differential and Integral Calculus, Vol. I & Vol. II, Mir Publishers, 1969.
5. Coddington, E. A., An Introduction to Ordinary Differential Equations, Prentice Hall, India, 1995.

CO-PO Mapping:

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	2	2	-	-	-	-	-	-	-	-	1
CO2	3	2	2	-	-	-	-	-	-	-	-	1
CO3	2	2	-	-	-	-	-	-	-	-	-	1
CO4	3	3	2	-	-	-	-	-	-	-	-	1

Course Name: Chemistry
Course Code: CH201
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Pre requisites: Knowledge of Chemistry up to 12th standard.

Course Objective:

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications.

Course Outcomes:

- CO1:** Able to describe the fundamental properties of atoms & molecules, atomic structure and the periodicity of elements in the periodic table
- CO2:** Able to apply fundamental concepts of thermodynamics in different engineering applications.
- CO3:** Able to apply the knowledge of water quality parameters, corrosion control & polymers to different industries.
- CO4:** Able to determine the structure of organic molecules using different spectroscopic techniques.
- CO5:** Capable to evaluate theoretical and practical aspects relating to the transfer of the production of chemical products from laboratories to the industrial scale, in accordance with environmental considerations.

Course Content:

Module I: Inorganic Chemistry (9 L)

(i) Atomic structure (5 L)

Bohr's theory to hydrogen-like atoms and ions; spectrum of hydrogen atom. Quantum numbers, Introduction to the concept of atomic orbitals, diagrams of s, p and d orbitals, Pauli's exclusion principle, Hund's rule, exchange energy, Aufbau principle and its limitation, introduction to Schrodinger equation.

(ii) Periodic properties (4 L)

Modern Periodic table, group trends and periodic trends in physical properties: electron affinity, electronegativity, polarizability, oxidation states, effective nuclear charges, penetration of orbitals, variations of s, p and d orbital energies of atoms.

Module II: Physical Chemistry (8 L)

(i) Use of free energy in chemical equilibria (6 L)

Thermodynamic functions: internal energy, enthalpy, entropy and free energy. 2nd Law of Thermodynamics, Estimations of entropy and free energies, Free energy and emf, Cell potentials, the Nernst equation and applications.

(ii) Real Gases (2 L)

Reason for deviation of real gases from ideal behavior, Equations of state of real gases, Vander Waals' equation, pressure & volume correction, validity, critical state of gas.

Module III: Organic Chemistry (8 L)**(i) Stereochemistry (4 L)**

Representations of 3 dimensional structures, Chirality, optical activity, isomerism, structural isomerism, stereoisomers, enantiomers, diastereomers, configurations (D,L & cis trans), racemisation.

(ii) Organic reactions (4L)

Concepts of inductive effect, resonance, hyperconjugation, introduction to reactions involving substitution, addition, elimination, oxidation (Baeyer villiger oxidation), reduction (Clemmensen reduction, Wolff-Kishner reduction)

Module IV: Industrial Chemistry 8L

(i) **Water (2 L):** Hardness, alkalinity, numerical

(ii) **Corrosion. (2 L):** Types of corrosion: wet & dry, preventive measures

(iii) **Polymers (3 L):** Classification of polymers, conducting polymers, biodegradable polymers

(iv) **Synthesis of a commonly used drug molecule. (1 L):** Paracetamol, Aspirin

Module V: Spectroscopic techniques in Chemistry (3L)

Electromagnetic radiation, Principles of spectroscopy, spectrophotometer, infrared spectroscopy, fingerprint region, functional group region, UV-VIS spectroscopy, ¹H Nuclear magnetic resonance spectroscopy, chemical shift

Text Books

(i) A Text Book of Organic Chemistry, Arun Bahl & Arun Bahl

(ii) General & Inorganic Chemistry, P.K. Dutt

(iii) General & Inorganic Chemistry, Vol I, R.P. Sarkar

(iv) Physical Chemistry, P.C. Rakshit

Reference Books

(v) Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane (iii) Fundamentals of Molecular Spectroscopy, by C. N. Banwell

(iv) Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan

(v) Physical Chemistry, by P. W. Atkins

(vi) Organic Chemistry: Structure and Function by K. P. C. Vollhardt and N. E. Schore, 5th Edition
<http://bcs.whfreeman.com/vollhardtschore5e/default.asp>

CO-PO Mapping:

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

Course Name: Basic Electrical Engineering

Course Code: EE201

Contact: 3:0:0

Total Contact hours: 36

Credits: 3

Prerequisites:

- Basic 12th standard Physics and Mathematics.
- Concept of components of electric circuit.

Course Objective:

To introduce the students to basic principles of DC and AC circuits, Electrical Machines and Electrical Systems.

Course Outcomes:

- CO1:** To understand Basic Electrical circuits, Power distribution and Safety measures.
- CO2:** To analyze and apply DC network theorems.
- CO3:** To analyze and apply concept of AC circuits of single-phase and three-phase.
- CO4:** To analyze and apply concepts of AC fundamentals in solving AC network problems.
- CO5:** To understand basic principles of Transformers and Rotating Machines.

Course contents:

Module I: DC Circuits (9L)

Definition of electric circuit, linear circuit, non-linear circuit, bilateral circuit, unilateral circuit, Dependent source, node, branch, active and passive elements, Kirchhoff's laws, Source equivalence and conversion, Network Theorems - Superposition Theorem, Thevenin's Theorem, Norton Theorem, Maximum Power Transfer Theorem, Star-Delta Conversions.

Module II: AC Fundamentals (9L)

Sinusoidal quantities, Average and RMS values, peak factor, Form factor, Phase and Phase difference, concept of phasor diagram, V-I Relationship in R, L, C circuit, Combination R-L-C in series and parallel circuits with phasor diagrams, impedance and admittance, impedance triangle and power triangle, Power factor, concept of resonance, Power in AC circuit, simple problems (series and parallel circuit only), Three-phase balanced circuits, Concept of three-phase power measurement.

Module III: Single-Phase Transformer (5L)

Brief idea on constructional parts, classifications, working principle. Problems on EMF equation. Phasor diagram, Equivalent circuit.

Module IV: Electrical Rotating Machines (8L)

a) DC Machines (4L)

Brief idea on constructional features, classifications, working principle of both motor and generator. Simple problems on Voltage equation.

b) Three-Phase Induction Motor (4L)

Basic concept of three phase circuit and production of rotating magnetic field. Working principle of three-phase induction motor and torque-speed characteristics (concept only). No numerical problem.

Module V: General Structure of Electrical Power System (1L)

Power generation to distribution through overhead lines and underground cables with single line diagram.

Module VI: Electrical Installations (4L)

Earthing of Electrical Equipment, ideas of basic components- MCB, MCCB, ELCB, SFU, Megger.

Text books:

1. D. P. Kothari & I. J. Nagrath, Basic Electrical Engineering, TMH.
2. V. Mittle & Arvind Mittal, Basic Electrical Engineering, TMH.
3. Ashfaq Hussain, Basic Electrical Engineering, S. Chand Publication.
4. Chakrabarti, Nath & Chanda, Basic Electrical Engineering, TMH.
5. C.L. Wadhwa, Basic Electrical Engineering, Pearson Education.

Reference books:

1. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
2. V. D. Toro, “Electrical Engineering Fundamentals”, Printice Hall India, 1989.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	1	-	-	-	2	-	-	-	2	2	1
CO2	2	3	-	-	-	-	-	-	-	-	1	1
CO3	2	3	1	-	-	-	-	-	-	-	1	1
CO4	1	2	3	1	-	-	-	-	-	-	-	1
CO5	3	-	-	-	-	-	-	-	-	-	-	1

Course Name: Programming for Problem Solving

Course Code: CS 201

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisites: Number system, Boolean Algebra

Course Outcomes:

CO1	Understand and differentiate among different programming languages for problem solving.
CO2	Describe the way of execution and debug programs in C language.
CO3	Define, select, and compare data types, loops, functions to solve mathematical and scientific problem.
CO4	Understand the dynamic behavior of memory by the use of pointers.
CO5	Design and develop modular programs using control structure, selection structure and file.

Course Content:

Fundamentals of Computer: (8 L)

History of Computer, Generation of Computer, Classification of Computers, Basic structure of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices. 2L

Binary and Allied number systems representation of signed & unsigned numbers, BCD, ASCII, Binary number. Arithmetic – Addition and Subtraction (using 1's complement and 2's complement). 2L

Overview of Procedural vs Structural language, compiler and assembler (basic concepts) 1L

Problem solving- Algorithm & flow chart. 2L

C Fundamentals: (28 L)

Variable and Data Types:

The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements. 2L

C Operators & Expressions:

Arithmetic operators, relational operators, logical operators, increment and decrement operators, bitwise operators, assignment operators, conditional operators, special operators - type conversion, C expressions, precedence and associativity.

Input and Output: Standard input and output, formatted output - printf, formatted input scanf, bit fields. 4L

Branching and Loop Statements:

Statement and blocks, if - else, switch, goto and labels, Loops - while, for, do while, break and continue. 4L

Fundamentals and Program Structures:

auto, external, static and register variables Functions, function types, function prototypes, functions returning values, functions not returning values, scope rules, recursion, C preprocessor and macro. 5L

Arrays, Strings and Pointers:

One dimensional arrays, Two-dimensional arrays, Multidimensional arrays. Passing an array to a

function Character array and string, array of strings, Passing a string to a function, String related functions, Pointers, Pointer and Array, Pointer and String, Pointer and functions, Dynamic memory allocation. 7L

Structures and Unions:

Basic of structures, arrays of structures, structures and pointers, structures and functions. 3L

Files handling with C:

formatted and unformatted files, Command line arguments, fopen, fclose, fgetc, fputc, fprintf, fscanf function. 3L

Text book:

Kerninghan B.W. & Ritchie D.M. - The C Programming Language ,PHI, 2nd Edition

Kanetkar Y. - Let us C, BPB Publication, 15th Edition

Reference Books:

E Balagurusamy – Programming in ANSI C, TMH, 3rd Edition

K R Venugopal & S R Prasad – MASTERING C, TMH, 2nd Edition

Reema Thareja – INTRODUCTION TO C PROGRAMMING, OXFORD UNIVERSITY PRESS, 2nd Edition

CO – PO Mapping:

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

Course Name: Engineering Mechanics

Course Code: ME 201

Contacts: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisites: Basic Concept of Physics

Course Objective:

This course teaches students how to apply Newtonian physics to relatively simple real life applications. This course covers statics, dynamics and elementary part of strength of materials.

Course Outcomes:

- CO1: To understand representation of force, moments for drawing free-body diagrams and analyze friction based systems in static condition
- CO2: To locate the centroid of an area and calculate the moment of inertia of a section.
- CO3: Apply of conservation of momentum & energy principle for particle dynamics and rigid body kinetics
- CO4: Understand and apply the concept of virtual work, rigid body dynamics and systems under vibration.

Course Content:

Module 1: Introduction to Engineering Mechanics: Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy. 6L

Module 2: Friction: Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack. 2L

Module 3: Basic Structural Analysis: Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines. 3L

Module 4: Centroid and Centre of Gravity: Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook. 5L

Module 5: Virtual Work and Energy Method: Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium. Stability of equilibrium. 5L

Module 6: Review of particle dynamics: Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique). 5L

Module 7: Introduction to Kinetics of Rigid Bodies: Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation. 5L

Module8: Mechanical Vibrations: Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum, use of simple, compound and torsion pendulums. 5L

Text books:

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill
3. R.C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
4. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press
5. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
6. Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education

Reference books:

1. Reddy Vijaykumar K. and K. Suresh Kumar(2010), Singer's Engineering Mechanics
2. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications
3. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
4. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

CO – PO Mapping:

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

Course Name: Programming for Problem Solving Lab**Course Code: CS291****Contacts: 0:0:3****Credits: 1.5****Prerequisites:** Number system, Boolean Algebra.**Course Outcomes:**

CO1	Learn the concept of DOS system commands and editor.
CO2	To formulate the algorithms for simple problems and to translate given algorithms to a working and correct program.
CO3	To be able to identify and correct syntax errors / logical errors as reported during compilation time and run time.
CO4	To be able to write iterative as well as recursive programs.
CO5	Learn the concept of programs with Arrays, Pointers, Structures, Union and Files.

List of Experiment:

- Some basic commands of DOS, Windows and Linux Operating System, File handling and Directory structures, file permissions, creating and editing simple C program, compilation and execution of C program.
- Writing C Programs on variable, expression, operator and type-casting.
- Writing C Programs using different structures of if-else statement and switch-case statement.
- Writing C Programs demonstrating use of loop (for loop, while loop and do-while loop) concept and use of break and continue statement.
- Writing C Programs demonstrating concept of Single & Multidimensional arrays.
- Writing C Programs demonstrating concept of Function and Recursion.
- Writing C Programs demonstrating concept of Pointers, address of operator, declaring pointers and operations on pointers.
- Writing C Programs demonstrating concept of structures, union and pointer to structure.
- Writing C Programs demonstrating concept of String and command line arguments.
- Writing C Programs demonstrating concept of dynamic memory allocation.
- Writing C Programs demonstrating concept of File Programming.

CO-PO Mapping:

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

Course Name: Chemistry Lab

Course Code: CH 291

Contact: 0:0:3

Credits: 1.5

Prerequisites: Knowledge of Physics up to 12th standard.

Course Objective:

- Study the basic principles of pH meter and conductivity meter for different applications.
- Analysis of water for its various parameters & its significance in industries.
- Learn to synthesis Polymeric materials and drugs.
- Study the various reactions in homogeneous and heterogeneous medium.

Course Outcomes:

CO1: Able to operate different types of instruments for estimation of small quantities chemicals used in industries and scientific and technical fields.

CO2: Able to analyse and determine the composition of liquid and solid samples working as an individual and also as a team member

CO3: Able to analyse different parameters of water considering environmental issues

CO4: Able to synthesize drug and polymer materials.

CO5: Capable to design innovative experiments applying the fundamentals of chemistry

List of Experiment:

Choice of 10-12 experiments from the following:

- Determination of surface tension and viscosity
- Thin layer chromatography
- Determination of hardness of water
- Determination of chloride content of water
- Determination of the rate constant of a reaction
- Determination of cell constant and conductometric titration
- pH metric titrations
- Synthesis of a polymer/drug
- Saponification/acid value of an oil
- Chemical analysis of a salt
- Chemical oscillations- Iodine clock reaction
- Determination of the partition coefficient of a substance between two immiscible liquids
- Adsorption of acetic acid by charcoal

Innovative experiments (any one)

- Synthesis of silver nano particles
- Green synthesis

CO-PO Mapping:

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

Course Name: Basic Electrical Engineering Laboratory

Course Code: EE291

Contact: 0:0:3

Credits: 1.5

Prerequisites:

- Basic Physics and applied physics.
- Basic Mathematics.
- Basic concept of Electric Circuit

Course Objective:

To impart and apply knowledge about the Basic Electrical Components, Machineries, Instruments and Safety measures.

Course Outcomes:

CO1: Identify and use common electrical components.

CO2: To develop electrical networks by physical connection of various components and analyze the circuit behavior.

CO3: Apply and analyze the basic characteristics of transformers and electrical machines.

List of Experiments:

1. Basic safety precautions – earthing, introduction to measuring instruments – Voltmeter, Ammeter, Multimeter, Wattmeter, Real life Resistor, Capacitor, Inductor.
2. Verification of Thevenin's and Norton's Theorem.
3. Verification of Superposition and Maximum Power Transfer Theorem.
4. Characteristics of Fluorescent, Tungsten and Carbon filament lamps.
5. Study of R-L-C series circuit.
6. Three-phase Power measurement with two wattmeter method.
7. Demonstration of cut-out sections of machines: DC Machine (commutator-brush arrangement), Induction Machine (squirrel cage rotor).
8. Measurement of primary and secondary voltage and current of single-phase transformer – Open Circuit and Short Circuit Test.
9. Starting, Reversing and speed control of DC shunt motor.
10. Torque-Speed characteristics of DC Machine.
11. Torque-Speed characteristics of Three-phase Induction Motor.
12. Test on single-phase Energy Meter.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	-	-	-	-	2	-	-	-	-	-	1
CO2	2	3	-	-	-	-	-	-	-	-	1	1
CO3	3	-	-	-	-	-	-	-	-	-	-	1

Course Name: Engineering Graphics & Design

Course Code: ME 291

Contact: 0:0:3

Credits: 1.5

Prerequisites: Basic knowledge of geometry

Course Objectives:

To learn detailed drawing and modeling of a system, component, or process which meets desired needs within realistic constraints. It will help students to use the techniques, skills, and modern engineering tools and communicate effectively.

Course Outcomes:

CO1: Get introduced with Engineering Graphics and visual aspects of design.

CO2: Know and use common drafting tools with the knowledge of drafting standards.

CO3: Apply computer aided drafting techniques to represent line, surface or solid models in different Engineering viewpoints.

CO4: Produce part models; carry out assembly operation and show working procedure of a designed project work using animation.

List of Drawing:

Traditional Engineering Graphics:

Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.

Module 1: Introduction to Engineering Drawing

Principles of Engineering Graphics and their significance, Usage of Drawing instruments, lettering, Conic sections including Rectangular Hyperbola (General method only); Cycloid, Epicycloid and Involute; Scales – Plain, Diagonal and Vernier Scales.

Module 2: Orthographic & Isometric Projections

Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes; Projection of Solids inclined to both the Planes- Auxiliary Views; Isometric Scale, Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa.

Module 3: Sections and Sectional Views of Right Angular Solids

Drawing sectional views of solids for Prism, Cylinder, Pyramid, Cone and project the true shape of the sectioned surface, Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw sectional orthographic views of objects from industry and dwellings (foundation to slab only)

Computer Graphics:

Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modeling; Solid Modeling.

Module 4: Overview of Computer Graphics

Demonstration of CAD software [The Menu System, Toolbars (Standard, Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), Zooming methods, Select and erase objects].

Module 5: CAD Drawing, Customization, Annotations, layering

Set up of drawing page including scale settings, ISO and ANSI standards for dimensioning and tolerancing; Using various methods to draw straight lines, circles, applying dimensions and annotations to drawings; Setting up and use of Layers, Changing line lengths (extend/lengthen); Printing documents; Drawing sectional views of solids and project the true shape of the sectioned surface; Drawing annotation, CAD modeling of parts and assemblies with animation, Parametric and non parametric solid, surface and wireframe modeling, Part editing and two dimensional documentation of models.

Module 6:**Demonstration of a simple team design project**

Illustrating Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; Meshed topologies for engineering analysis and tool-path generation for component manufacture, Use of solid-modeling software for creating associative models at the component and assembly levels.

Text Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. (Corresponding set of) CAD Software Theory and User Manuals

Reference Books:

1. K. Venugopal, Engineering Drawing + AutoCAD, New Age International publishers
2. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication.
3. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
4. Narayana, K.L. & P Kanniah (2008), Text book on Engineering Drawing, Scitech Publishers.

CO-PO Mapping:

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

Course Name: Lang. Lab. and Seminar Presentation

Course Code: HU 291

Contact: 0:0:2

Credit: 1

Pre requisites: Basic knowledge of LSRW skills.

Course Objective: To train the students in acquiring interpersonal communication skills by focussing on language skill acquisition techniques and error feedback.

Course Outcomes:

CO1: Able to understand advanced skills of Technical Communication in English through Language Laboratory.

CO2: Able to apply listening, speaking, reading and writing skills in societal and professional life.

CO3: Able to demonstrate the skills necessary to be a competent Interpersonal communicator.

CO4: Able to analyze communication behaviours.

CO5: Able to adapt to multifarious socio-economical and professional arenas with the help of effective communication and interpersonal skills.

Course Content:

Module 1: Introduction to the Language Lab

- a. The Need for a Language Laboratory
- b. Tasks in the Lab
- c. Writing a Laboratory Note Book

Module 2: Active Listening

- a. What is Active Listening?
- b. Listening Sub-Skills—Predicting, Clarifying, Inferencing, Evaluating, Note-taking
- c. Academic Listening vs Business Listening
- d. Listening in Business Telephony
- e. Study of Contextualized Examples based on Lab Recordings

Module 3: Speaking

- a. Speaking—Accuracy and Fluency Parameters
- b. Pronunciation Guide—Basics of Sound Scripting, Stress and Intonation
- c. Fluency-focussed activities—JAM, Conversational Role Plays, Speaking using Picture/Audio Visual inputs
- d. Accuracy-focussed activities—Identifying Minimal Pairs, Sound Mazes, Open and Closed Pair Drilling, Student Recordings (using software)
- e. Group Discussion: Principles and Practice

Module 4: Lab Project Work

- a. Making a brief Animation film with voice over (5 minutes)OR
- b. Making a brief Documentary film (10 minutes)

Reference Books:

1. IIT Mumbai, **Preparatory Course in English** syllabus
2. IIT Mumbai, **Introduction to Linguistics** syllabus
3. Sasikumar et al. *A Course in Listening and Speaking*. New Delhi: Foundation Books, 2005.
4. Tony Lynch, *Study Listening*. Cambridge: Cambridge UP, 2004.

CO – PO Mapping :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	2	-	-	3	-	3	2	2	3	3	-	3
CO2	2	3	3	3	-	3	3	3	2	3	-	3
CO3	1	3	3	3	-	2	2	2	2	3	-	2
CO4	1	2	3	3	-	2	1	1	2	3	-	2
CO5	3	3	2	3	-	2	3	2	2	3	-	2

Course Name: NSS/Physical Activities/ Meditation & Yoga/ Photography/Nature Club

Course Code: MC 281

Contact: 0:0:3

Course Objectives:

- To increase student awareness about the weaker and unprivileged sections of society
- To expose students to environmental issues and ecological concerns
- To make students self aware about their participatory role in sustaining society and the environment

List of Activities:

- a) Creating awareness in social issues
- b) Participating in mass education programmes
- c) Proposal for local slum area development
- d) Waste disposal
- e) Environmental awareness ``
- f) Production Oriented Programmes
- g) Relief & Rehabilitation work during Natural calamities

Creating awareness in social issues:

1. Women's development – includes health, income-generation, rights awareness.
2. Hospital activities – Eg. writing letters for patients, guiding visitors
3. Old age home – visiting the aging in-mates, arranging for their entertainment.
4. Children's Homes - visiting the young in-mates, arranging for their entertainment
5. Linking with NGOs to work on other social issues. (Eg. Children of sex-workers)
6. Gender issues- Developing an awareness, to link it with Women's Cell of college

Participating in mass education programmes: 1. Adult education 2. Children's education

Proposal for local slum area development : One or two slums to be identified and according to the needs, activities to be developed and proposals and reports are to be submitted.

Environmental awareness

- Resource conservation – Awareness to be developed on water, energy, soil.
- Preservation of heritage monuments- Marches, poster campaigns
- Alternative energy consciousness amongst younger school-children.
- Plantation and beautification- Plantation of trees, their preservation and upkeep, developing NSS parks.
- Waste disposal- Proper methods of domestic waste disposal.

Production Oriented Programmes

5. Working with people and explaining and teaching improved agricultural practices
6. Rodent control land pest control practices;
7. Soil-testing, soil health care and soil conservation;
8. Assistance in repair of agriculture machinery;
9. Work for the promotion and strengthening of cooperative societies in villages;
10. Assistance and guidance in poultry farming, animal husbandry, care of animal health etc.;
11. Popularization of small savings and
12. Assistance in procuring bank loans

Relief & Rehabilitation work during Natural calamities

- g) Assisting the authorities in distribution of rations, medicine, clothes etc.;
- h) Assisting the health authorities in inoculation and immunization, supply of medicine etc.;
- i) Working with the local people in reconstruction of their huts, cleaning of wells, building roads etc.;

Curriculum for B.Tech 3rd Semester

Under Autonomy (GR A: ECE, EE, EIE, BME; GR B: CSE, IT, ME, CE, FT)

3rd Semester									
SL No	Course Type	Course Code	THEORY	Contact Hours/Week				Credit Points	
				L	T	P	Total		
A. THEORY									
1	PC	IT301	Data Structure and Algorithm	3	0	0	3	3	
2	PC	IT 302	Analog and Digital Electronics	3	0	0	3	3	
3	BS	M (IT)301	Mathematics -III	3	1	0	4	4	
4	BS	PH 301	Physics-II	3	0	0	3	3	
5	ES	M(IT)302	Numerical Methods and Statistics	3	0	0	3	3	
Total of Theory								16	16
B. PRACTICAL									
6	PC	IT391	Data Structure Lab	0	0	3	3	1.5	
7	PC	IT 392	Analog and Digital Electronics Lab	0	0	3	3	1.5	
8	BS	PH391	Physics-II Lab	0	0	3	3	1.5	
9	ES	M(IT)392	Numerical Methods and Statistics Lab	0	0	3	3	1.5	
10	PROJ	PR 391	Project-III	0	0	2	2	1	
11	PROJ*	PR 392	Innovative activities-II	0	0	0	1	0.5	
C. MANDATORY ACTIVITIES / COURSES									
12	MC	MC 381	Behavioural and Interpersonal Skills	0	0	3	3		
Total of Theory, Practical & Mandatory Activities/Courses								34	23.5

j) Assisting and working with local authorities in relief and rescue operation; Collection of clothes and other materials, and sending the same to the affected areas;

Syllabus- 3rd Semester

Course Name: Data Structure and Algorithm

Course Code: IT 301

Contact 3:0:0

Total Contact Hours: 38

Credits: 3

Prerequisite:

Basic Mathematics, Programming language

Course Objective:

The objective of the course is to provide knowledge of various data structures and algorithms; to introduce difference techniques for analyzing the efficiency of computer algorithms and provide efficient methods for storage, retrieval and accessing data in a systematic manner and explore the world of searching, sorting, traversal and graph tree algorithm along with demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists and trees.

Course Outcome: At the end of the course students will be able to

CO1	Use different kinds of data structures which are suited to different kinds of applications, and some are highly specialized to specific tasks.
CO2	Manage large amounts of data efficiently, such as large databases and internet indexing services.
CO3	Use efficient data structures which are a key to designing efficient algorithms.
CO4	Use some formal design methods and programming languages which emphasize on data structures, rather than algorithms, as the key organizing factor in software design.
CO5	Store and retrieve data stored in both main memory and in secondary memory.

Course Content:

Module I : Introduction : Concepts of data structures (7)

a) Data and data structure b) Abstract Data Type and Data Type. Algorithms and programs, basic idea of pseudo-code. Algorithm efficiency and analysis, time and space analysis of algorithms – order notations. Array : Different representations – row major, column major. Sparse matrix - its implementation and usage. Array representation of polynomials. Linked List : Singly linked list, circular linked list, doubly linked list, linked list representation of polynomial and applications.

Module II: Stack and Queue (7)

Stack and its implementations (using array, using linked list), applications. Queue, circular queue,

dequeue. Implementation of queue- both linear and circular (using array, using linked list), applications. Recursion : Principles of recursion – use of stack, differences between recursion and iteration, tail recursion. Applications - The Tower of Hanoi, Eight Queens Puzzle.

Module III: Trees (12)

Basic terminologies, forest, tree representation (using array, using linked list). Binary trees - binary tree traversal (pre-, in-, post- order), threaded binary tree (left, right, full) - non-recursive traversal algorithms using threaded binary tree, expression tree. Binary search tree- operations (creation, insertion, deletion, searching). Height balanced binary tree – AVL tree (insertion, deletion with examples only). B- Trees – operations (insertion, deletion with examples only). Huffman tree.

Graphs : Graph definitions and Graph representations/storage implementations – adjacency matrix, adjacency list, adjacency multi-list. Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) – concepts of edges used in DFS and BFS (tree-edge, back-edge, cross-edge, forward-edge), applications. Minimal spanning tree – Prim’s algorithm

Module IV: Sorting Algorithm(10)

Internal sorting and external sorting Bubble sort and its optimizations, insertion sort, shell sort, selection sort, merge sort, quick sort, heap sort (concept of max heap), radix sort. Tree Sort technique .Searching : Sequential search, binary search, interpolation search. Hashing : Hashing functions, collision resolution techniques

Text Books:

1. Data Structures Using C, by Reema Thereja, OXFORD Publications
2. Data Structures and Algorithms Using C by Amitava Nag and Joyti Prakash Singh, VIKASH Publication
3. Data Structures by S. Lipschutz.

Reference Books:

1. Data Structures Using C, by E. Balagurusamy E. Mc graw Hill)
2. Data Structures Using C and C++, by Moshe J. Augenstein, Aaron M. Tenenbaum

CO-PO Mapping :

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

Course Name: Analog and Digital Electronics

Course Code: IT 302

Contact 3:0:0

Total Contact Hours:

Credits: 3

Prerequisites:

Mathematics, Physics, Basic Electronics.

Course Objective:

The objective of the course is to prepare students to perform the analysis and design of various digital and analog electronic circuits.

Course Outcome: After completion of this course student will be able to

CO1	Understand basic analog and digital electronics, including semiconductor properties, operational amplifiers, combinational and sequential logic and analog-to-digital digital-to-analog conversion techniques
CO2	Identify different symbols, working principles of basic Digital electronics circuits for data processing application
CO3	Analyze the characteristics of basic digital circuits
CO4	Design analog amplifiers, combinational logic devices and sequential logic devices like counters and registers

Course Content:

Module I : Analog Electronics (10)

Recapitulation of P-N diodes, BJT, FET , Feedback and OPAMP ;Power Amplifiers – Class A, B, AB and C - basic concepts, power, efficiency calculation; Phase Shift, Wein Bridge oscillators; Astable & Monostable Multivibrators, 555 Timer and Multivibrators ; Schmitt Trigger circuit.

Module II: Introduction to Number Systems (10)

Binary, Octal and Hexadecimal representation and their conversions; BCD, ASCII, EBDIC, Gray codes and their conversions ; Signed binary number representation with 1's and 2's complement methods , Binary arithmetic; Boolean algebra ; Various logic gates; Representation in SOP and POS forms ; Minimization of logic expressions by algebraic method , K-MAP method and Quin Mc-Clusky Method.

Module III: Combinational Circuits (6)

Adder and Subtractor; Applications and circuits of Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator and Checker.

Module IV: Sequential Circuits (6)

Basic Flip-flop & Latch ; SR, JK, D, T and JK Master-slave Flip Flops Registers (SISO,SIPO,PIPO,PISO); Ring counter, Johnson counter ; Basic concept of Synchronous and Asynchronous counters ; Design of synchronous and asynchronous Mod N Counter.

Module V: A/D and D/A conversion techniques:(2)

Basic concepts of R-2R , A/D and D/A; successive approximation ADC

Module VI: Logic families (2)

TTL, ECL, MOS and CMOS - basic concept

Text Books:

1. 'Digital Circuits and Design', Salivahanan, S. Arivazhagan, Vikas Publishers
2. 'Electronics Fundamentals and Applications', D. Chattopadhyay, P. C. Rakshit, New Age International Publishers

Reference Books:

1. 'Digital Design', M. Morris Mano, Pearson Education

CO-PO Mapping:

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

Course Name: Mathematics - III

Course Code: M (IT) 301

Contact: 3:1:0

Total Contact Hours: 48

Credits: 4

Prerequisite:

The students to whom this course will be offered must have the concept of (10+2) standard set theory, calculus, basic probability.

Course Objectives:

The objective of this course is to disseminate the prospective engineers with the knowledge of Graph Theory and Algebraic structure. It also aims to equip the students with concepts and tools of probability distribution as an intermediate to the advanced level of applications that they would find useful in their disciplines.

Course Outcome: At the end of the course students will be able to

CO1	Recall the distinctive characteristics of probability distribution, abstract algebra, and graph theory.
CO2	Demonstrate the theoretical working of probability distribution, abstract algebra, and graph theory.
CO3	Compute the probability of real world uncertain phenomena by indentifying probability distribution that fits the phenomena.
CO4	Construct the shortest path and minimal spanning tree from a given graph using the algorithms of graph theory.

Course Content:

Module I: Probability Distributions (16)

Classical and Axiomatic definition of Probability (elementary properties), conditional probability, Baye's theorem and related problems. Random Variable: Discrete and Continuous (definition & examples); Probability Distribution (definition & examples); Probability Mass Function, Probability Density Function and Distribution Function for a single random variable only (definition, properties & related problems); Expectation, Variance and Standard Deviation for a single random variable only (definition, properties & related problems); Binomial Distribution, Poisson Distribution, Binomial Approximation to Poisson Distribution and Normal Distribution (problems only), Mean, Variance and Standard Deviation of Binomial, Poisson and Normal Distribution (problems only).

Module II: Algebraic Structures (14)

Group and related problems, order of an element and related problems, Lagrange's theorem, Subgroup,

Normal subgroup, Cyclic group, Permutation group, Symmetric group (S₃).

Module III: Graph Theory (18)

Basics of Graph Theory and related theorems and problems; Digraphs; Weighted Graph; Connected and Disconnected graph; Bipartite Graph; Complement of a Graph; Regular Graph; Complete Graph; Walk, Path, Circuit, Euler Graph; Hamiltonian circuit, Cut Set and Cut Vertices; Adjacency and Incidence Matrices of a graph (digraph); Isomorphism.

Basics of Tree and related theorems, Binary Tree, Spanning Tree, Minimal Spanning Tree, Dijkstra's algorithm, Kruskal's Algorithm, Prim's Algorithm.

Planar and Dual Graphs, Kuratowski's graphs, Homeomorphic graphs Euler formula for connected planar graph.

Text Books:

1. Das, N.G. *Probability and Statistics*; The McGraw Hill Companies.
2. Gupta, S. C. and Kapoor, V. K. *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons.
3. Deo, N. *Graph Theory with Applications to Engineering and Computer Science*, Prentice Hall.
4. Mapa, S. K. *Higher algebra: Abstract and Linear*, Levant, 2011.
5. Chakraborty, S. K. and Sarkar, B. K. *Discrete Mathematics*, OXFORD University Press.

Reference Books:

1. Chandrasekaran, N. and Umavparvathi, M. *Discrete Mathematics*, PHI
2. Lipschutz, S. *Theory and Problems of Probability (Schaum's Outline Series)*, McGraw Hill Book Co.
3. Spiegel, M. R. *Theory and Problems of Probability and Statistics (Schaum's Outline Series)*, McGraw Hill Book Co.
4. Grewal, B. S. *Higher Engineering Mathematics*, Khanna Pub.
5. Kreyzig, E. *Advanced Engineering Mathematics*, John Wiley and Sons.
6. Sharma, J.K. *Discrete Mathematics*, Macmillan.
7. Spiegel, M. R., Schiller, J.J. and Srinivasan, R.A. *Probability and Statistics (Schaum's Outline Series)*, TMH.
8. Wilson: Introduction to graph theory, Pearson Education.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	1	1	-	-	-	-	-	-	-	-	1
CO2	3	2	1	-	-	-	-	-	-	-	-	1
CO3	3	2	2	-	-	-	-	-	-	-	-	1
CO4	3	2	2	-	-	-	-	-	-	-	-	1

Course Name: Physics II
Course Code: PH 301
Contact: 3:0:0
Total Contact Hours:
Credits: 3

Pre-Requisites: 1st year Basic Physics knowledge

Course Objective:

The Physics-II course will provide the exposure to the physics of materials that are applied in digital circuitry, storage devices; exposure to the physics of quantum logic gate operation and quantum computation; an insight into the science & technology of next generation; foundations of electromagnetic theory and communication systems; concept of fundamental particles and associated applications in semiconductors

Course Outcome: After completion of this course student will be able to

CO1	explain electromagnetic wave propagation using fundamentals of electrostatics, magnetostatics and electromagnetic theory.
CO2	apply Schrödinger equation in variety of atomic scale problems including nanomaterials.
CO3	analyze the importance of superposition principle of quantum mechanics in conceptualization of Quantum bits.
CO4	justify the importance of Fermi energy level in turning electronic properties of various semiconductors

Course Content:

Module I: Quantum Mechanics-II, Quantum Computation and Communication (12)

Quantum Mechanics-II

Formulation of quantum mechanics and Basic postulates; Operator correspondence-Measurements in Quantum Mechanics- Eigen value, Eigen function, superposition principle, orthogonality of wave function, expectation value. Commutator.

Time dependent Schrödinger's equation, formulation of time independent Schrödinger's equation by method of separation of variables, Schrödinger's equation as energy eigen value equation, Application of Schrödinger equation – Particle in an infinite square well potential (1-D and 3-D potential well; Discussion on degenerate levels), 1D finite barrier problem and concept of quantum tunnelling (solve only $E < V_0$).

Quantum Computation and Communication

The idea of n- dimensional vector space, use of 'bra-ket' notation

, matrix representation of bra & kets; basis, Hilbert space; Pauli matrices.

Idea of qubit and examples of single qubit logic gates- Classical bits, qubit as a two level system; Bloch vector, Pauli gate, Hadamard gate, Phase shift gate, Quantum circuits related to Quantum gates.

Module II: Statistical Mechanics (6)

Basics of Statistical Mechanics:

Concept of energy levels and energy states, phasespace, microstates, macrostates and thermodynamic probability, MB, BE, FD, statistics (Qualitative discussions)- physical significance, conception of bosons, fermions, classical limits of quantum statistics, Fermi distribution at zero & non-zero temperature, Concept of Fermi level.

Applications of Statistical Mechanics:

Qualitative study: Fermi level in metals, intrinsic and extrinsic semiconductors (pictorial representations on temperature dependence and doping concentration viz. p type, n-type).

Module III: Storage and display devices (3)

Different storage and display devices-Magnetic storage materials, Hard disc (examples related to computers compared with semiconductor storage viz. Pendrive), Operation and application of CRT, Liquid crystal display (LCD), LED, Plasma display, Thin film transistor display).

Module IV: Electricity and Magnetism (11)

Gauss's law in integral form and conversion into differential form, Equation of continuity, Extend to Poisson's & Laplace's equation, Application to parallel plate, spherical and cylindrical capacitors.

Magnetostatics:

Lorentz force (concept in Hall effect-), force on a small current element placed in a magnetic field. Biot-Savart law- non existence of magnetic monopole, Ampere's circuital law, Magnetic vector and scalar potential.

Electro-magnetism & Electromagnetic theory

Faraday's law, Concept of displacement current, Maxwell's field equations with physical significance, wave equation in free space, transverse nature of electromagnetic wave.

Application of Electromagnetic theory in Polarization

Definition, Plane of polarization, Plane of vibration, Malus Law, Fundamental concepts of plane, circular & elliptical polarizations (only qualitative idea) with examples, Brewster's law, Double refraction : Ordinary & Extra ordinary rays, Nicol's prism, Engineering applications in E.M.Theory, Numerical problems

Module V : Physics of Nanomaterial (4)

Reduction of dimensionality, properties of nanomaterials, Quantum wells (two dimensional), Quantum wires (one dimensional), Quantum dots (zero dimensional); Application of nanomaterials (CNT, grapheme, electronic, environment, medical).

Text Books:

1. Integrated Engineering Physics by Amal Kumar Chakraborty
2. Engineering Physics by [Khan](#) and Panigrahi Publisher: Oxford.

Reference Books:**Module 1:**

1. Advanced Quantum Mechanics-J. J. Sakurai (TMH)
2. Quantum Mechanics-Schiff (Addison-Wesley)
3. Quantum Computation and Quantum Information(10th Anniversary Edition)-Nielsen & Chuang (Cambridge University Press)
4. The physics of quantum information-[Dirk Bouwmeester](#), [Artur K. Ekert](#), [Anton Zeilinger](#) (Springer)
5. Quantum Mechanics-Cohen Tanuje.
6. Advanced Quantum Mechanics-P.A.M. Dirac

Module 2.

- Statistical Mechanics by B.B. Laud
 Statistical Mechanics by Singh and Singh
 Statistical Mechanics by Satyaprakash

Module 3

- 1 Introduction to solid state physics-Kittel (TMH)
2. Solid State Physics- Ali Omar (Pearson Education)
3. Solid state physics- S. O. Pillai
4. Solid State Physics-A. J. Dekker (Prentice-Hall India)
5. Materials Science-Raghavan

Module 4:

1. Electromagnetics-B.B. Laud (TMH)
2. Electricity Magnetism-B.Ghosh (Book & Allied Publisher)
3. Electricity Magnetism-Chattohadhyay & Rakshit (New Central Book Agency)
4. Electricity Magnetism-Fewkes and Yardwood (Oxford University Press)
5. Optics-A. K. Ghatak (TMH)
6. Optics-B.D. Gupta (Books and Allied Publ)

Module 6

6. Nanotechnology-Rakesh Rathi (S. Chand Publishers)
7. Integrated Electronics-Millman Halkias (TMH)
8. Nanotechnology-Rakesh Rathi (S. Chand Publishers)
9. Nanoscience-H. E. Schaefer (Springer)

CO-PO Mapping:

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

Course Name: Numerical Methods and Statistics

Course Code: M (IT) 302

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisites:

The students to whom this course will be offered must have the concept of (10+2) standard number system, algebra and calculus.

Course Objectives:

The purpose of this course is to provide basic understanding of the derivation and the use of the numerical methods along with the knowledge of finite precision arithmetic.

Course Outcome: At the end of the course students will be able to

CO1	Recall the distinctive principles of numerical analysis and the associated error measures.
CO2	Understand the theoretical workings of numerical techniques.
CO3	Apply numerical methods used to obtain approximate solutions to intractable mathematical problems such as interpolation, integration, the solution of linear and nonlinear equations, and the solution of ordinary differential equations.
CO4	Select appropriate numerical methods to apply to various types of problems in engineering and science in consideration of the mathematical operations involved, accuracy requirements, and available computational resources.
CO5	Interpret complex statistical findings using the understanding of inferential statistics.

Course Content:

Module I: Error Analysis and Interpolation (8)

Approximation in Numerical Computation: Truncation and rounding errors, Propagation of errors, Fixed and floating-point arithmetic.

Interpolation: Difference Operators: Forward and Backward, Shift Operator; Newton forward interpolation, Newton backward interpolation, Lagrange's Interpolation.

Module II: Numerical Solution of Linear and Non-linear Equations (8)

Numerical Solution of a System of Linear Equations: Gauss elimination method, LU Factorization method, Gauss-Seidel iterative method.

Solution of Polynomial and Transcendental Equations: Bisection method, Regula-Falsi, Newton-Raphson method.

Module III: Numerical Integration and Numerical Solution of Differential Equation (6)

Numerical Integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms.

Numerical solution of ordinary differential equation: Euler's method, Euler's modified method, Fourth order Runge-Kutta method.

Module IV: Statistics (14)

Basic Statistics: Basic statistics, measure of central tendency, mean, median, mode, dispersion, correlation coefficient and regression.

Sampling theory: Random sampling. Statistic and its Sampling distribution. Sampling distribution of sample mean and variance in random sampling from a normal distribution (statement only) and related problems.

Estimation of parameters: Unbiased and consistent estimators. Interval estimation. Maximum likelihood estimation of parameters (Binomial, Poisson). Confidence intervals and related problems

Text Books:

1. Shishir Gupta & S. Dey, Numerical Methods, Mc. Grawhill Education Pvt. Ltd.
2. C. Xavier: C Language and Numerical Methods, New age International Publisher.
3. Dutta & Jana: Introductory Numerical Analysis. PHI Learning
4. J. B. Scarborough: Numerical Mathematical Analysis. Oxford and IBH Publishing
5. Jain, M. K., Iyengar, S. R. K. and Jain, R. K. *Numerical Methods (Problems and Solution)*. New age International Publisher.
6. Prasun Nayek: Numerical Analysis, [Asian Books](#)
7. N. G. Das: Statistical Methods, TMH.
8. **Sancheti**, D. S. & **Kapoor**, V. K. : *Statistics Theory, Method & Application*, Sultan chand & sons, New Delhi

Reference Books:

1. Balagurusamy, E. *Numerical Methods*, Scitech. TMH.
2. Dutta, N. *Computer Programming & Numerical Analysis*, Universities Press.
3. Guha, S. and Srivastava, R. *Numerical Methods*, Oxford Universities Press.
4. Shastri, S. S. *Numerical Analysis*, PHI.
5. Mollah, S. A. *Numerical Analysis*, New Central Book Agency.
6. Numerical Methods for Mathematics, Science & Engg., Mathews, PHI.
7. Rao, G. S. *Numerical Analysis*, New Age International.
8. Rao, G. S. *Programmed Statistics (Questions – Answers)*, New Age International

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	1	1	-	-	-	-	-	-	-	-	1
CO2	3	2	1	-	-	-	-	-	-	-	-	1
CO3	3	2	2	-	-	-	-	-	-	-	-	1
CO4	3	3	2	3	-	-	-	-	-	-	-	1
CO5	3	3	2	3	-	-	-	-	-	-	-	1

Course Name: Data Structure Lab

Course Code: IT391

Contact: 0:0:3

Credits: 1.5

Prerequisites:

Basic Mathematics, Programming language

Course Objective:

To develop the conceptual understanding for solving problems using data structures such as linear lists, stacks, queues, hashing, trees and graphs and writing programs for these solutions.

Course Outcome: After completion of this course student will be able to

CO1	Understand the concept of dynamic memory management, data types, basic data structures, and complexity analysis.
CO2	Introduce the concept of data structures through ADT.
CO3	Choose the appropriate linear and non-linear data structure and algorithm design method for a specified application design.
CO4	Analyze the complexity of the problems.

List of Experiment:

1. Experiments should include but not limited to Implementation of array operations:
2. Stack and Queues: adding, deleting, elements circular Queue: Adding& deleting elements
3. Merging Problem:
4. Evaluation of expressions operations on Multiple stacks & queues:
5. Implementation of linked list: inserting, deleting, inverting a linked list
6. Implementation of stacks and queues
7. Using linked lists: Polynomial addition, Polynomial multiplication
8. Sparse Matrices: Multiplication , addition
9. Recursive and Non Recursive traversal Trees
10. Threaded binary tree traversal. AVL tree implementation
11. Application of Trees. Application of sorting and searching algorithms
12. Hash tables implementation: searching, inserting and deleting, searching and sorting techniques.
13. Innovative Experiments

Text Books:

1. Data Structures Using C, by Reema Thereja, OXFORD Publications
2. Data Structures and Algorithms Using C by Amitava Nag and Joyti Prakash Singh, VIKASH Publication
3. Data Structures by S. Lipschutz.

Reference Books:

1. Data Structures Using C, by E. Balagurusamy E. Mc graw Hill)
2. Data Structures Using C and C++, by Moshe J. Augenstein, Aaron M. Tenenbaum

CO-PO Mapping:

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

Course Name: Analog and Digital Electronics Lab

Course Code: IT392

Contact: 0:0:3

Credits: 1.5

Prerequisite:

Basic Mathematics, Programming language

Course Objective:

The objective of the course is to illustrate the different electronic circuit and their application in practice.

Course Outcome: At the end of the course students will be able to know to find out:

CO1	Examine the characteristics of analog electronic circuit devices such as BJTs and FETs, amplifiers
CO2	Make use of different basic logic gates and universal gates
CO3	Implement the combinational circuits in digital electronics using basic logic gates
CO4	Construct sequential circuits like registers and counters using flip-flops and basic gates

List of Experiment:

1. Design of an amplifier.
2. Design of a Phase-Shift Oscillator.
3. Design of a Schmitt Trigger using Opamp.
4. Design of a Multivibrator circuit using 555 timer.
5. Design of Half and Full adder and Half and Full Subtractor
6. Construction of simple Decoder & Multiplexer circuits using logic gates
7. Realization of RS / JK / D flip flops using logic gates
8. Design of Shift Register using J-K / D Flip Flop.
9. Realization of Synchronous Up/Down counter.
10. Design of MOD- N Counter (Synchronous and Asynchronous).
11. Study of DAC and ADC.
12. Innovative Experiments

Text Books:

1. 'Digital Circuits and Design', Salivahanan, S. Arivazhagan, Vikas Publishers
2. 'Electronics Fundamentals and Applications', D. Chattopadhyay, P. C. Rakshit, New Age International Publishers

Reference Books:

1. 'Digital Design', M. Morris Mano, Pearson Education

CO-PO Mapping:

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

Course Name: Physics-II Lab
Course Code: PH391
Contact: 0:0:3
Credits: 1.5

Perquisites:

Knowledge of Physics upto B.Tech Physics-I lab

Course Objective:

The Physics-II Lab course will provide the exposure to the physics of materials that are applied in digital circuitry, storage devices; exposure to the physics of quantum logic gate operation and quantum computation; an insight into the science & technology of next generation; foundations of electromagnetic theory and communication systems; concept of fundamental particles and associated applications in semiconductors

Course Outcome: At the end of the course students will be able to know to find out:

CO1	demonstrate experiments allied to their theoretical concepts
CO2	conduct experiments using semiconductors , dielectric and ferroelectrics
CO3	classify various types of magnetic materials
CO4	participate as an individual, and as a member or leader in groups in laboratory sessions actively
CO5	analyze experimental data from graphical representations , and to communicate effectively them in Laboratory reports including innovative experiments

List of Experiment:

Module I : Electricity Magnetism

1. Study of dipolar magnetic field behaviour.
2. Study of hysteresis curve of a ferromagnetic material using CRO.
3. Use of paramagnetic resonance and determination of Lande-g factor using ESR setup.
4. Measurement of Curie temperature of the given sample.
5. Determination of dielectric constant of given sample (frequency dependent).
6. Determination of Hall co-efficient of a semiconductor and measurement of Magneto resistance of a given semiconductor

Module II: Quantum Mechanics-II

7. Determination of Stefan's radiation constant.
8. To study current-voltage characteristics, load response, areal characteristics and spectral response of

photo voltaic solar cells & measurement of maximum workable power.

9. Measurement of specific charge of electron using CRT.

10. Determination of band gap of a semiconductor.

Module III : Experiments Beyond Syllabus

1. Determination of thermal conductivity of a bad conductor by Lees and Chorlton's method.

2. Determination of thermal conductivity of a good conductor by Searle's method.

3. Study of I-V characteristics of a LED.

4. Study of I-V characteristics of a LDR

5. Study of transducer property: Determination of the thermo-electric power at a certain temperature of the given thermocouple.

6. Innovative Experiments

Text Books

1. Electricity and Magnetism (In SI Units): Berkeley Physics Course - Vol.2,
2. Principles of Engineering Physics Vol 1 and Vol 2; by Md. N. Khan and S. Panigrahi, Pub: Cambridge Univ. press
3. Introduction to Quantum Mechanics S. N. Ghoshal (Calcutta Book House)
4. Introduction to solid state physics-Kittel (TMH)
5. Nanostructure and Nanomaterials, B.K. Parthasarathy

Reference Books

1. Edward M Purcell Introduction to Electrodynamics Griffiths David J. The Feynman Lectures on Physics. 2 (2nd ed.),
2. Feynman, Richard P Addison-Wesley. ISBN 978-0-8053- 9065-0
3. Quantum Mechanics-Bagde Singh (S. Chand Publishers)
4. Advanced Quantum Mechanics-J. J. Sakurai (TMH)
5. Quantum Computation and Quantum Information(10th Anniversary Edition)- Nielsen &

CO-PO Mapping:

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

Course Name: Numerical Methods and Statics Lab

Course Code: M(IT)392

Contact: 0:0:3

Credits: 1.5

Prerequisites: Any introductory course on programming language (example. C/ Matlab).

Course Objectives: The purpose of this course is to provide basic programming skills for solving the problems in numerical methods.

Course Outcome:

On successful completion of the learning sessions of the course, the learner will be able to:

CO1	Understand the theoretical workings of numerical techniques with the help of C/ Matlab
CO2	Execute basic command and scripts in a mathematical programming language
CO3	Apply the programming skills to solve the problems using multiple numerical approaches.
CO4	Analyze if the results are reasonable, and then interpret and clearly communicate the results.

List of Experiment:

1. Assignments on Newton forward /backward, Lagrange's interpolation.
2. Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule
3. Assignments on numerical solution of a system of linear equations using Gauss elimination, Gauss Jacobi and Gauss-Seidel iterations.
4. Assignments on numerical solution of Algebraic Equation by Bisection method, Regula-Falsi method, Newton-Raphson method.
5. Assignments on ordinary differential equation: Euler's method, Euler's modified method, Runge-Kutta methods.
6. Simple problems as assignment on Measures of Central Tendency- mean, median, mode, Measures of Dispersion- variance, standard deviation. Problems related to engineering field.
7. Innovative Experiments

Implementation of numerical methods on computer through C/C++ and commercial Software Packages: Matlab / Scilab / Labview / Mathematica/NAG ([Numerical Algorithms Group](#)/Python).

CO-PO Mapping:

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

Course Name: Behavioral & Interpersonal Skills

Course Code: MC-381

Contact: 0:0:3

Total Contact Hours: 36

Course Objective: To train the students in acquiring interpersonal communication skills by focusing on language skill acquisition techniques and error rectification through feedback.

Course Outcome:

CO1	It will equip the student to handle workplace interpersonal communication in an effective manner.
CO2	To enable students with strong oral and written interpersonal communication skills.
CO3	To prepare students to critically analyze workplace situations and take appropriate decisions.
CO4	To make students campus ready through proper behavioral and interpersonal grooming.
CO5	Integration of enhanced skill set to design and frame team based Project Report and Presentation.

Course Content:

MODULE ONE – INTERPERSONAL COMMUNICATON

1. The skills of Interpersonal Communication.
2. Gender/Culture Neutrality.
3. Rate of Speech, Pausing, Pitch Variation and Tone.
4. Corporate Communication.
5. Branding and Identity.

MODULE TWO- INTERPERSONAL COMMUNICATION BASED ON WORKPLACE COMMUNICATION

6. Workplace Communication.
7. Modes of Communication (Telephone, Conference Call, Team Huddle, Public Relation etc.)
8. Communication with Clients, Customers, Suppliers etc.
9. Organizing/Participating in Business Meeting.
10. Note Taking.
11. Agenda.
12. Minutes.

MODULE THREE – BUSINESS ETIQUETTE AND CORPORATE LIFE

13. Presenting oneself in the Business Environment.
14. Corporate Dressing and Mannerism.
15. Table Etiquette (Corporate Acculturation, Office parties, Client/Customer invitations etc.)
16. E-mail Etiquette.
17. Activity based Case Study.

MODULE FOUR – MOVIE MAKING: CORPORATE BUSINESS MEETING

18. Team based Brainstorming.
19. Process Planning and Developing Plot.
20. People management.
21. Documentation and Scripting.
22. Shooting the Movie: Location and Camera.
23. Post Production and Editing.
24. Movie Review: Feedback and Analysis

Curriculum for B.Tech 4th Semester

Under Autonomy (GR A: ECE, EE, EIE, BME; GR B: CSE, IT, ME, CE, FT)

4								
Sl No	Course Type	Course Code	Theory	Contact Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	PC	IT401	Computer Organization & Architecture	3	0	0	3	3
2	PC	IT402	Object Oriented Programming using	3	0	0	3	3
3	PC	IT403	Formal Language and Automata	3	0	0	3	3
4	PC	IT404	Communication Engineering & Coding	3	0	0	3	3
5	HS	HU 401	Values & Ethics in Profession	2	0	0	2	2
Total of Theory							14	14
B. PRACTICAL								
6	PC	IT491	Computer Organization & Architecture	0	0	3	3	1.5
7	PC	IT492	Object Oriented Programming Lab	0	0	3	3	1.5
8	PC	IT493	Programming Skill Development Lab	0	0	3	3	1.5
9	PROJ	PR 491	Project-IV	0	0	2	2	1
10	PROJ*	PR 492	Innovative activities-III	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
11	MC	MC 401	Environmental Science	0	0	3	3	
Total of Theory, Practical & Mandatory Activities/Courses							28	20

*Students may choose either to work on participation in all the activities of Institute's Innovation Council for eg: IPR workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

Syllabus-4th Semester

Course Name: Computer Organization & Architecture

Course Code: IT 401

Contact: 3:0:0

Total Contact Hours: 42

Credits: 3

Prerequisites: Basic Programming, Basic concept of Digital Electronics.

Course Objectives:

1. To study the basic organization and architecture of digital computers (CPU, memory, I/O, software).
2. Discussions on digital logic and microprogramming.
3. Understanding and utilization of digital computers.
4. Design and application of computer systems as foundation for more advanced computer-related studies.

Course Outcome: At the end of the course students will be able to

CO1:	Understand the organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit of digital computer system.
CO2:	Identify the structure and functioning of a digital computer including its overall system architecture, operating system, and digital components.
CO3:	Analyze various design techniques of CPU, Memory, pipelining, ALU, interconnecting I/O devices and microprogramming in order to achieve multiprocessing.
CO4:	Develop and Design quantitative performance evaluation of computer systems.

Course Content:

Module I (4)

Basic Computer Functions and Interconnection Structures, Discussion between computer architecture and organization, Role of Operating System, Quantitative techniques in computer design.

Fetch, decode and execute cycle, Concept of operator, operand, registers and storage, Instruction format. Instruction sets and addressing modes.

Module II (8)

Memory classification, Memory Hierarchy and characteristics; Organization of RAM, Magnetic memory recording formats & methods, Disk & tape units with detailed working principles.

Memory Inclusion, Coherence and locality properties; Associative memory organization ; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, Paging, mapping and management techniques, memory replacement policies.

Module III (10)

The ALU – ALU organization, Integer representation, Input/output Organization: Introduction to Bus architecture, effect of bus widths, Programmed & Interrupt I/O , DMA. Serial & Parallel Address; implementation of high speed Address Carry Look Ahead & carry Save Address.

Multiplication of signed binary numbers-Booth's algorithm; Divide algorithms Restoring & Non-Restoring: Floating point - IEEE 754 standard; Floating point number arithmetic; Overflow detection, status flags. Flynn's classification –SISD, SIMD, MISD, MIMD architectures.

Module IV (10)

Timing diagrams; T-States, Controlling arithmetic & logic instruction, control structures; Hardwired & Micro programmed, CISC & RISC characteristics.

Pipelining: Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards and structural hazards, techniques for handling hazards, Exception handling, Pipeline optimization techniques;

Instruction-level parallelism: basic concepts, techniques for increasing ILP, superscalar, super pipelined and VLIW processor architectures. Array and vector processors.

Module V (10)

Multiprocessor architecture: taxonomy of parallel architectures; Centralized shared- memory architecture: synchronization, memory consistency, interconnection networks. Distributed shared-memory architecture. Cluster computers.

Non von Neumann architectures: data flow computers, reduction computer architectures, systolic architectures

Text Books:

1. Mano, M.M., “Computer System Architecture”, PHI.
2. Kai Hwang, “Advance Computer Architecture” McGraw Hill.
3. Behrooz Parhami, “Computer Architecture”, Oxford University Press.
4. Nicholas P Carter, “Computer Architecture & Organization” McGraw Hill.

Reference Books:

1. Hayes J. P., “Computer Architecture & Organisation”, McGraw Hill,
2. Hamacher, “Computer Organisation”, McGraw Hill,
3. N. senthil Kumar, M. Saravanan, S. Jeevananthan, “Microprocessors and Microcontrollers”
4. Chaudhuri P. Pal, “Computer Organisation & Design”, PHI,
5. P N Basu- “Computer Organization & Architecture” , Vikas Pub

CO-PO Mapping:

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

Course Name: Object Oriented Programming using JAVA

Course Code: IT 402

Contact: 3:0:0

Total Contact Hours: 40

Credits: 3

Prerequisites: Basic knowledge of computers, basic knowledge of programming.

Course Objectives:

1. Understand basic of Object Oriented Programming
2. Understanding the features of Java
3. Enable students to write Java program and develop projects.

Course Outcome: At the end of the course students will be able to

CO1:	Understand the key concepts of object oriented programming and have an ability to design Object Oriented programs.
CO2:	Analyze complex programming problems and optimize the solutions.
CO3:	Evaluate and analyze different solution based on object oriented concepts.
CO4:	Apply the concepts of object oriented programming for implementing solution of dynamic problems in the field of Information Technology.

Course Content:

Module I: Object Oriented Design: (3)

Concepts of object oriented programming language, Object, Class, relationships among objects, aggregation, links, relationships among classes-association, aggregation

Module II: Object Oriented Concept: (3)

Class, object, message passing, inheritance, encapsulation, polymorphism

Difference between OOP and other conventional programming – advantages and disadvantages.

Module III: Understanding Java Programming Language: (2)

History of Java Programming languages, Purpose of invention of Java. Structure of a basic Java Program, Component of Java Development Kit-API, JRE, Understanding the steps to run a complete Java Program.

Module IV: Basic Components of Java Program: (2)

Java Tokens-Literals, identifier, keywords, operator, separator, Data types, variables, constant, Type casting-defining type casting, requirement of type casting, implicit and explicit type casting. Control structure. Access specifier.

Module V: Class and Object Properties: (6)

Defining class and object, Class Members-Local variable, instance variable, class variable, Primitive and Reference variable, Constructor, this keyword, finalize and garbage collection, Array-Declaring and defining array, accessing array elements, length properties, 2D array, anonymous array, array of Objects. Understanding method- method returning object, passing objects, method passing and returning arrays, use of method overloading. Static-Static block and non static block, static variable, static method. nested & inner classes.

Module VI: Reusability Property: (6)

Super class & subclasses including multilevel hierarchy, process of constructor calling in inheritance, use of super and final keywords with super () method, dynamic method dispatch, use of abstract classes & methods, interfaces. Creation of packages, importing packages, member access for packages. Serialization and deserialization.

Module VII: String Handling: (2)

Basic string handling concepts- String (discuss charAt() , compareTo(),equals(), equalsIgnoreCase(), indexOf(), length() , substring(), toCharArray() , toLowerCase(), toString(), toUpperCase() ,trim() , valueOf() methods) & StringBuffer classes (discuss append(), capacity(), charAt(), delete(), deleteCharAt(),ensureCapacity(), getChars(), indexOf(), insert(), length(), setCharAt(), setLength(), substring(), toString() methods),concept of mutable and immutable string, command line arguments

Module VIII Exception handling & Multithreading: (5)

Exception handling basics, different types of exception classes, use of try & catch with throw, throws & finally, creation of user defined exception classes. Basics of multithreading, main thread, thread life cycle, creation of multiple threads, thread priorities, thread synchronization, inter-thread communication, deadlocks for threads, suspending & resuming threads.

Module IX: Basic IO Operation and File Handling: (3)

Understanding unformatted and formatted IO. Reading and writing files.

Module X : Collection and Generics: (4)

ArrayList class , LinkedList class, ListIterator interface, HashSet class, LinkedHashSet class, TreeSet class, PriorityQueue class, ArrayDeque class, Map interface, HashMap class, LinkedHashMap class, TreeMap class, Hashtable class, Comparable and Comparator, Properties class
Generics class, Generic interface, Generic Type, Generic Method, Generics Bounded Type parameter

Module XI: JAVA New Feature: (4)

Lambda Expression, default and static method in interface, Assertion, Annotation, Running Java Program in one command.

Text Books:

Herbert Schildt Java Complete Reference TMH

Reference Books:

Mr Kotiyana JAVA The Complete Core Reference ORACLE

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2
CO1	3	3	2	1	2	--	--	--	--	--	--	--
CO2	3	2	2	2	3	--	--	--	--	--	--	--
CO3	3	3	3	3	3	--	--	--	--	--	--	--
CO4	3	3	3	2	3	--	--	--	--	--	--	2

Course Name: Formal Language and Automata Theory

Course Code: IT 403

Contact: 3:0:0

Total Contact Hours: 40

Credits: 3

Prerequisites: Elementary discrete mathematics including the notion of set, function, relation, product, partial order, equivalence relation, graph & tree. They should have a thorough understanding of the principle of mathematical induction and various proof techniques.

Course Objectives:

1. Being familiar with a broad overview of the theoretical foundations of computer science. Students will learn about a variety of issues in the mathematical development of computer science theory, particularly finite representations for languages and machines, as well as gain a more formal understanding of algorithms and procedures.
2. Understand basic properties of formal languages and formal grammars.
3. Understand basic properties of deterministic and nondeterministic finite automata and Understanding the minimization of deterministic and nondeterministic finite automata.
4. Understand the relation between types of languages and types of finite automata
5. Understanding the Context free languages and grammars, and also Normalizing CFG and Understand the concept of Pushdown automata and its application.
6. Understand basic properties of Turing machines and computing with Turing machines and the concepts of tractability and decidability problem. Understand the challenges for Theoretical Computer Science and its contribution to other sciences.

Course Outcome: At the end of the course students will be able to

CO1:	Analyze situations in related areas of theory in computer science.
CO2:	Model, compare and analyze different computational models using combinatorial methods.
CO3:	Apply rigorously formal mathematical methods to prove properties of languages, grammars and Automata.
CO4:	Construct algorithms for different problems and argue formally about correctness on different restricted Machine models of computation.
CO5:	Identify limitations of some computational models and possible methods of proving them.

Course Content:

Module I (14)

Fundamentals: Basic definition of sequential circuit, block diagram, mathematical representation, and concept of transition table and transition diagram (Relating of Automata concept to sequential circuit concept) Design of sequence detector, Introduction to finite state model Finite state machine: Definitions, capability & state equivalent, kth-equivalent concept, Finite memory definiteness, testing table & testing graph. Minimization of FSM-completely specified and incompletely specified (Merger graph, Merger table, Compatibility graph) Equivalence between two FSM's, Limitations of FSM Application of finite automata, Finite Automata with output- Moore & Melay machine.

Module II (10)

Deterministic finite automaton and non deterministic finite automaton. Transition diagrams and Language recognizers. Finite Automata: NFA with \hat{I} transitions - Significance, acceptance of languages.

Conversions and Equivalence: Equivalence between NFA with and without $\hat{\lambda}$ transitions. NFA to DFA conversion. DFA minimization. Myhill-Nerode theorem Regular Languages: Regular sets. Regular expressions, identity rules. Arden's theorem state and prove Constructing finite Automata for a given regular expressions, Regular string accepted by NFA/DFA. Pumping lemma of regular sets. Closure properties of regular sets (proofs not required). Grammar Formalism: Regular grammars-right linear and left linear grammars. Equivalence between regular linear grammar and FA.

Module III (10)

Context free grammar. Derivation trees, sentential forms. Right most and leftmost derivation of strings. Context Free Grammars, Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form and Greibach normal form. Pumping Lemma for Context Free Languages. Enumeration of properties of CFL. Closure property of CFL, Ogden's lemma & its applications. Push Down Automata: Push down automata, definition. Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversion. Introduction to DCFL and DPDA.

Module IV (6)

Turing Machine: Turing Machine, definition, model, Design of TM, Computable functions, Church's hypothesis, counter machine, Types of Turing machines Universal Turing Machine, Halting problem.

Text and Reference Books:

1. "Theory of Computer Science-Automata Languages and Computation", Mishra and Chandrashekar, 2nd edition, PHI
 2. "Switching & Finite Automata", ZVI Kohavi, 2nd Edn., Tata McGraw Hill
 3. "An Introduction to Computing", Peter Linz, Narosa.
- "Introduction to Automata Theory Language and Computation", Hopcroft H.E. and Ullman J. D.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2
CO1	3	3	3	2	--	--	--	--	--	--	--	--
CO2		3	3	3	--	--	--	--	--	--	--	--
CO3	3	3	3	2	--	--	--	--	--	--	--	--
CO4		3	2	3	--	--	--	--	--	--	--	--
CO5	2	3	3	3	2	--	--	--	--	--	--	--

Course Name: Communication Engineering & Coding Theory

Course Code: IT 404

Contact: 3:0:0

Total Contact Hours: 34

Credits: 3

Prerequisites: Mathematics, Physics, Electronics.

Course Objectives:

1. To comprehend basics of communication system and coding techniques.
2. To apply the basic concept of PCM systems and baseband transmission schemes.
3. To analyze and evaluate band pass signalling schemes.
4. To produce spectral characteristics of band pass signalling schemes.
5. To asses noise issues.

Course Outcome: At the end of the course students will be

CO1:	Able to understand basics of communication system and coding schemes.
CO2:	Able to apply the basic concept of PCM systems and baseband transmission schemes.
CO3:	Able to analyze and evaluate band pass signalling schemes.
CO4:	Able to Create spectral characteristics of band pass signalling schemes and asses noise performance.

Course Content:

Module I: (4)

Elements of communication system, introduction to signals and modulation. Basic concept of a signal (Amplitude, frequency, wavelength, bandwidth), introduction to baseband transmission - modulation. Elements of Communication systems, origin of noise and its effect on communication system. Concept and need for modulation - types of modulation, concept of time domain and spectral representation of a signal.

Module II: (5)

Linear Modulation: Basic principles of Amplitude Modulation with Time domain representation of AM signal, modulation index calculation, transmission bandwidth, power & efficiency calculations. Basic concept of square law modulator and balanced modulator. Detection of AM by envelope detector, Synchronous detection for AM-SC. Basic principles of Sideband suppressed techniques and the need for it. Need for carrier suppression .Basic concept of SSB-SC, DSB-SC, VSB-SC. Generation of SSB: Filter method, Phase shift method. Names of SSB-SC, DSB-SC generator and detector

Module III: (4)

Non linear Modulation & Demodulation: Frequency Modulation and Phase Modulation: Time domain representations, total power calculation for a single tone message. Generation of FM & PM: basic concept and difference of wide band frequency modulation and narrow band frequency modulation. basic concept on direct and indirect method of FM generation : introductory discussion on Armstrong method. Basic block diagram representation of generation of FM & PM: basic Concept of VCO & Reactance modulator only. Demodulation of FM and PM: Only Basic Concept of frequency discriminators Phase Locked Loop Comparison of various Analog modulation techniques, inter relation between PM and FM

Module IV: (10)

Sampling and digital transmission: Sampling theorem, Sampling rate, sampling theorem, nyquist rate, Impulse sampling, Reconstruction from samples, Aliasing; Analog Pulse Modulation – basic discussion on PAM, PWM, PPM. Concept of Quantisation & Uniform Quantiser, Non-uniform Quantiser, Quantisation error, signal to quantisation noise ratio calculation, A-law & μ -law companding (after discussion on companding mention only the two types and their use) ,Encoding, Coding efficiency. Basic concept of Pulse Code Modulation, Block diagram of PCM, basic concept of DPCM, Delta modulation, basic concept of slope overload and Granular.

distortion, Adaptive delta modulation. Multiplexing - TDM, FDM, SDM. Line coding & properties, NRZ & RZ, AMI, Manchester coding. Brief discussion on: ISI, Raised cosine function, Nyquist criterion for distortion-less base-band binary transmission, Eye pattern

Module V: (5)

Digital Carrier Modulation & Démodulation Techniques: Introduction to the different digital modulation techniques-ASK, FSK, PSK, BPSK, QPSK, MSK, Introduction to QAM,. Spread Spectrum Modulation – DSSS, FHSS - concept only.

Module VI: (6)

Information Theory & Coding: Introduction to Information Theory, Entropy, Mutual information, Information rate, channel and bandwidth, Bit rate, Baud rate, Information capacity, Shanon’s limit, Shanon-Fano algorithm for encoding, Huffman coding for numerical, Shannon's Theorem - Source Coding Theorem, Information Capacity Theorem. Error control Strategies: (Basic Concept of Data communication, concept of FEC, ARQ and CRC).

Text Books:

1. An Introduction to Analog and Digital Communications, Simon Haykin; Published by Wiley India.
2. Principle of Communication Systems by Herbert Taub and D.L.Schilling
3. Modern Digital and Analog Communication Systems –
4. Data Communication and Networking by Behrouz A. Forouzan, Published by Tata McGraw-Hill

Reference Books:

1. Communication Systems 4th Edition by Simon Haykin; Published by Wiley India (Student Edition)
2. Principles and Analog and Digital Communication by Jerry D Gibson, Published by MacMillan.
3. Communication Systems by A. B. Carlson, Published by McGraw-Hill.
4. Understanding Signals and Systems by Jack Golten, Published by McGraw Hill.

CO-PO Mapping:

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

Course Name: Values & Ethics in Profession

Course Code: HU 401

Contact: 2:0:0

Total Contact Hours: 33

Credits: 3

Prerequisites: Basic knowledge of management, communication, environment science.

Course Objectives:

To create awareness on professional ethics and Human Values

Course Outcome: At the end of the course students will be

CO1:	Able to understand the core values that shape the ethical behaviour of an engineer and Exposed awareness on professional ethics and human values.
CO2:	Able to understand the basic perception of profession, professional ethics, various moral issues & uses of ethical theories.
CO3:	Able to understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
CO4:	Able to aware of responsibilities of an engineer for safety and risk benefit analysis, professional rights and responsibilities of an engineer.
CO5:	Able to acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives.

Course Content:

Module I: (3)

Introduction: Definition of Ethics; Approaches to Ethics: Psychological, Philosophical, Social.

Module II: (5)

Psycho-social theories of moral development: View of Kohlberg; Morality and Ideology, Culture and Morality, Morality in everyday Context.

Module III: (5)

Ethical Concerns: Work Ethics and Work Values, Business Ethics, Human values in organizations: Values Crisis in contemporary society Nature of values: Value Spectrum of a good life.

Module IV: (6)

Ethics of Profession: Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies.

Module V: (6)

Self Development: Character strengths and virtues, Emotional Intelligence, Social intelligence, Positive cognitive states and processes (Self-efficacy, Empathy, Gratitude, Compassion, and Forgiveness).

Module VI: (8)

Effects of Technological Growth: Rapid Technological growth and depletion of resources, Reports of

the Club of Rome. Limits of growth: sustainable development Energy Crisis: Renewable Energy Resources, Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics Appropriate Technology, Movement of Schumacher; Problems of man, machine, interaction.

Text Books:

1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994.
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.

Reference Books:

1. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

CO-PO Mapping:

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

Course Name: Computer Organization and Architecture Lab**Course Code: IT 491****Contact: 0:0:3****Credits: 1.5****Prerequisite:**

Basic concept of Digital Electronics.

Course Objectives:

1. Implementation of digital logic using XLINX tool.
2. Simulate digital circuit design using XLINX tool.

Course Outcome: At the end of the course students will be able to

CO1:	Remember the basic designing principles of digital electronics circuits.
CO2:	Demonstrate Hardware Description Language (HDL) in order to implement skills in designing Architectural solutions and describing designs using VHDL.
CO3:	Apply fundamentals of digital design and extend the learning to design sequential circuits.
CO4:	Analyze & Examine the digital circuit design using Simulation tool.

List of Experiment: (30)

All laboratory assignments are based on Hardware Description Language (VHDL or Verilog) Simulation.

- HDL introduction.
- Design Implementation of Basic digital logic base programming with HDL.
- Implementation of 8-bit Addition, Multiplication, Division.
- Implementation of combinational circuit Design
- Implementation of 8-bit Register design.
- Implementation of Sequential circuit.
- Memory unit design and perform memory operations.
- Implementation of 8-bit simple ALU design.
- Implementation of 8-bit simple CPU design.

Innovation in implementation of Interfacing of CPU and Memory

CO-PO Mapping:

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

Course Name: Object Oriented Programming Lab

Course Code: IT 492

Contact: 0:0:3

Credits: 1.5

Prerequisite:

Basic knowledge of computers, basic knowledge of programming.

Course Objectives:

1. Enable students to use basic object oriented features in coding
2. Enable students to develop small projects

Course Outcome: At the end of the course students will be able to

CO1:	Apply object oriented programming concepts in designing programs.
CO2:	Analyze different dimensions of a problem and provide optimal solutions.
CO3:	Evaluate and analyze different solution based on object oriented concepts.
CO4:	Implement solutions of real-life problems in the field of Information Technology.

List of Experiment:

Module I: (3)

Writing simple java program, compiling and running.

Understanding the main () method.

Module II: Basic Java Concepts : (6)

Using basic java token, control structures.

Illustrating class objects, constructor, final, finalize.

Understanding Arrays and hands on application using array.

Understanding and writing methods.

Static and non static concepts.

Module III: Reusable properties: (3)

Class Relationship.

Using inheritance

Creating abstract classes interfaces.

Module IV: (3)

String handling, Basic string handling concepts

Module V: Exception and Threading: (6)

Illustrating exception handling

Illustrating multi threading applications

Module VI: IO: (6)

Basic IO and File IO operation

Module VII : Generics and Collection: (3)

Test application using generics and collection classes.

Module VIII: Innovative Idea Development: (6)

Applying Java new features for developing innovative projects

Text Books:

Herbert Schildt Java Complete Reference TMH

Reference Books:

1. Mr Kotiyana JAVA The Complete Core Reference ORACLE
2. Kathie Seira Head Forst Java Orielley

CO-PO Mapping:

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	--	1	1	--	--	--	--	--	--
CO2	2	3	2	--	3	1	--	--	--	--	--	--
CO3	3	3	2	--	3	2	--	--	--	--	--	--
CO4	3	--	--	--	3		2	--	--	--	--	2

Course Name: Programming Skill Development Lab

Course Code: IT 493

Contact: 0:0:3

Credits: 1.5

Prerequisite:

Mathematics, basic understanding of Computer Programming.

Course Objectives:

The objective of the course is to provide basic knowledge of Python and to design and program Python applications.

Course Outcome: At the end of the course students will be able to

CO1:	Understand basic of Python Programming Language.
CO2:	Analyze problems and design effective solutions of them.
CO3:	Apply the best features of Python to program real life problems.
CO4:	Implement optimal solution of a given problem.

List of Experiment:

Module I: Introduction to Python: (3)

Installation of Python, Two modes of using Python Interpreter, Variables and Data Types, Operators and their Precedence

Module II: Loops and Iterations: (2)

Iteration: while and for loops, Python Syntax, Colon & Indentation, Syntax of 'for loops', Conditional Execution: if, elif and else, Modify loops: break and continue

Module III: Strings & Lists: (2)

Python Strings, Slicing, Python Lists, Mutable and Immutable Types

Module IV: Functions and More on Strings & Lists: (2)

Functions, Optional and Named Arguments, More on Strings & Lists experiments, Split and Join Manipulating and Copying Lists

Module V: Modules and Packages: (3)

Python Modules and Packages, Different ways to import Packages, File, Input/ Output, The pickle module, Formatted Printing, Exception Handling

Module VI: Graphics, GUI and Object Oriented Programming:

Turtle Graphics, Writing GUI Programs, Object Oriented Programming in Python, Inheritance, Reusing code

Module VII: Files and Streams: (4)

File related modules in Python, File modes and permissions, Reading & Writing data from a file, Redirecting output streams to files, Working with directories, CSV files and Data Files

Module VIII: Python and Databases: (5)

ODBC and Python, Working with Databases in MySQL, Working with Tables in MySQL,
Working with SQLite Database

Module IX: Innovative Projects implementation using Python (6)

Text Books:

1. 'Python for Everybody – Exploring Data in Python 3', Charles Severance, Shroff Publishers & Distributors Pvt. Ltd.
2. 'Python Training Guide', Mercury Learning & Information USA, BPB Publications, 2015.

Reference Books:

1. 'Python for Education', Ajith Kumar B. P., Inter University Accelerator Center, New Delhi, 2010.
2. 'Python Cookbook: Recipes for Mastering Python 3', 3rd Edition - David Beazley & Brian K. Jones, O'Reilly Media, Inc., 2013.

CO-PO Mapping:

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

Course Name: Environmental Science

Course Code: MC 401

Contact: 0:0:3

Prerequisite:

Knowledge of Basic Chemistry

Course Objectives:

1. Apply the knowledge of environmental science to 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.
2. Analyze and discuss the relevance of environmental science to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
3. Function in multi/inter-disciplinary teams with a spirit of tolerance, patience and understanding so necessary for team work.
4. 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.

Course Outcome: At the end of the course students will be able to

CO1:	Describe the structure and function of environment and different types of environmental pollution.
CO2:	Identify all types of resources and learn the quality parameter to maintain proper balance.
CO3:	Demonstrate environmental problems like global warming, acid rain, natural and manmade disasters.
CO4:	Demonstrate the controlling method of environmental pollution and apply their knowledge for environment management.
CO5:	Apply the method of synthesis of green chemistry and find green solution.

List of Experiment:

Module I: General: (6)

Natural Resources: Forest Resource, water resource, mineral resource, energy resources (renewable, non-renewable, potentially renewable). Population Growth: Exponential Growth, logistic growth, Maximum sustainable yield Disaster Management: Types of disasters (Natural & Man-made), Floods, Earthquake, Tsunamis, Cyclones, landslides (cause, effect & control). Ecology & Ecosystem: Elements of ecology, definition of ecosystem- components types and function, Food chain & Food web, Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, and Aquatic ecosystems. Environmental Management: Environmental impact assessment, Environmental laws and protection act of India, Different international environmental agreement.

Module II: Air Pollution: (6)

Sources of Pollutants: point sources, nonpoint sources and manmade sources primary & secondary pollutant. Types of air pollutants: primary & secondary pollutant ; Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN, Smog (Photochemical smog and London smog). Effects on human health & climate: Greenhouse effect, Global Warming, Acid rain, Ozone Layer Depletion. Air pollution and meteorology: Ambient Lapse Rate, Adiabatic Lapse Rate, Atmospheric stability & Temperature inversion. control of air pollution (ESP, cyclone separator, bag

house, catalytic converter, scrubber (ventury)

Module III: Water Pollution: (6)

Classification of water (Ground & surface water). Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, heavy metals, pesticides, volatile organic compounds. Surface water quality parameters: pH, DO, 5 day BOD test, BOD reaction rate constants, COD. Numerical related to BO Lake: Eutrophication [Definition, source and effect]. Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only), ground water pollution (Arsenic & Fluoride; sources, effects, control) , Quality of Boiler fed water: DO, hardness, alkalinity, TDS and Chloride, Layout of waste water treatment plant (scheme only).

Module IV: Land Pollution: (2)

Types of Solid Waste: Municipal, industrial, commercial, agricultural, domestic, hazardous solid wastes (bio-medical), E-waste , Solid waste disposal method: Open dumping, Land filling, incineration, composting, recycling (Advantages and disadvantages).

Module V: Noise Pollution: (2)

Definition of noise, effect of noise pollution on human health, Average Noise level of some common noise sources, Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, L10 (18 hr Index) . Noise pollution control.

Text Books:

1. A Textbook of Environmental Studies, Shashi Chawla. Tata McGraw Hill Education Private Limited.
2. Environmental Studies, Dr. J P Sharma, University Science Press

Reference Books:

1. Environmental Engineering, J K Das Mohapatra, Vikas Publication

CO-PO Mapping:

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

Department: Information Technology
Curriculum Structure & Syllabus
(Effective from 2018-19 admission batch)

5 th Semester								
Sl No	Course Code	Paper Code	Theory	Contact Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	PC	IT501	Design & Analysis of Algorithm	3	0	0	3	3
2	PC	IT502	Software Engineering	3	0	0	3	3
3	PC	IT503	Operating System	3	0	0	3	3
4	HS	HU503	Industrial & Financial Management	2	0	0	2	2
5	PE	IT504	A. Programming Practice with C++	3	0	0	3	3
			B. Artificial Intelligence and Expert System					
			C. Microprocessor and Microcontroller					
Total of Theory							14	14
B. PRACTICAL								
6	PC	IT591	Algorithm Lab	0	0	3	3	1.5
7	PC	IT592	Software Engineering Lab	0	0	3	3	1.5
8	PC	IT593	Operating System Lab	0	0	3	3	1.5
9	PE	IT594	A. Programming Practice with C++ Lab	0	0	3	3	1.5
			B. Artificial Intelligence and Expert System Lab					
			C. Microprocessor and Microcontroller Lab					
10	PROJ	PR591	Project-V	0	0	2	2	1
11	PROJ*	PR592	Innovative Activities-IV	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
12	MC	MC501	Constitution of India	3	0	0	3	
Total of Theory, Practical & Mandatory Activities/Courses							31	21.5

* Students may choose either to work on participation in Hackathons etc. Development of new product/ Business Plan/ registration of start-up.
 Students may choose to undergo Internship / Innovation / Entrepreneurship related activities.
 Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry/ Long Term goals under rural Internship. (Duration 4-6 weeks)

Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

Course Name: Design and Analysis of Algorithm

Course Code: IT 501

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite:

Discrete Mathematics Data Structure and Basic Programming Knowledge

Course Objective:

The objective of the course is to study paradigms and approaches used to analyze and design algorithms and to appreciate the impact of algorithm design in practice, use different computational models, order notation and various complexity measures to analyze the complexity/performance of different algorithms.

Course Outcome

After completion of this course students will be able to

- CO1:** Understanding the time complexity of the basic algorithms for the classic problems in various domains.
- CO2:** Apply the classic algorithms to solve different problems.
- CO3:** Evaluate existing algorithms by calculating the time complexity.
- CO4:** Design algorithm to solve various problems in different domains.

Course Contents:

Module I: [2L]

Introduction: Time and Space Complexity, Different Asymptotic notations and their mathematical significance

Module II : [8L]

Divide and Conquer: Basic method, use, Merge Sort, Quick Sort and their complexity, Heap Sort and its complexity

Dynamic Programming: Basic method, use, Matrix Chain multiplication, All pair shortest paths, single source shortest path, Strassen's matrix multiplication algorithm.

Module III: [8L]

Backtracking: Basic method, use, 8 queens problem, Graph coloring problem.

Greedy Method: Basic method, use, Knapsack problem, traveling sales man, Job sequencing with deadlines, Minimum cost spanning tree by Prim's and Kruskal's algorithm.

Module IV: [3L]

Branch and bound technique: integer programming, 0/1 knapsack problem

Module V: [4L]

Disjoint set manipulation: Set manipulation algorithm like UNION-FIND, union by rank.

String matching problem: Different techniques – Naive algorithm, Knuth, Morris, Pratt (KMP) algorithm with their complexities.

Module VI: [6L]

Amortized Analysis: Aggregate, Accounting, and Potential Method.

Network Flow: Ford Fulkerson algorithm, Max-Flow Min-Cut theorem (Statement and Illustration)

Module VII: [5L]

Notion of NP-completeness: P class, NP class, NP hard class, NP complete class – their interrelationship, Satisfiability problem, Cook’s theorem (Statement only).

Approximation Algorithms: Necessity of approximation scheme, performance guarantee, polynomial time approximation schemes.

Textbooks:

1. A. Aho, J. Hopcroft and J. Ullman “The Design and Analysis of Algorithms”
2. D. E. Knuth “The Art of Computer Programming”, Vol. 3
3. E. Horowitz and Shani “Fundamentals of Computer Algorithms”

Reference books:

4. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, “Introduction to Algorithms

CO- PO Mapping

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

Course Name: Software Engineering

Course Code: IT 502

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite:

Mathematics, Data Structure and Basic Computations.

Course Objective:

In this course, students will gain a broad understanding of the discipline of software engineering and its application to the development of and management of software systems. Knowledge of basic software engineering methods and practices and their appropriate application.

Course Outcome

After completion of this course student will be able to

- CO1:** Ability to analysis and design of complex systems and meet ethical standards, legal Responsibilities.
- CO2:** Ability to apply software engineering principles, techniques and develop, maintain, Evaluate large-scale software systems.
- CO3:** To produce efficient, reliable, robust and cost-effective software solutions and perform independent research and analysis.
- CO4:** Ability to work as an effective member or leader of software engineering teams and manage time, processes and resources effectively by prioritizing competing demands to achieve personal and team goals.

Course Contents:

Introduction [2L]

Definition of Software Engineering, Software crisis, Evolution of technology- Hype curve, Exploratory style of Software development vs. Software Engineering, Human cognition mechanism, Software Engineering principle- abstraction and decomposition.

Software Development Life Cycle (SDLC) models [4L]

Water fall model, V-shape Model, Prototyping Model, Spiral Model, RAD Agile Model, Verification and Validation.

Software Project Management [7L]

Responsibility of a project manager, Project planning, Metrics for project size estimation, Project estimation techniques, COCOMO model, Halstead's Software Science, Scheduling- CPM, PERT, Gantt chart, Risk management, Software configuration management, Staffing and team leader project and planning

Requirement analysis and specification [3L]

SRS, Requirement gathering and specification, Functional requirement, Traceability.

Software Design [8L]

Characteristics of a good software, Cohesion and coupling, Function oriented design- DFD, Structure chart. Design phase in life cycle, System Design Definitions, Concept and methodologies, data flow oriented Design, Program Design and the requirements. Object oriented design- class and relationship, UML diagrams.

Coding and Testing [7L]

Coding Standard, software documentation, Testing- unit testing, black box testing- equivalence class partitioning, boundary value analysis, white box testing- McCabe's Cyclometric Complexity, Mutation Testing, Debugging, Program analysis tool, Integration Testing, Grey box testing, System testing- Smoke and performance testing.

Software Reliability and Quality Management [2L]

Reliability, Hazard, MTTF, Repair and Availability, Software quality, Software reliability and fault-tolerance, six-sigma.

Computer-aided software engineering [3L]

Computer-aided software engineering (CASE)-environment and benefit. Function point methods (FSM,ISO,OMG) & Metrics. Standards: Capability Maturity Model Integration, ISO 9001.

Text Books:

1. Rajib Mall: Software Engineering, PHI
2. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Seventh Edition, Mc Graw-Hill International Edition.

Reference Books:

1. Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education Asia, 2011.
2. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
3. Software Engineering: Iyan Somarville, 7th Edition.

CO-PO Mapping:

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

Course Name: Operating System

Course Code: IT 503

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisites:

Computer organization and Architecture, Data Structures, Algorithms & Programming Concept

Course Objective:

The objective of the course is to present an introduction to operating systems, with an emphasis on concurrency and control of asynchronous processes, deadlocks, memory management, processor and disk scheduling, parallel processing, and file system organization.

Course Outcome:

After completion of this course students will be able to

- CO1:** Understand competence in recognizing and using operating system features.
- CO2:** Apply knowledge of different operating system algorithms.
- CO3:** Analyze theory and implementation of different operating system aspect and the structure and basic architectural components involved in operating system.
- CO4:** Evaluate different operating system approaches.

Course Contents:

Introduction: [2L]

Introduction to OS. Operating system functions, evaluation of O.S., Different types of O.S.: batch, multi-programmed, timesharing, real-time, distributed, parallel.

System Structure: [2L]

Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, system calls.

Processes: [3L]

Concept of processes, process scheduling, operations on processes, co-operating processes, inter-process communication.

Threads: [2L]

Overview, benefits of threads, user and kernel threads.

CPU Scheduling: [3L]

Scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, priority), algorithm evaluation, multi-processor scheduling.

Synchronization: [4L]

Background, critical section problem, critical region, synchronization hardware, classical problems of synchronization, semaphores.

Deadlock: [4L]

System model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

Memory Management: [3L]

Background, logical vs. physical address space, swapping, contiguous memory allocation, Pre-paging, paging, segmentation, segmentation with paging.

Virtual Memory:[4L]

Background, demand paging, performance, page replacement, page replacement algorithms (FCFS, LRU), allocation of frames, thrashing, Virtualization(VMware).

File Systems:[3L]

File concept, access methods, directory structure, file system structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency & performance.

I/O Management:[3L]

I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices, network devices, clocks and timers, blocking and non blocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.

Disk Management: [3L]

Disk structure, disk scheduling (FCFS, SSTF, SCAN,C-SCAN), disk reliability, disk formatting, boot block, bad blocks.

Text Books:

1. Milenkovic M., "Operating System : Concept & Design", McGraw Hill.
2. Silbersehatz A. and Peterson J. L., "Operating System Concepts", Wiley.
3. Dhamdhare: Operating System TMH

Reference Books:

1. Tanenbaum A.S., "Operating System Design & Implementation", Practice Hall NJ.
2. Stalling, William, "Operating Systems", Maxwell McMillan International Editions, 1992.

CO-PO Mapping

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

Course Name: Programming Practice with C++

Course Code: IT 504A

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite:

Basic computer programming concepts

Course Objective:

The objective of the course is to introduce with the object oriented programming paradigm using C++ and make the students understand different concept of C++ and apply the features in application development.

Course Outcome

After completion of this course student will be able to

CO1: Understand the basic concept of object oriented programming

CO2: Apply the concept of object oriented programming concept using C++

CO3: Analyse the different features of object oriented programming in the context of C++

CO4: Evaluate concept of C++ to design different small to big scale project

Course Contents:

Module I: [2L]

Introduction to Object oriented design, Declaration, Expression and statements

Concepts of object oriented programming language, Language translator, Basics of OOPs, Structure of C++ program, Class and object, Abstraction and encapsulation, Polymorphism.

Module II: [8L]

Array, Function, Pointer & Data abstraction through classes and user defined data types

Array, Addresses, Pointer. Function: Declaration, Definition and call, Inline function, Main function argument, Reference variable, Function overloading, Default argument, Parameter passing, Recursion, Scope of variable, Return-by-value and Return-by-reference, Pointer to function. Class, Members, Constructor and destructor, Copy constructor. Dynamic memory management: Operators new and delete, Malloc and free, Static member, Scope of class names, Scope of variables. Friend Function : understanding friend function and its use Pre-processor

Module III: [12L]

Class relationships: Operator Overloading, Polymorphism & Standard Library in C++

Overloading unary and binary operator, Overloaded function calls, Subscripting, class member access, Non-member operator, New and delete, Cast operator. Introduction, Polymorphism, Coercion, Overloading, Parametric and inclusion polymorphism Inheritance: direct and indirect superclasses, Multiple inheritance, Virtual base class, Friend,

Virtual function, Abstract class, Overriding and hiding, Dynamic binding of functions, Virtual destructor and operators. Standard library in C++: Standard library function, Input and output, Iostream class hierarchy, Class ios, Other stream classes, File Handling,

Module IV: [8L]

Template , Exception Handling & UML Diagram

Class template, Member function inclusion, Function template, Specialization, Inheritance, Namespace. Concept of exception handling, Catch block, Nested try-catch block, Condition expression in throw expression, Constructor & destructor, Runtime standard exception. Object oriented design and modeling: Software architecture, Process life cycle, phases, Modularity, OO methodology, Modeling, UML overview, Object oriented design patterns.

Module V: [6L]

Introduction to C++11 Features

Lambda Expressions, Automatic Type Deduction and decl type, Uniform Initialization Syntax, Deleted and Defaulted Functions, null ptr, Delegating Constructors, Rvalue References, Threading Library

Text Books:

1. Schildt, H., The Complete Reference C++, McGraw – Hill.
2. Balaguruswamy, Object Oriented Programming C++ McGraw – Hill.

Reference Books:

1. C++ object oriented programming paradigm, Debasish Jana, PHI
2. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS

CO-PO Mapping:

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

Course Name: Artificial Intelligence

Course Code: IT 504B

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite:

Basic concept of computer science and automation, Knowledge of programming languages, Basic mathematical concept like calculus, probability, metrics and statistics.

Course Objectives:

Apply knowledge of computing and mathematics appropriate to the discipline. Analyze a problem and identify and define the computing requirements appropriate to its solution. Design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs Understand current techniques, skills, and tools necessary for computing practice.

Course Outcome

After completion of this course student will be able to

- CO1:** Understand various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction).
- CO2:** Apply facts, rules, and concepts of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving.
- CO3:** Analyze working knowledge of reasoning in the presence of incomplete and/or uncertain information.
- CO4:** Evaluate and create knowledge representation, reasoning, and machine learning techniques for the solution of real-world problems.

Course Content:

Introduction to Artificial Intelligence and Agent [3L]:

Foundations and History of Artificial Intelligence, Turing Test, Intelligent Agents – Agents and environment. Concept of Rationality, Nature of environments and Structure of agents.

Searching and Problem Solving: [12L]:

Problem solving agents - Problem formulation with suitable examples, searching for solutions, 8 puzzle problem, tower of Hanoi problem, water jugs problem, 8-queen problem, Data driven and goal driven search, Uninformed search strategies – Breadth-first search, Uniform-cost search, depth-first search, Depth-limited search, Uninformed search strategies Iterative deepening depth-first search, Bidirectional search, avoiding repeated states, Informed search strategies – Greedy best first search, A* search, Informed search strategies Memory-bounded heuristic search, Heuristic Functions, Constraint satisfaction problems.

Game Playing: [2L]:

Adversarial search, Mini-max, alpha-beta pruning.

Knowledge Representation and Reasoning: [10L]:

Building a Knowledge Base, Propositional logic, first order, script and frame, Logic, situation calculus. Theorem Proving in First Order Logic. Planning, partial order planning, Hierarchical Task network planning, Planning and acting in nondeterministic domains.

Uncertain Knowledge and Reasoning, Probabilities, Bayesian Networks, Inference using full joint distribution, Independence, Bayes' rule and its use, Semantics of Bayesian Networks, Exact Inference in Bayesian networks, Dempster-Shafer-theory.

Learning: [5L]:

Learning from observation – Forms of learning, Inductive learning, Learning Decision trees, Knowledge in learning - Explanation based learning, Learning Decision Trees, Neural Networks Clustering concept, Reinforcement Learning – Introduction, Passive reinforcement Learning, Active Reinforcement Learning.

Expert Systems [4L]:

Introduction to Expert system, Expert System Design, Expert System Shell, Case Studies of Typical Expert Systems, PROLOG.

Text Books:

1. Fuzzy Logic with Engineering Applications, Timothy J. Ross, Willey.
2. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S.Rajasekaran, G. A. Vijayalakshami, PHI.
3. Genetic Algorithms: Search and Optimization, E. Goldberg

Reference Books:

1. Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee PHI.
2. Elements of Artificial Neural Network, Kishan Mehrotra, MIT Press.
3. An Introduction to Genetic Algorithms, Melanie Mitchell, MIT Press.

CO-PO Mapping

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

Course Name: Microprocessor & Microcontroller

Course Code: IT 504C

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisites:

Digital Electronics, Computer Programming, Computer Organisation and Architecture

Course Objective:

To develop an in-depth understanding of the operation of microprocessors and microcontrollers, machine language programming & interfacing techniques.

Course Outcome:

After completion of this course student will be able to

- CO1:** Describe the general architecture of a microcomputer system and architecture & organization of 8085 & 8086 Microprocessor and understand the difference between 8085 and advanced microprocessor.
- CO2:** Understand and classify the instruction set of 8085 microprocessor and distinguish the use of different instructions and apply it in assembly language programming.
- CO3:** Recognize 8051 micro controller hardware, input/output pins, ports, external memory, counters and timers, instruction set, addressing modes, serial data i/o, interrupts
- CO4:** Understand and realize the Interfacing of memory & various I/O devices with 8085 microprocessor.

Course Contents:

Module -1: [10L]

Introduction to Microcomputer based system. History of evolution of Microprocessor and Microcontrollers and their advantages and disadvantages.

Architecture of 8085 Microprocessor, Pin description of 8085.

Address/data bus Demultiplexing , Status Signals and the control signals.

Instruction set of 8085 microprocessor, Addressing modes

Timing diagram of the instructions (a few examples).

Module -2: [10L]

Assembly language programming with examples, counter and Time Delays, Stack and Subroutine Interrupts of 8085 processor (software and hardware), I/O Device Interfacing- I/O Mapped I/O and Memory Mapped I/O, Serial (using SID and SOD pins and RIM, SIM Instructions) and Parallel data transfer,

Module 3: [8L]

The 8086 microprocessor- Architecture, Addressing modes, interrupts

Introduction to 8051 Microcontroller –Architecture, Pin Details

Addressing modes, Instruction set, Examples of Simple Assembly Language.

Module -4: [8L]

Memory interfacing with 8085, 8086

Support IC chips- 8255, 8251, 8237/8257, 8259
 Interfacing of 8255 PPI with 8085 and Microcontroller 8051.
 Brief introduction to PIC microcontroller (16F877)

Text Book:

1. Microprocessor architecture, programming and application with 8085 – R. Gaonkar, Penram International
2. Fundamentals of microprocessor and microcontroller- B.Ram
3. An Introduction to Microprocessor and Applications –Krishna Kant, Macmillan

Reference Book:

1. Microprocessors and microcontrollers - N. Senthil Kumar, M. Saravanan and Jeevananthan, Oxford university press
2. 8086 Microprocessor –K Ayala, Cengage learning
3. Ray & Bhurchandi, Advanced Microprocessors & Peripherals, TMH
4. The 8051 microcontrollers – Uma Rao and Andhe Pallavi, Pearson
5. The 8051 Microcontroller and Embedded System- Mazidi
6. The 8051 microcontroller - K. Ayala, Thomson

CO-PO Mapping

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

Course Name: Industrial & Financial Management

Course Code: HU 503

Contact: 2:0:0

Total Contact Hours: 34

Credits: 2

Prerequisite:

Mathematics, English.

Course Objective:

- ✓ Introduce students to financial management and its importance and its applications in business, their relationship with the business environment and the role and functions of chief financial officer.
- ✓ Introduce students to financial planning, and objectives, and its benefits, and the types of areas and stages of financial planning, and the factors that help the success of financial planning and the methods used in financial planning to assess the short-term financial needs.
- ✓ Introduce students to time value of money and its relationship to the objectives of financial management, rationale for using the time value of money, and simple and compound interest and how to calculate it, and also to understand the present value of the future payments.
- ✓ Introduce students to major financial statements of businesses as well as the definition of the purposes and tools of financial analysis and its importance in the financial control process. Introduce students to the basics of investing in securities through exposure to the following points: knowledge of financial markets, and their components, and functions of the financial market, and the parties worked in the financial markets, the stock traded in the money markets and capital markets, then find out the efficiency standards of the financial market, as well as valuations of Shares and bonds.
- ✓ Giving students how to apply full financial cycle and makes the necessary adjustments on service and commercial installations
- ✓ Giving student's of Application processors to finance small projects.

Course Outcome

After completion of this course student will be able to

- CO1:** Explain and describe various technology-based business models and the dynamics of value creation, value proposition, and value capture in industrial enterprises.
- CO2:** Select, interpret and use different costing techniques as a basis for decisions in various business situations.
- CO3:** Understand the basic principles of financial accounting and reporting.
- CO4:** Produce and interpret an industrial company's Annual Statement, at a basic level.

Course Content:

Introduction [10L]

Introduction to Accounting, Important Definitions, Basic concepts and conventions, Types of Accounts with Golden Rule of Accounting, Journal, Ledger and Trial Balance,

Preparation of Trading Account, Profit & Loss A/C and Balance Sheet for business organizations.

Financial Management [10L]

Introduction to Financial Management, Introduction, Definition and concept, scope, objective, functions of Finance Manager. Ratio Analysis: Definition, Objectives, Advantages & Disadvantages. Classification of Ratios: Liquidity ratios, Capital Structure ratios, Activity ratios & Profitability Ratios, Capital Budgeting: Nature of Investment Decision, Importance of Capital Budgeting, capital budgeting process, Investment criteria, payback period, Rate of return, cash flow, discounting cash flow NPV method and IRR method, Benefit cost ratio, ARR.

Cost Accounting [7L]

Introduction to cost accounting-Cost Centre Cost unit, Elements of costs, Statement of cost or cost sheet, Marginal cost & C-V-P analysis with BEC. Budget and Budgetary Control: Concepts of Budget, Budgeting and budgetary control, advantages, disadvantages, uses, Master Budget, Zero Based Budget, Cash budget, Flexible budget.

Working capital management [4L]

Introduction-working capital concept-financing working capital-importance of working capital-management of working capital-working capital cycle-management of different components of working capital-working capital forecast.

Introduction to GST [3L]

Introduction to GST-Basic concept and application.

Text Books:

4. Financial Management, Khan & Jain, S. Chand
5. Management Accounting, Khan & Jain, S. Chand
6. Modern Accountancy, Haniff & Mukherjee, TMH

Reference Books:

1. An Introduction to Accountancy, S.N.Maheswari, Vikas publication
2. Cost Accounting: Theory and Practices, B. Banerjee, PHI
3. Financial Management, IM Pandey, Vikas

CO-PO Mapping

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

Course Name: Constitution of India

Course Code: MC501

Contact: 3:0:0

Total Contact Hours: 32

Prerequisite: NA

Course Outcome:

After completion of this course student will be able to

- CO1:** Develop human values, create awareness about law ratification and significance of Constitution
- CO2:** Comprehend the Fundamental Rights and Fundamental Duties of the Indian Citizen to implant morality, social values and their social responsibilities.
- CO3:** Create understanding of their Surroundings, Society, Social problems and their suitable solutions.
- CO4:** Familiarize with distribution of powers and functions of Local Self Government.
- CO5:** Realize the National Emergency, Financial Emergency and their impact on Economy of the country.

Course content:

1. Meaning of the constitution law and constitutionalism (2L)
2. Historical perspective of the Constitution of India (2L)
3. Salient features and characteristics of the Constitution of India (1L)
4. Scheme of the fundamental rights (2L)
5. The scheme of the Fundamental Duties and its legal status (2L)
6. The Directive Principles of State Policy – Its importance and implementation (2L)
7. Federal structure and distribution of legislative and financial powers between the Union and the States (3L)
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India (2L)
9. Amendment of the Constitutional Powers and Procedure (2L)
10. The historical perspectives of the constitutional amendments in India (2L)
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency (3L)
12. Local Self Government – Constitutional Scheme in India (3L)
13. Scheme of the Fundamental Right to Equality (2L)
14. Scheme of the Fundamental Right to certain Freedom under Article 19 (2L)
15. Scope of the Right to Life and Personal Liberty under Article 21. (2L)

Text Books:

1. Introduction to Constitution of India, D.D. Basu, Lexis Nexus
2. The Constitution of India, PM Bhakshi, Universal Law

CO-PO mapping:

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

Course Name: Design Analysis of Algorithm Lab

Course Code: IT 591

Contact: 0:0:3

Credits: 1.5

Prerequisite:

Discrete Mathematics, Data Structure, Basic Programming Knowledge

Course Objective:

The objective of the course is to analyze and design algorithms, use different computational models, order notation and various complexity measures to analyze the complexity/performance of different algorithms.

Course Outcome

After completion of this course student will be able to

CO1: Analyze a problem and design the solution for the problem.

CO2: Optimize the solution with respect to time complexity & memory usage.

CO3: Apply different algorithmic approaches for solving the problems.

CO4: Analyze the efficiency of algorithms using time and space complexity theory.

Course Content:

1. Implement Merge Sort using Divide and Conquer approach
2. Implement Quick Sort using Divide and Conquer approach
3. Find the minimum number of scalar multiplication needed for chain of matrix using dynamic programming
4. Implement all pair of Shortest path for a graph (Floyd- Warshall Algorithm) using dynamic programming
5. Implement Traveling Salesman Problem using dynamic programming
6. Implement Single Source shortest Path for a graph using Bellman Ford Algorithm
7. Implement 15 Puzzle Problem using Branch and Bound technique.
8. Implement 8 Queen Problem using Backtracking.
9. Implement any one of the following problems using Backtracking:
 - Graph Coloring Problem
 - Hamiltonian Problem
10. Implement any one of the following problem using Greedy method:
 - Knapsack Problem
 - Job sequencing with deadlines
11. Implement KMP algorithm for string matching.
12. Implement Ford Fulkerson algorithm.

Text books:

1. Aho, J. Hopcroft and J. Ullman “The Design and Analysis of Algorithms”
2. D. E. Knuth “The Art of Computer Programming”, Vol. 3
3. E. Horowitz and Shani “Fundamentals of Computer Algorithms”

Reference books:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, “Introduction to Algorithms”

CO-PO Mapping

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

Course Name: Software Engineering Lab

Course Code: IT 592

Contact: 0:0:3

Credits: 1.5

Prerequisite: Familiar with MS Office Package and Basic Computations.

Course Objective:

Demonstrate the UML diagrams with ATM system descriptions, Demonstrate the working of software testing tools with c language, Understanding Project Planning Tools.

Course Outcome:

After completion of this course student will be able to

- CO1:** Ability to analysis and design of complex systems and meet ethical standards, legal responsibilities
- CO2:** Ability to apply software engineering principles, techniques and develop, maintain, evaluate large-scale software systems.
- CO3:** To produce efficient, reliable, robust and cost-effective software solutions and perform independent research and analysis.
- CO4:** Ability to work as an effective member or leader of software engineering teams and manage time, processes and resources effectively by prioritizing competing demands to achieve personal and team goals.

List of Experiments:

1. Identifying the Requirements from Problem Statements
2. Requirements, Characteristics of Requirements, Categorization of Requirements, Functional Requirements, Identifying Functional Requirements
3. Estimation of Project Metrics
4. Project Estimation Techniques -COCOMO, Basic COCOMO Model, Intermediate COCOMO Model, Complete COCOMO Model, Advantages of COCOMO, Drawbacks of COCOMO, Halstead's Complexity Metrics
5. Modeling UML Use Case Diagrams and Capturing Use Case Scenarios
6. Use case diagrams, Actor, Use Case, Subject, Graphical Representation, Association between Actors and Use Cases, Use Case Relationships, Include Relationship, Extend Relationship, Generalization Relationship, Identifying Actors, Identifying Use cases, Guidelines for drawing Use Case diagrams
7. Identifying Domain Classes from the Problem Statements
8. Introduction to selenium tool for software testing.
9. JUnit, Static analysis, Junit Framework
10. Prepare a SRS document in line with the IEEE recommended standards
11. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.
12. Draw the sequence diagram for any two scenarios.
13. Draw the collaboration diagram.

14. Draw the state chart diagram & component diagram.
15. Draw the deployment diagram.

Text Book

1. Rajib Mall: Software Engineering, PHI
2. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Seventh Edition, Mc Graw-Hill International Edition.

Reference Book

1. Ian Sommerville, “Software Engineering”, 9th Edition, Pearson Education Asia, 2011.
 2. Pankaj Jalote, “Software Engineering, A Precise Approach”, Wiley India, 2010.
- Software Engineering: Iyan Somarville, 7th Edition

CO-PO Mapping:

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

Course Name: Operating System Lab

Course Code: IT 593

Contact: 0:0:3

Credits: 1.5

Prerequisite:

Computer architecture, C,C++, Java

Course Objective:

The objective of the course is to have students understand and appreciate the principles in the design and implementation of operating systems software.

Course Outcome

After completion of this course student will be able to

- CO1:** Describe the important computer system resources and the role of operating system in their management policies and algorithms.
- CO2:** Understand the process management policies and scheduling of processes by CPU
- CO3:** Evaluate the requirement for process synchronization and coordination handled by operating system
- CO4:** Describe and analyze the memory management and its allocation policies

Course Contents:

1. Managing Unix/Linux Operating System :

Installation & Configuration of Operating Systems-Multi Booting, VMware installation, Creating a bash shell script, making a script executable, shell syntax (variables, conditions, control structures, functions, commands). Partitions, Swap space, Device files, Raw and Block files, Formatting disks, Making file systems, Super block, I-nodes, File system checker, Mounting file systems, Logical Volumes, Network File systems, Backup schedules and methods Kernel loading, init and the inittab file, Run-levels, Run level scripts. Password file management, Password security, Shadow file, Groups and the group file, Shells, restricted shells, user-management commands, homes and permissions, default files, profiles, locking accounts, setting passwords, Switching user, Switching group, Removing users & user groups.

2. Process: starting new process, replacing a process image, duplicating a process image, waiting for a process, zombie process.

3. Signal: signal handling, sending signals, signal interface, signal sets.

4.Semaphore: programming with semaphores (use functions semctl, semget, semop, set_semvalue, del_semvalue, semaphore_p, semaphore_v).

5.POSIX Threads: programming with pthread functions (viz. pthread_create, pthread_join, pthread_exit, pthread_attr_init, pthread_cancel)

6.Inter-process communication: pipes(use functions pipe, popen, pclose), named pipes (FIFOs, accessing FIFO),message passing & shared memory(IPC version V).

Text Books:

1. Russ Cox, Frans Kaashoek, Robert Morris , xv6: a simple, Unix-like teaching operating system",Revision8.
2. Sumitabha Das , UNIX Concepts and Applications, Tata McGraw-Hill.

Reference Books:

1. Tanenbaum A.S., "Operating System Design & Implementation", Practice Hall NJ.2.
2. Stalling, William, "Operating Systems", Maxwell McMillan International Editions.

CO-PO Mapping

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

Course Name: Programming Practice with C++ Lab

Course Code: IT 594A

Contact: 0:0:3

Credits: 1.5

Prerequisite:

Basic Computer concepts

Course Objective:

The objective of the course is to introduce with the object oriented programming paradigm using C++ and make the students understand different concept of C++ and apply the features in application development.

Course Outcome

After completion of this course student will be able to

- CO1** Apply the concept of Object oriented programming in developing program
- CO2** Analyse and evaluate different feature of C++ in different laboratory experiments
- CO3** Develop small to big scale project using C++

List of Experiments:

Introduction

Introduction of UNIX/Linux Operating System which includes preliminary commands, start-up & shutdown methodology, file handling as well as introduction to editors like Vi editor, introduction to GNU C & C++ compiler, as well as introduction to GNU & GDB script.

Basic Programming Concepts

Introduction to C++, basic loop control, executing programs, writing functions, selection statements, review of functions and parameters, command line arguments, recursion

Stream and Structure

I/O streams, arrays and string manipulation, pointers, structures & unions Template , Exception

Object Oriented Concepts

Object-Oriented Programming in C++, fundamentals of classes, constructors-destructors. Dealing with member functions

Overloading

Operator overloading and Polymorphism (both static & dynamic).

Inheritance

Introduction to Inheritance, derived class handling, abstract class, virtual class, overriding, template class, name-space & exception handling.

Memory Management

Dynamic memory allocation, implementation of Linked Lists, using C++.

C++11 Features

Basic C++11 features

Innovative Experiments

Design innovative projects using C++

Text Books:

1. Schildt, H., The Complete Reference C++, McGraw – Hill.
2. Balaguruswamy, Object Oriented Programming C++ McGraw – Hill.

Reference Books:

1. C++ object oriented programming paradigm, Debasish Jana, PHI
2. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	--	1	1	--	--	--	--	--	--
CO2	3	3	2	--	3	2	--	--	--	--	--	--
CO3	3	--	--	--	3	--	2	--	--	--	--	2

Course Name: Artificial Intelligence Lab

Course Code: IT 594B

Contact: 0:0:3

Credits: 1.5

Perquisite:

Knowledge of programming languages.

Course Objective:

Apply knowledge of computing and mathematics appropriate to the discipline. Analyze a problem, and identify and define the computing requirements appropriate to its solution. Design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs Understand current techniques, skills, and tools necessary for computing practice.

Course Outcome:

After completion of this course student will be able to

- CO1:** Understand and recognize various AI search algorithms and AI tools.
- CO2:** Apply the fundamentals of knowledge representation, inference and theorem proving using
- CO3:** Analyze working knowledge of reasoning in the presence of incomplete and/or uncertain information.
- CO4:** Evaluate and create knowledge representation, reasoning, and machine learning techniques for the solutions of real-world problems.

List of Experiments:

A. Write the following programs using PROLOG

1. Study of PROLOG facts and rules.
2. Write a program to compute factorial of a number.
3. Write a program to compute GCD of two numbers.
4. Write a program to represent facts and rules.
5. Write a program to represent a family tree.
6. Write a program to diagnosis intelligently.
7. Write a program to check whether a given line segment is vertical or horizontal.
8. Write a program for list processing.

B. Write the following programs using PROLOG

1. Write a program to solve 8 queens problem

2. Solve any problem using depth first search.
 3. Solve any problem using best first search.
 3. Solve 8-puzzle problem using best first search
 4. Solve Robot (traversal) problem using means End Analysis
 6. Solve traveling salesman problem.
- C. Write some programs on recent trend in AI (It may be recent real world problems)
 Jupyter Notebook(iPython) :Medical diagnosis. Design an Expert System

Projects assigned by instructor to model and solve real world problems.

TEXT BOOKS:

1. Artificial Intelligence: A Modern Approach,. Russell & Norvig, Prentice Hall.
2. Artificial Intelligence, Elain Rich and Kevin Knight, TMH.

REFERENCE BOOK:

3. Prolog Programming for Artificial Intelligence Paperback by Ivan Bratko
4. Jacek M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishers

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

CO-PO Mapping

Course Name: Microprocessor and Microcontroller Lab

Course Code: IT 594C

Contact: 0:0:3

Credits: 1.5

Prerequisite:

Basic Knowledge of Digital Electronics

Course Objective:

To apply Assembly Level Programming for arithmetic-logical solutions and also to interpret the interfacing programming by conducting experiments.

Course Outcome

After completion of this course student will be able to

- CO1:** Able to solve small assignments using the 8085 basic instruction sets and memory mapping through trainer kit and simulator.
- CO2:** Able to write 8085 assembly language programs like Addition, Subtraction, Multiplication, Square, Complement, Look up table, Copying a block of memory, Shifting, Packing and unpacking of BCD numbers, Ascending order, Descending order etc. using trainer kit.
- CO3:** Able to validate the interfacing technique using 8255 trainer kit through subroutine calls and IN/OUT instructions like glowing LEDs accordingly, stepper motor rotation etc
- CO4:** Able to test fundamental of 8051 programs using the trainer kit.

List of Experiments:

1. Familiarization with 8085 register level architecture, the basic instruction sets (data transfer, arithmetic, logical, branching) and the trainer kit components including the memory map.
2. Familiarization with the process of storing, executing and viewing the contents of memory as well as registers in the trainer kit 8085 and simulator through small assignments.
3. Programming using 8085 kit and simulator for: Addition, Subtraction, Multiplication by repeated addition method, Square, Complement, Look up table, Copying a block of memory, Shifting, Packing and unpacking of BCD numbers, Addition of BCD numbers, Binary to ASCII conversion, Smallest and Largest number from an array of numbers, Ascending order, Descending Order, String Matching, Multiplication using shift and add method.
4. Program using subroutine calls and IN/OUT instructions using 8255 PPI on the trainer kit e.g. subroutine for delay, reading switch state and glowing LEDs accordingly, glowing of seven segment display.

Program for serial communication between two trainer kits.

1. Interfacing of 8255: Keyboard, Stepper motor rotation.
2. Study of 8051 Micro controller kit and writing programs.

Text Book:

4. Microprocessor architecture, programming and application with 8085 – R. Gaonkar, Penram International
5. Fundamentals of microprocessor and microcontroller- B.Ram

Reference Book:

7. Microprocessors and microcontrollers - N. Senthil Kumar, M. Saravanan and Jeevananthan, Oxford university press
8. 8086 Microprocessor –K Ayala, Cengage learning
9. Ray & Bhurchandi, Advanced Microprocessors & Peripherals, TMH
10. The 8051 Microcontroller and Embedded System- Mazidi

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

CO-PO Mapping

Department: Information Technology
Curriculum Structure & Syllabus
(Effective from 2018-19 admission batch)

6 th Semester								
Sl No	Course Code	Paper Code	Theory	Contact Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	PC	IT601	Database Management System	3	0	0	3	3
2	PC	IT602	Web Technology	3	0	0	3	3
3	PC	IT603	Computer Networking	3	0	0	3	3
4	PE	IT604	A. E-Commerce and ERP	3	0	0	3	3
			B. Digital Image Processing					
			C. Soft Computing					
Total of Theory							12	12
B. PRACTICAL								
5	PC	IT691	Database System Lab	0	0	3	3	1.5
6	PC	IT692	Web Technology Lab	0	0	3	3	1.5
7	PC	IT693	Computer Networking Lab	0	0	3	3	1.5
8	PE	IT694	A. E-Commerce and ERP Lab	0	0	3	3	1.5
			B. Digital Image Processing Lab					
			C. Soft Computing Lab					
9	PROJ	PR691	Project-VI	0	0	2	2	1
10	PROJ*	PR692	Innovative Activities-V	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
11	MC	MC681	Technical Lecture Presentation & Group Discussion-I	0	0	3	3	
Total of Theory, Practical & Mandatory Activities/Courses							29	19.5

*Students may choose either to work on participation in all the activities of Institute's Innovation Council for eg: IPR workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

Course Name: Database Management System

Course Code: IT 601

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite:

Mathematics, Data Structure, Operating System.

Course Objective:

The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

Course Outcome

After completion of this course student will be able to

- CO1:** Understand Database Management System, explain fundamental elements of a database management system, compare the basic concepts of relational data model, entity-relationship model, file organization and use appropriate index structure.
- CO2:** Apply efficient query optimization techniques, suitable transaction management, concurrency control mechanism and recovery management techniques.
- CO3:** Evaluate a database design and improve the design by normalization.
- CO4:** Design entity-relationship diagrams to represent simple database application scenarios, translate entity-relationship diagrams into relational tables, populate a relational database and formulate SQL queries on the data.

Course Contents:

Module I: Introduction: [2L]

Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.

Module II: Entity-Relationship Model: [3L]

Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.

Module III: Relational Model: [4L]

Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications of the Database.

Module IV: SQL and Integrity Constraints: [8L]

Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested Sub queries, Database security application development using SQL, Stored procedures and triggers.

Module V: Relational Database Design: [9L]

Functional Dependency, Different anomalies in designing a Database., Normalization using functional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Normalization using multi-valued dependencies, 4NF, 5NF

Module VI: Internals of RDBMS: [6L]

Physical data structures, Query optimization: join algorithm, statistics and cost bas optimization. Transaction processing, Concurrency control and Recovery Management: transaction model properties, state serializability, lock base protocols, two phase locking.

Module VII: File Organization & Index Structures: [4L]

File & Record Concept, placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree.

Text Books:

1. Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mc.Graw Hill.
2. Elmasri Ramez and Novathe Shamkant, "Fundamentals of Database Systems", Benjamin Cummings Publishing. Company.

Reference Books:

1. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems (3/e), McGraw Hill.
2. Peter Rob and Carlos Coronel, Database System- Design, Implementation and Management (7/e), Cengage Learning.

CO-PO Mapping

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

Course Name: Web Technology

Course Code: IT 602

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite:

Computer Networking, Database Management System, JAVA Programming Language

Course Objective:

Describing the web application architecture and protocols, illustrating different technologies those are used to develop web applications, describing different frameworks those used to develop web applications

Course Outcome: At the end of the course students will be able to

- CO1:** Understand and evaluate web application architecture, technologies and frameworks.
- CO2:** Apply the knowledge of web technology in developing web applications
- CO3:** Evaluate different solutions in field of web application development.
- CO4:** Implement small to large scale project to provide live solution in web application development fields

Course Content:

Module I: Introduction to World Wide Web: [2L]

Web Architecture, Web Applications, Web servers, Web Browsers and Agents, Internet standards, DNS, SMTP , Pull and Push mechanism: Pros and Cons. HTTP, HTTPS, XMPP

Module II: Mark-up: [2L]

HTML: Elements, Attributes, Tags, Forms, Input, Frames, Tables.

Module III: Cascading Style Sheets: [2L]

Advantages, Rules, CSS, inline and external, using template Layouts.

Module IV: Java Script and Node JS: [5L]

Basic java Script concepts, Use of Java Script, Variable, Object, function, Event Handling. Evaluation of Java Scrip. Create, Publish, Extend & Manage, Node.js HTTPs : Create Server and Get Data, Node.js Express, Node JS Mongo DB. Node.js Promise , Node.js Generators & Compare with Callbacks, Node js Streams : File stream, Pipes, Node.js Testing with Jasmine

Module V: Server-side Programming: [7L]

Servlets: HTTP Tunneling, Programmatically issuing HTTP GET, POST etc. and retrieval of content Concept of Dynamic Web pages, Web server versus Application server, Role of threading in a Server, Servlet-2.x API conforming to Web 2.0: Role of web.xml as deployment descriptor, request and response, Basic request handling, parameter retrieval, multiple parameter retrieval, inter-Servlet collaboration: Dispatching the request, Concept of state of web: Sessions , tracking session, Using Cookies and jsession Id, Parameter passing to and from session, Servlet Filters and common uses of Filters and Cookies. Migration to Servlet 3.x plus and omission of web.xml and concept of Web Socket.

Module VI: Persistence: JDBC 3.x framework: [6L]

Need and different approaches of persistence of data, Connecting to databases using jdbc:odbc bridge and Type-4 drivers, Executing basic CRUD using JDBC: Statement, Prepared Statement, Result Set. Execution of batch SQL, Stored Procedures using Callable Statement, Transaction Failure management: Save Point and roll back concepts, Prevention of SQL injection, Concept of connection URL in details: Connecting to a remote database host (server). Concept of roles of Drivers: Java reflection in Action.

Module VII: Java Server Pages: [6L]

Benefits of JSP over Servlets, JSP scriptlets, page directives, declarations, action tags: <jsp:useBean/>, <jsp:include/> <jsp:forward/> , introduction to MVC and Spring MVC

Module VIII: XML Technologies: [2L]

XML, Namespace, DTD, W3C XML Schema

Module IX: Ajax: [2L]

Introduction to Asynchronous pattern and Using XML to communicate over XML Http Request object. Handling 5 states and finding response state. Migration of Ajax to AJAX

Module X: Web Service: [2L]

Introduction to web service architecture. Simple object access protocol, Web service description language, RESTful web service.

Text Book:

1. Professional Java Server Programming Allamaraju, Apress

Reference Book:

1. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013.
2. Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Kogent Learning Solutions INC.

CO-PO Mapping:

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

Course Name: Computer Networking

Course Code: IT 603

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite:

Basic Digital Communication, Computer Architecture and Operating System.

Course Objective:

Understanding the basic concept of different network models, explaining the network architecture, Analyzing and evaluating different network protocols.

Course Outcome

After completion of this course student will be able to

CO1: Understand the network model and architecture

CO2: Apply different networking concepts for implementing network solution.

CO3: Analyse different networking functions and features for identifying optimal solutions

CO4: Evaluate and implement routing algorithms for implanting solution for the real-life problems

Course Content:

Module I: Overview of Data Communication and Networking: [4L]

Introduction; Data communications: components, data representation (ASCII,ISO etc.), direction of data flow (simplex, half duplex, full duplex); network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN,WAN); Internet: brief history, Protocols and standards; Reference models: OSI and TCP/IP.

Module II: Physical Layer: [5L]

Overview of data, signal, transmission & transmission media; Circuit switching: time division & space division switch, TDM bus; Telephone Network.

Module III: Data link Layer: [8L]

Types of errors, framing, error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, GoBack- N ARQ, Selective repeat ARQ, HDLC; Point to Point Protocol, LCP, NCP, Token Ring; Reservation, Polling, Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA Traditional Ethernet, fast Ethernet,

Module IV: Network layer: [7L]

Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing: IP addressing, subnetting; Routing: techniques, Routing Protocols, ARP, IP, ICMP, IPV6.

Module V: Transport layer: [6L]

Process to Process delivery; UDP; TCP; Congestion Control: Open Loop, Closed Loop choke packets; Quality of service: techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm.

Module VI: Application Layer: [6L]

DNS, SMTP, SNMP, FTP, HTTPS, Firewalls, IP Filtering

Text Books:

1. B. A. Forouzan – “Data Communications and Networking (5th Ed.) “ – TMH
2. W. Stallings – “Data and Computer Communications (5th Ed.)” – PHI/ Pearson Education

Reference Books:

1. A. S. Tanenbaum – “Computer Networks (4th Ed.)” – Pearson Education/PHI
2. Black, Data & Computer Communication, PHI
3. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP

CO-PO Mapping

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

Course Name: E-Commerce and ERP

Course Code: IT604A

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite:

Concepts of Computer Networking, Operating System, Database Management System

Course Objective:

The objective of the course is to explain the characteristics and functions of electronic commerce including mobile commerce, fundamental characteristics of electronic markets, common business models used in B2C and B2B electronic commerce. To acquire an overview to ERP and the knowledge on related technologies. Skill to ERP Manufacturing Perspective and ERP modules and to examine ERP tools and understand the benefits of ERP.

Course Outcome

After completion of this course student will be able to

- CO1:** Understand the policy issues related to privacy, intellectual property rights, and establishing identity those are germane to electronic commerce along with the Internet and related technologies.
- CO2:** Comprehend the underlying economic mechanisms and driving forces of E-Commerce.
- CO3:** Analyse the impact that electronic commerce is facing and outlines the different digital transaction process and basic concepts of e-commerce.
- CO4:** Identify different technologies and IT support used in ERP and apply different tools used in ERP.

Course Contents:

Module I: Introduction to E-Commerce: [2L]

Definition, Scope of E-Commerce, Hardware requirements, E-Commerce and Trade Cycle, Electronic Markets, Electronic Data Interchange and Internet Commerce.

Module II: Business to Business E-Commerce: [4L]

Electronic Markets, Electronic Data Interchange (EDI): Technology, Standards (UN/EDIFACT), Communications, Implementations, Agreements, Security, EDI and Business, Inter-Organizational E-commerce. Business models for E-commerce, Business Process Re-Engineering.

Module III: Legal issues: [3L]

Risks: Paper Document vs. Electronic document, Authentication of Electronic document, Laws, Legal issues for Internet Commerce: Trademarks and Domain names, Copyright, Jurisdiction issues, Service provider liability, Enforceable online contract.

Module IV: Security Issues :[5L]

Security Solutions: Symmetric and Asymmetric Cryptosystems, RSA, DES, and Digital Signature, Protocols for secure messaging, Secure Electronic Transaction (SET) Protocol, Electronic cash over internet, Internet Security, Search engines, Intelligent agents in E-Commerce Electronic payment systems, E-security.

Module V: Business to Consumer E-Commerce and E-Business: [5L]

Consumer trade transaction, Web metrics, Elements of E-Commerce, Industry impacts of E-business. Integrating Intranet and internet web applications across multiple networks. Internet bookshops, Software supplies and support, Electronic Newspapers, Internet Banking, Virtual Auctions, Online Share Dealing, Gambling on the net, E-Diversity, Case studies through internet.

Module VI: Mobile Commerce: [2L]

Overview, Infrastructure, Applications, Mobile Payment, Limitations, Security in M-Commerce.

Module VII: Information Technology and ERP Systems [9L]

The evolution of ERP systems architecture: Client-Server based architecture, Multi-Tier architecture – Presentation layer, Application layer, and Database layer. Brief discussion on Extended ERP systems - Web-enabled ERP architecture, Service- Oriented Architecture and Cloud Computing. Open Source ERP. ERP and Supply Chain Management, and Customer Relationship Management, ERP and Business Intelligence, ERP and Data warehousing, ERP and E-business.

Module VIII: Emerging Trends and Future of ERP Systems: [6L]

Emerging Technologies and ERP: Service-oriented Architecture: Enterprise SOA layers – Business processes, Business services, Components and Integration services, Difference between multi-layered Client-server architecture and SOA. Enterprise Application Integration: Basic understanding of the concept, Types of EAI – User Interface, Method, Application Interface, Data.

Text Books:

- 1.E-Commerce-Strategy, Technologies & Applications by David Whitley, TMH
2. Handbook on Electronic Commerce, Shaw et al., Springer publication.
3. Enterprise Resource Planning –Alexis Leon, Tata McGraw Hill

Reference Books:

1. E-Commerce-Strategy, Technologies & Applications by David Whitley, TMH.
2. Applied E-Commerce, Langer, John Wiley Publication.
3. E-Commerce- The cutting edge of business by Kamlesh K. Bajaj, TMH.
4. Enterprise Resource Planning, 2nd Edition by Alexis Leon, Tata McGraw Hill Education, 2008
5. Guide to Planning ERP Application, Annetta Clewwto and Dane Franklin, McGraw Hill, 1997

CO-PO Mapping

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

Course Name: Digital Image Processing

Course Code: IT 604B

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite:

Mathematics, Computer Programming

Course Objective:

The aim of this course is to introduce to the students the basics of digital image processing. The students will gain overview about the available techniques and possibilities of this field. They will learn basic image transformation, segmentation algorithms and problems of object measurements.

Course Outcome:

After completion of this course students will be able to

- CO1:** Understand the fundamental concepts of a digital image processing system.
- CO2:** Analyze images in the spatial as well as frequency domain using various transformation techniques for improving the image quality.
- CO3:** Implement various compression techniques.
- CO4:** Evaluate image segmentation and representation techniques

Course Contents:

Module I: Introduction to Digital Image Processing: [3L]

Elements of digital image processing systems, Elements of visual perception Brightness, contrast, hue, saturation, mach band effect, Image sampling and quantization.

Module II: Image Enhancement: [8L]

Spatial Basic grey level transformation, Histogram equalization, Histogram specification techniques, Noise Distributions, Image subtraction and Image averaging, Smoothing, sharpening filters, Frequency Domain methods: Introduction to Fourier Transform and DFT, Discrete Cosine Transform (DCT) and its properties, Smoothing in Frequency- Domain, Sharpening in Frequency- Domain, Homomorphic filtering.

Module III: Image Restoration: [5L]

Model of Image Degradation/restoration process, Noise models, Unconstrained restoration, Lagrange multiplier, Least mean square filtering, Constrained least mean square filtering, Wiener filtering.

Module IV: Color Image Processing: [3L]

Different color Models, Color Transformations, Smoothing & Sharpening Color Image, Color Segmentation, Noise.

Module V: Image Compression: [6L]

Need for data compression, Different types of compression, Variable length coding-Huffman Coding, Run Length Encoding, Arithmetic coding, Lossy Compression: Vector Quantization, Transform coding, Basics of Image compression standards: JPEG.

Module VI: Image Segmentation: [6L]

Thresholding, Region Based segmentation, Region growing, Region splitting and Merging, Edge detection, Canny edge detector.

Module VII: Image registration: [3L]

Geometric transformations: translation, rotation, scaling, homomorphic coordinate system; ground control points, affine transformation.

Module VIII: Representation & Description: [2L]

Representation of segmented image, Boundary & Regional Descriptors, Use of Principal components for description.

Text Books:

1. Digital Image Processing by Woods, Gonzalves, Pearson
2. Digital Image Processing & Analysis by Chanda & Majumder, PHI

Reference Books:

1. Digital Image Processing by Jahne by Springer India
2. Image Processing, Analysis & Machine Vision by Sonka, VIKAS
3. Fundamentals of Digital Image Processing by Jain, PHI

CO-PO Mapping:

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

Course Name: Soft Computing

Course Code: IT 604C

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite:

Mathematics, Set theory.

Course Objective:

To give students knowledge of soft computing theories fundamentals, that is of fundamentals of non-traditional technologies and approaches to solving hard real-world problems, namely of fundamentals of artificial neural networks, fuzzy sets, fuzzy logic and genetic algorithms.

Course Outcome

After completion of this course student will be able to

CO1: Understand importance of soft computing.

CO2: Remember different soft computing techniques like Genetic Algorithms, Fuzzy Logic, Neural Networks and their combination.

CO3: Implement algorithms based on soft computing.

CO4: Apply soft computing techniques to solve engineering or real-life problems.

Course Content:

Module I: Introduction : [4L]

Soft Computing. Difference between Hard and Soft computing, Requirement of Soft Computing, Major Areas of Soft Computing, Applications of Soft Computing.

Module II: Fuzzy Systems : [9L]

Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Min-max Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification.

Module III: Genetic Algorithm: [8L]

History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function, GA Operators- Reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA, Multi-level Optimization.

Module IV: Neural Networks : [8L]

Neural Network, Learning rules and various activation functions, Single layer Perceptrons , Back Propagation networks, Architecture of Back propagation(BP) Networks, Back propagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.

Module V: Multi-objective Optimization Problem Solving : [4L]

Concept of multi-objective optimization problems (MOOPs) and issues of solving them. Multi-Objective Evolutionary Algorithm (MOEA), some applications with MOEA.

Module VI: Hybrid Systems: [3L]

Introduction to Hybrid Systems, Neuro Fuzzy Hybrid Systems, Neuro-Genetic Hybrid Systems, Fuzzy-Genetic Hybrid Systems.

Text Books:

1. Fuzzy Logic with Engineering Applications, Timothy J. Ross, Willey.
2. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S.Rajasekaran, G. A. Vijayalakshami, PHI.
3. Genetic Algorithms: Search and Optimization, E. Goldberg

Reference Books:

1. Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee PHI.
2. Elements of Artificial Neural Network, Kishan Mehrotra, MIT Press.
3. An Introduction to Genetic Algorithms, Melanie Mitchell, MIT Press.

CO-PO Mapping

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

Course Name: Database Management System Lab

Course Code: IT 691

Contact: 0:0:3

Credits: 1.5

Prerequisite: Knowledge about the basics of electronics and basic concepts in logic design, basic knowledge of data structure and programming concept.

Course Objective:

To develop conceptual understanding of database management system for solving different industry level problems & to learn its applications

Course Outcome:

After completion of this course student will be able to

CO1: Design and implement a database schema for a given problem-domain

CO2: Create and maintain tables using PL/SQL Course Outcome

CO3: Populate and query a database

CO4: Application development using PL/SQL & front-end tools

List of Experiments:

1. Study of Backend Tool – Oracle.
2. Data Definition Language (DDL) commands in RDBMS.
3. Data Manipulation Language (DML) and Data Control Language (DCL) commands in RDBMS.
4. High-level language extension with Cursors.
5. High level language extension with Triggers
6. Procedures and Functions.
7. Embedded SQL.
8. Database design using E-R model and Normalization.
9. Mini project (Application Development using Oracle and Visual Basic)
 - i. Inventory Control System.
 - ii. Material Requirement Processing
 - iii. Hospital Management System
 - iv. Railway Reservation System
 - v. Personal Information System
 - vi. Web Based User Identification System
 - vii. Time-table Management System

Text Book

1. ORACLE PL/SQL by example. Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3rd Edition

Reference Book

1. ORACLE DATA BASE LOG PL/SQL Programming SCOTT URMAN, Tata Mc- Graw Hill.
2. SQL & PL/SQL for Oracle 10g, Black Book, Dr.P.S. Deshpande.

CO-PO Mapping

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

Course Name: Web Technology Lab

Course Code: IT 692

Contact: 0:0:3

Credits: 1.5

Prerequisite: Basic knowledge on Java and computer networking and database.

Course Objective:

Describing the web application architecture and protocols; Illustrating different technologies those are used to develop web applications; Describing different frameworks those used to develop web applications.

Course Outcome: At the end of the course students will be able to

- CO1:** Apply the knowledge of web technology in developing web applications
- CO2:** Evaluate different solutions in field of web application development
- CO3:** Implement small to large scale project to provide live solution in web application development fields.

List of Experiments:

HTML

Developing application using different HTML elements, designing forms using HTML, Apply DOM

CSS

Using different CSS Styles for designing interactive forms and interfaces.

Java Script

Using Java script variables, operators, control structure, functions and event handling, Form validation using java script, Node js server implementation, express js for implementing web application handling get, put, post, etc.

JDBC

Connecting to databases using jdbc:odbc bridge and Type-4 drivers, Batch execution, Stored Procedure

Servlet

Developing web application using servlet: get/post, Developing filter application, Session handling.

JSP

Developing web application using JSP as view, Session handling using JSP, Using JSP components, Custom tag development.

AJAX

Developing web application using AJAX: accessing XML, text files.

Web Service

Development web service as reusable components

Innovative Experiments

Develop some innovative experiments.

Text Book:

1. Professional Java Server Programming Allamaraju, aprerss

Reference Book:

1. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013.
2. Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Kogent Learning Solutions INC.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO	PO1	PO1	PO12
CO1	2	3	3	3	3	--	--	--	--	--	--	--
CO2	2	3	3	3	3	--	--	--	--	--	--	--
CO3	2	3	3	3	3	--	--	--	2	3	--	3

Course Name: Computer Networking Lab

Course Code: IT 693

Contact: 0:0:3

Credits: 1.5

Prerequisite:

Basic Computer Architecture and Operating System.

Course Objective:

Understanding the basic concept of different network models, Explaining the network architecture, Apply different computer routing algorithms in real life problems.

Course Outcome

After completion of this course student will be able to

CO1: Understand and apply different network commands.

CO2: Analyze different networking functions and features for implementing optimal solutions.

CO3: Apply different networking concepts for implementing network solution.

CO4: Implement different network protocols.

List of Experiments:

- Familiarization with: Different networking cables, Different connectors, Hubs, Switches, Routers
- NIC Installation & Configuration (Windows/Linux)
- Understanding IP address, subnet etc, Connect the computers in Local Area Network.
- Study of basic Network Configuration commands.
- Configure a Network topology using packet tracer software
- Link Layer Error Detection Mechanism (Cyclic Redundancy Check), Data Link Layer Error Control mechanism (Selective Repeat, Go Back N)
- Implementation of Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window), Data
- Server Setup/Configuration: FTP, TELNET, NFS, DNS, Firewall.
- TCP/UDP Socket Programming: Simple, TCP based, UDP based Multicast & Broadcast Sockets

Text Books:

1. B. A. Forouzan – “Data Communications and Networking (5th Ed.) “ – TMH
2. W. Stallings – “Data and Computer Communications (5th Ed.)” – PHI/ Pearson Education

Reference Books:

1. A. S. Tanenbaum – “Computer Networks (4th Ed.)” – Pearson Education/PHI
2. Black, Data & Computer Communication, PHI
3. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP

CO-PO Mapping

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

Course Name: E-Commerce and ERP Lab

Course Code: IT694A

Contact: 0:0:3

Credits: 1.5

Prerequisite:

Object Oriented Programming, Computer Networking, Web Application Development, Database Management System.

Course Objective:

Understanding basic concept of object-oriented programming and PhP framework, Explaining the client-side components, Applying the PhP web application development concept in web application development.

Course Outcome

After completion of this course student will be able to

CO1: Understand the concept of PhP framework.

CO2: Analyzing different client and server side components for developing application.

CO3: Apply and concept for developing MVC application.

CO4: Apply and implement the solution to real life problem using PHP concepts.

Course Content:

Introduction to PHP:

Evaluation of PHP, Basic syntax, Variable constant, Data Types, control structure, function, array, string.

Web Designing:

Introduction to HTML HTML Tags Creating Forms Creating tables Managing home page, Java Script, CSS.

Database Connectivity with MySQL:

Introduction to RDBMS Connection with MySql Database Performing basic database operation (DML) (Insert, Delete, Update, Select) Setting query parameter Executing query Join (Cross joins, Inner joins, Outer Joins, Self joins.)

E-Commerce/M-Commerce Applications:

Online Store, Online Banking, Credit Card Transaction Processing. Comparison Shopping in B2C, Exchanges Handling in B2B, Interaction Examples: Virtual Shopping Carts.

Text Books:

1. PhP Complete Refernce Steven Holzner

Reference Books:

1. Programming PHP Kevin Tatroe

CO-PO Mapping

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

Course Name: Digital Image Processing Lab

Course Code: IT 694B

Contact: 0:0:3

Credits: 1.5

Prerequisite:

Knowledge on Computer Programming

Course Objective:

The aim of this course is to familiarize the students in the regular Image Processing Software with respect to basic processing required to generate thematic maps from different sources of images.

Course Outcome:

After completion of this course students will be able to

- CO1:** Apply enhancing operations on the image using spatial filters and frequency domain filters.
- CO2:** Analyse the characteristics of the image using different transformation techniques.
- CO3:** Estimate the efficiency of the compression techniques on the images.
- CO4:** Implement different segmentation operations of images.

List of Experiments:

Simulation using MATLAB

1. Image sampling and quantization
2. Analysis of spatial and intensity resolution of images.
3. Intensity transformation of images.
4. DFT analysis of images
5. Different types of Transforms
6. Histogram Processing
7. Image Enhancement-Spatial filtering
8. Image Enhancement- Filtering in frequency domain
9. Image segmentation – Edge detection, line detection and point detection.
10. Region based Segmentation
11. Analysis of images with different color models.
12. Image compression techniques
13. Image restoration
14. A mini project based on medical image processing

References:

1. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Digital Image Processing using MATLAB, Pearson Education, Inc., 2004.
2. Lab Manual

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2
CO1	2	-	-	-	1	-	-	-	-	-	-	1
CO2	2	3	2	3	-	-	-	-	-	-	-	-
CO3	1	1	1	2	1	-	-	-	1	-	-	-
CO4	1	3	3	1	2	1	1	-	1	1	-	1

Course Name: Soft Computing Lab

Course Code: IT 694C

Contact: 0:0:3

Credits: 1.5

Prerequisite:

Mathematics, set theory and basic computation.

Course Objective:

To give students knowledge of soft computing theories fundamentals, that is of fundamentals of non-traditional technologies and approaches to solving hard real-world problems, namely of fundamentals of artificial neural networks, fuzzy sets, fuzzy logic and genetic algorithms.

Course Outcome

After completion of this course student will be able to

- CO1:** Understand importance of soft computing techniques and tools.
- CO2:** Understand different soft computing techniques like Genetic Algorithms, Fuzzy Logic, Neural Networks and their combination.
- CO3:** Implement algorithms based on soft computing techniques.
- CO4:** Apply soft computing techniques to solve engineering or real life problems.

List of Experiments:

- 1) Overview of Matrix, Matrix Operations, Giving input to Matrix, Displaying elements of Matrix.
- 2) Performing Operations on Matrix like Addition, Subtraction, and Multiplication.
- 3) Performing Transpose Operations on Matrix.
- 4) Plotting of mathematical functions like $\log(x)$, $\sin(x)$, $\cos(x)$. etc
- 5) Write a Program in MATLAB to check whether a number is even or odd
- 6) Write a program in MATLAB to find out the sum of "N" natural numbers.
- 7) Write a Program in MATLAB to generate the fibonacci series upto N , where N is the desired value input by user
- 8) Write a MATLAB program to solve MATRIX based problems.
- 9) Write a MATLAB Program to implement LMS Learning rule.
- 10) Write a MATLAB program to verify McCulloch OR Function.
- 11) Write a MATLAB program to verify Hebb's Rule.
- 12) Write a MATLAB program to implement various Fuzzy Operations. (Eg Union , Intersection , Complement, XOR Operation) For two Fuzzy Set
 $P = (0.3/a) + (0.9/b) + (1.0/c) + (0.7/d) + (0.5/e) + (0.4/f) + (0.6/g)$
 $Q = (1/a) + (1/b) + (0.5/c) + (0.2/d) + (0.2/e) + (0.1/f) + (0.4/g)$
- 13) Write a MATLAB program to implement Max-Min Composition
 For Two Fuzzy sets
 $P = [0.3 \ 0.7 ; 0.9 \ 0.4 ; 0.2 \ 0.5]$
 $Q = [0.4 \ 0.1 \ 0.8; 0.3 \ 0.7 \ 0.6]$
- 14) Implementation of Union , Intersection , Complement , XOR Operation and Demorgan's Law
- 15) Write a MATLAB program to implement MAX Composition for the two set of Matrix

$$S = [0.3 \ 0.7; 0.9 \ 0.4; 0.2 \ 0.5]$$

$$R = [0.4 \ 0.1 \ 0.8; 0.3 \ 0.7 \ 0.6]$$

16) Write a MATLAB program to implement Deffuzification of α -cut method

For the following fuzzy set

$$F = (0.6/a) + (0.3/b) + (0.7/c) + (1.0/d).$$

Projects assigned by instructor to model and solve real world problems.

Text Books:

1. Fuzzy Logic with Engineering Applications, Timothy J. Ross, Willey.
2. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S.Rajasekaran, G. A. Vijayalakshami, PHI.
3. Genetic Algorithms: Search and Optimization, E. Goldberg

Reference Books:

1. Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee PHI.
2. Elements of Artificial Neural Network, Kishan Mehrotra, MIT Press.
3. An Introduction to Genetic Algorithms, Melanie Mitchell, MIT Press.

CO-PO Mapping

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