



MGM UNIVERSITY, CHHATRAPATI SAMBHAJINAGAR

ACADEMIC SECTION

NOTIFICATION

No. 95/2023

17th August 2023

Enclosed Format of Curriculum Booklet




Registrar 17/8/23
Registrar
MGM University
Aurangabad

To,

All Deans and Principals / Directors / HoD's

Copy to :

1. PS of Hon'ble Chancellor - For kind information please,
2. PS of Hon'ble Vice-Chancellor
3. The Controller of Examinations
4. The ERP section
5. The Website Team
6. The Deputy Registrar (Academics)



MGM University

Chhatrapati Sambhajinagar

Name of Faculty – Engineering & Technology

Name of Institute – Institute of Information and Communication Technology

Name of Programme – B. Tech. IT with Multidisciplinary Minor

CURRICULUM BOOKLET

(With effect from Academic year 2023-24)

MGM University

Chhatrapati Sambhajinagar

MGMUNIVERSITY

Published by –

**Academic Section,
Registrar Office,
MGM University**

Contents

Sr. No.	Particulars	Page no.
1	University's Vision	6
2	University's Mission	6
3	University Song	7
4	IICT at a glance	8
5	IICT's Vision	8
6	IICT's Mission	8
7	Programs offered at IICT	9
8	B. Tech (Information Technology)	10
9	Admission eligibility for Maharashtra Candidate	10
10	Admission eligibility for All India Candidate	11
11	Course Structure for I Semester (Group A)	12
12	Course Structure for II Semester (Group A)	13
13	Course Structure for I Semester (Group B)	14
14	Course Structure for II Semester (Group B)	15
15	Course Structure for III Semester	16
16	Course Structure for IV Semester	17
17	Course Structure for V Semester	18
18	Course Structure for VI Semester	19
19	Course Structure for VII Semester	20

20	Course Structure for VIII Semester	21
21	Syllabus for I Semester	22-56
22	Syllabus for II Semester	57-83
23	Syllabus for III Semester	84-101
24	Syllabus for IV Semester	102-120
25	Syllabus for V Semester	121-141
26	Syllabus for VI Semester	142-168
27	Syllabus for VII Semester	169-182
28	Syllabus for VIII Semester	183-194

MGM University

Vision

- To ensure sustainable human development which encourages self-reliant and self-content society.
- To promote activities related to community services, social welfare and also Indian heritage and culture.
- To inculcate the culture of non-violence and truthfulness through vipassanna meditation and Gandhian Philosophy.
- To develop the culture of simple living and high thinking

Mission

- To impart state of art education and technical expertise to students and give necessary training to teachers to create a self-reliant society for future.
- To encourage students to participate in Indian and International activities in sports, literature, etc. so that future generation becomes base for free and liberal society
- To educate students in areas like Management, Finance, Human relations to inculcate philosophy of simple living and high thinking value of simple economic society.
- To inculcate a culture of non-violence and truthfulness through Vipassana.
- To sustain activities of Indian culture (viz. classical dance, music and fine arts) through establishing institutes like Mahagami, Naturopathy, etc.

विद्यापीठ गीत

अत्त दिप भव भव प्रदिप भव,
 स्वरूप रूप भव हो
 ज्ञान सब्ब विज्ञान सब्ब भव,
 सब्ब दिप भव हो
 अत्ताहि अत्त नो नाथो,
 अत्ताहि अत्त नो गति
 अत्त मार्गपर अप्रमादसे है तुझे चलना
 सब्ब का कल्याण हो,
 वो कार्यकुशल करना
 सब्ब का उत्तम मंगल, पथप्रदर्शक हो
 अत्त दिप भव भव प्रदिप भव,
 स्वरूप रूप भव हो
 ज्ञान सब्ब विज्ञान सब्ब भव,
 सब्ब दिप भव हो
 बुद्धमं शरनं गच्छामि :
 धम्मं शरनं गच्छामि :
 संघं शरनं गच्छामि :

Institute of Information and Communication Technology (IICT) at a Glance

The Institute of Information and Communication Technology (IICT) offers emerging courses in Information Technology, with a focus on Internet of Things (IoT), Blockchain, and Big Data Analytics (BDA). Additionally, it provides undergraduate degrees in Artificial Intelligence & Machine Learning (B.Tech. AI and ML) and Data Science (B.Tech. Data Science). IICT also offers B. Tech CSE(AI) in collaboration with IBM. Furthermore, the department offers Master of Technology Degrees in Data Science (M.Tech. Data Science) and AI & ML (M.Tech. AI and ML) and UG Diploma in Cyber Security and Digital Forensics. Moreover, IICT offers a PhD program in IT.

Vision

IICT shall be a center of excellence fostering innovation, entrepreneurship, and technological advancement with social and global perspectives. It will develop skilled professionals and contribute to industry, research, and interdisciplinary growth.

Mission

- Empower students with human values, ethical conduct, and environmental responsibility.
- Foster interdisciplinary technocrats contributing to sustainable industrial growth.
- Promote expertise in emergent technologies through research, innovation, and industry collaboration to solve real-world challenges.
- Encourage entrepreneurship and leadership, preparing students for future challenges.

Programs offered at IICT

Undergraduate Programmes	Postgraduate Programmes	UG Diploma	PhD Programmes
B.Tech. in Information Technology	M.Tech. Data Science	Cyber Security and Digital Forensics	PhD in IT
B.Tech. in Artificial Intelligence and Machine Learning	M.Tech. AI and ML		
B.Tech. in Data Science			
B. Tech CSE(AI)			

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Name of Program – B. Tech. Information Technology**Duration – Four Years****Eligibility** –Passed HSC or its equivalent examination from science stream and obtained at least 45% marks (at least 40% marks, in case of Backward class categories belonging to Maharashtra State only) and the candidate should have appeared and secured non zero score in MGMU-CET 2024/MHT-CET 2024/PERA-CET 2024/JEE Mains 2024.**1. Maharashtra State Candidate**

(i) The Candidate should be an Indian National and having domicile of Maharashtra state and/or born in Maharashtra state.

(ii) Passed HSC or its equivalent examination with Physics and Mathematics as compulsory subjects along with one of the Chemistry or Biotechnology or Biology or Technical Vocational subject or Computer Science or Information Technology or Informatics Practices or Agriculture or Engineering Graphics or Business Studies, and obtained at least 45% marks (at least 40% marks, in case of Backward class categories and Persons with Disability candidates belonging to Maharashtra State only) in the above subjects taken together and the candidate should have appeared in MGMU-CET 2024/ MHT-CET 2024/ PERA CET 2024/ JEE (Main) Paper-I 2024 and should obtain non zero score in MGMU-CET 2024/ MHT-CET 2024/ PERA CET 2024/ JEE (Main) Paper-I 2024.. However, preference shall be given to the candidate obtaining non-zero positive score in MGMU-CET 2024 over the candidates who obtained non-zero score in MHT-CET 2024/ PERA CET 2024.

OR

(ii) Passed Diploma in Engineering and Technology and obtained at least 45% marks (at least 40% marks, in case of Backward class categories and Persons with Disability candidates belonging to Maharashtra State only).

2. All India Candidates

(i) The Candidate should be an Indian National.

(ii) Passed HSC or its equivalent examination with Physics and Mathematics as compulsory subjects along with one of the Chemistry or Biotechnology or Biology or Technical Vocational subject or Computer Science or Information Technology or Informatics Practices or Agriculture or Engineering Graphics or Business Studies , and obtained at least 45% marks (at least 40% marks, in case of Backward class categories and Persons with Disability candidates belonging to Maharashtra State only) in the above subjects taken together and candidate should have appeared in MGMU-CET 2024/ MHT-CET 2024/ PERA CET 2024/ JEE (Main) Paper-I 2024 and should obtain non-zero score in MGMU-CET 2024/ MHT-CET 2024/ PERA CET 2024/ JEE (Main) Paper-I 2024. However, preference shall be given to the candidate obtaining non-zero positive score in JEE Mains Paper-I over the candidates who obtained non-zero score in MGMU-CET 2024/ MHT-CET 2024/ PERA CET 2024.

OR

(ii) Passed Diploma in Engineering and Technology and obtained at least 45% marks (at least 40% marks, in case of Backward class categories and Persons with Disability candidates belonging to Maharashtra State only)

Name of Faculty: Faculty of Engineering and Technology
Name of the Department : Institute of Information and Communication Technology (IICT)
Name of the Programme: B.Tech. in Information Technology with Multidisciplinary Minor
Programme Type (UG/PG): UG
Duration: 4 Years

First Year - Semester I (Group A)												
Course Category	Course Code	Course Title	Nature of Course	No of Credits	Teaching (Contact hrs/ week)		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
BSC	APS21BSL101	Single and Multivariable Calculus	Lecture	4	4	-	60	40	100	-	16	40
BSC	APS21BSL102	Engineering Physics	Lecture	3	3	-	60	40	100	-	16	40
ESC	APS21ESL101	Python Programming	Lecture	2	2	-	60	40	100	-	16	40
ESC	APS21ESL102	Engineering Graphics	Lecture	2	2	-	60	40	100	-	16	40
AEC	MGM54AEL101	Communicative English	Lecture	1	1	-	30	20	50	-	8	20
VSEC	APS21VSP101	Engineering Exploration	Practical	2	-	4	60	40	100	-	16	40
BSC	APS21BSP101	Engineering Physics Lab	Practical	1	-	2	30	20	50	-	8	20
ESC	APS21ESP101	Python Programming Lab	Practical	1	-	2	30	20	50	-	8	20
ESC	APS21ESP102	Engineering Graphics Studio	Practical	2	-	4	30	20	50	-	8	20
ESC	APS21ESP103	Recent Trends in Integrated Technology	Practical	1	-	2	30	20	50	-	8	20
AEC	MGM54AEP101	Communicative English Lab	Practical	1	-	2	30	20	50	-	8	20
CCA	MGM82C CP101 MGM82C CP102 MGM82C CP103	NCC /Yoga / Sports	Practical	2	-	4	50	-	50	20	-	20
TOTAL				22	12	20	530	320	850	-	-	-

First Year - Semester II (Group A)												
Course Category	Course Code	Course Title	Nature of Course	No of Credits	Teaching (Contact hrs/ week)		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
BSC	APS21BSL103	Linear Algebra and Differential Equations	Theory	4	4	-	60	40	100	-	16	40
BSC	APS21BSL104	Engineering Chemistry	Theory	3	3	-	60	40	100	-	16	40
ESC	APS21ESL103	Engineering Mechanics	Theory	2	2	-	60	40	100	-	16	40
ESC	APS21ESL104	Building Programming logic in C	Theory	1	1	-	30	20	50	-	8	20
PCC	APS21PCL 101	Basics of Electrical and Electronics Engineering	Theory	2	2	-	60	40	100	-	16	40
IKS	APS21IKL101	Indian Knowledge System	Theory	2	2	-	60	40	100	-	16	40
VSEC	APS21VSP102	Workshop Practices	Practical	2	-	4	60	40	100	-	16	40
BSC	APS21BSP102	Engineering Chemistry Lab	Practical	1	-	2	30	20	50	-	8	20
ESC	APS21ESP104	Engineering Mechanics Lab	Practical	1	-	2	30	20	50	-	8	20
ESC	APS21ESP105	Building Programming logic in C Lab	Practical	1	-	2	30	20	50	-	8	20
PCC	APS21PCP 101	Electrical and Electronics Technology Lab	Practical	1	-	2	30	20	50	-	8	20
CCA	MGM82CCP104 MGM73CCP105 MGM73CCP106 MGM85CCP107 MGM82CCP201	NSS/ Fine Art/ Visual Art Cultural Activities Health and Wellness	Practical	2	-	4	50	-	50	20	-	20
TOTAL				22	14	16	560	340	900	-	-	-

First Year - Semester I (Group B)												
Course Category	Course Code	Course Title	Nature of Course	No of Credits	Teaching (Contact hrs/ week)		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
BSC	APS21BSL101	Single and Multivariable Calculus	Theory	4	4	-	60	40	100	-	16	40
BSC	APS21BSL104	Engineering Chemistry	Theory	3	3	-	60	40	100	-	16	40
ESC	APS21ESL101	Python Programming	Theory	2	2	-	60	40	100	-	16	40
ESC	APS21ESL103	Engineering Mechanics	Theory	2	2	-	60	40	100	-	16	40
AEC	MGM54AEL101	Communicative English	Theory	1	1	-	30	20	50	-	8	20
PCC	APS21PCL101	Basics of Electrical and Electronics Engineering	Theory	2	2	-	60	40	100	-	16	40
VSEC	APS21VSP102	Workshop Practices	Practical	2	-	4	60	40	100	-	16	40
BSC	APS21BSP102	Engineering Chemistry Lab	Practical	1	-	2	30	20	50	-	8	20
ESC	APS21ESP101	Python Programming Lab	Practical	1	-	2	30	20	50	-	8	20
ESC	APS21ESP104	Engineering Mechanics Lab	Practical	1	-	2	30	20	50	-	8	20
AEC	MGM54AEP101	Communicative English Lab	Practical	1	-	2	30	20	50	-	8	20
PCC	APS21PCP101	Electrical and Electronics Technology Lab	Practical	1	-	2	30	20	50	-	8	20
CCA	MGM82CCP101 MGM82CCP102 MGM82CCP103	NCC / Yoga / Sports	Practical	2	-	4	50	-	50	20	-	20
TOTAL				23	14	18	590	360	950	-	-	-

First Year - Semester II (Group B)												
Course Category	Course Code	Course Title	Nature of Course	No of Credits	Teaching (Contact hrs/ week)		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
BSC	APS21BSL103	Linear Algebra and Differential Equations	Theory	4	4	-	60	40	100	-	16	40
BSC	APS21BSL102	Engineering Physics	Theory	3	3	-	60	40	100	-	16	40
ESC	APS21ESL102	Engineering Graphics	Theory	2	2	-	60	40	100	-	16	40
IKS	APS21IKL101	Indian Knowledge System	Theory	2	2	-	60	40	100	-	16	40
ESC	APS21ESL104	Building Programming logic in C	Theory	1	1	-	30	20	50	-	8	20
VSEC	APS21VSP101	Engineering Exploration	Practical	2	-	4	60	40	100	-	16	40
BSC	APS21BSP101	Engineering Physics Lab	Practical	1	-	2	30	20	50	-	8	20
ESC	APS21ESP102	Engineering Graphics Studio	Practical	2	-	4	30	20	50	-	8	20
ESC	APS21ESP105	Building Programming logic in C Lab	Practical	1	-	2	30	20	50	-	8	20
ESC	APS21ESP103	Recent Trends in Integrated Technology	Practical	1	-	2	30	20	50	-	8	20
CCA	MGM82CCP104 MGM73CCP105 MGM73CCP106 MGM85CCP107 MGM82CCP201	NSS/ Fine Art/ Visual Art Cultural Activities Health and Wellness	Practical	2	-	4	50	-	50	20	-	20
TOTAL				21	12	18	500	300	800	-	-	-

Program Name: B.Tech. (Information Technology/Data Science/AIIML) Structure (Semester III)												
Course Category	Course Code	Course Title	Nature of Course	No. of Credits	Teaching Contacts Hrs/week		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
PCC	ITY23PCL201	Discrete Structures and Applications	Lecture	2	2	-	60	40	100	-	16	40
PCC	ITY23PCL202	Data structures	Lecture	2	2	-	60	40	100	-	16	40
PCC	ITY23PCL203	Object Oriented Programming	Lecture	2	2	-	60	40	100	-	16	40
PCC	ITY23PCL204	Network Communications and Computing	Lecture	2	2		60	40	100	-	16	40
PCC	ITY23PCP202	Data structures Lab	Practical	1	-	2	30	20	50	-	8	20
PCC	ITY23PCP203	Object Oriented Programming Lab	Practical	1	-	2	30	20	50	-	8	20
MDM		Refer Course no.1 of selected MDM from Appendix A	Lecture	2	2	-	60	40	100	-	16	40
OE1		Refer MGMU Basket	Lecture	2	2	-	30	20	50	-	8	20
OE2		Refer MGMU Basket	Lecture	2	2		30	20	50		8	20
FP	ITY23FPJ201	Web Technology	Project	2		4	50	-	50	20	-	20
EEMC	ITY23HSL201	Business Management and Financial Accounting	Lecture	2	2	-	60	40	100	-	16	40
VEC	MGM56VEL102	Constitution of India	Lecture	2	2	-	30	20	50	-	8	20
		TOTAL		22	18	8	560	340	900			

Note:

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation,

Course Category: PC-Program Core, PE-Program Elective, MDM-Minor, OE- Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project.

**Program Name: B.Tech. (Information Technology/Data Science/AI ML) Structure
(Semester IV)**

Course Category	Course Code	Course Title	Nature of Course	Credit	Teaching Scheme		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
PCC	ITY23PCL251	Statistics	Lecture	2	2	-	60	40	100	-	16	40
PCC	ITY23PCL252	Programming in JAVA	Lecture	2	2		60	40	100	-	16	40
PCC	ITY23PCL253	Digital Logic Design	Lecture	2	2	-	60	40	100	-	16	40
PCC	ITY23PCL254	Digital Image Processing	Lecture	2	2	-	60	40	100	-	16	40
PCC	ITY23PCP252	Programming in JAVA– Lab	Practical	1	-	2	30	20	50	-	8	20
PCC	ITY23PCP254	Digital Image Processing - Lab	Practical	1	-	2	30	20	50	-	8	20
MDM		Refer Course no.2 of selected MDM from Appendix A	Lecture	2	2	-	60	40	100	-	16	40
OE3		Refer MGMU Basket	Lecture	2	2	-	30	20	50	-	8	20
VSEC	ITY23VSP251	Advanced Python	Practical	2	-	4	30	20	50	-	8	20
EEMC	ITY23HSL252	Entrepreneurship Development	Lecture	2	2	-	60	40	100	-	16	40
VEC	MGM21VEL101	Environmental Studies	Lecture	2	2	-	30	20	50	-	8	20
AEC		Refer MGMU Basket	Lecture	2	2	-	30	20	50	-	8	20
		TOTAL		22	18	8	540	360	900			

Note:

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation,

Course Category: PC-Program Core, PE-Program Elective, MDM-Minor, OE- Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project.

Program Name: B.Tech. (Information Technology) Structure Semester V												
Course Category	Course Code	Course Title	Nature of Course	Credit	Teaching Scheme		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
PCC	ITY23PCL301	Design and Analysis of Algorithms	Lecture	3	3	-	60	40	100	-	16	40
PCC	ITY23PCL302	Machine Learning	Lecture	2	2	-	60	40	100	-	16	40
PCC	ITY23PCL303	Database Management Systems	Lecture	2	2	-	60	40	100	-	16	40
PCC	ITY23PCL304	Geographical Information Systems	Lecture	2	2	-	60	40	100	-	16	40
PCC	ITY23PCP301	Design and Analysis of Algorithms – Lab	Practical	1	-	2	30	20	50	-	8	20
PCC	ITY23PCP302	Machine Learning - Lab	Practical	1	-	2	30	20	50	-	8	20
PCC	ITY23PCP303	Database Management Systems – Lab	Practical	1	-	2	30	20	50	-	8	20
Program Elective - I												
PEC	ITY23PEL301	Basics of blockchain	Lecture	3	3	-	60	40	100	-	16	40
	ITY23PEL302	Microprocessors, Microcontrollers and IoT Devices										
	ITY23PEL303	Introduction to Big Data										
PEC	ITY23PEP301	Basics of Blockchain Lab	Practical	1	-	2	30	20	50	-	8	20
	ITY23PEP302	Microprocessors, Microcontrollers and IoT Devices Lab										
	ITY23PEP303	Introduction to Big Data Lab										
MDM		Refer Course no.3 of selected MDM from Appendix A	Lecture	4	4	-	60	40	100	-	16	40
OE4		Refer MGMU Basket	Lecture	2	2	-	30	20	50	-	8	20
		TOTAL		22	18	8	510	340	850			

Note:

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation,

Course Category: PC-Program Core, PE-Program Elective, MDM-Minor, OE- Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project.

Program Name: B.Tech. (Information Technology) Structure												
Semester VI												
Course Category	Course Code	Course Title	Nature of Course	Credit	Teaching Scheme		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
PCC	ITY23PCL351	Advanced Algorithm	Lecture	3	3	-	60	40	100	-	16	40
PCC	ITY23PCL352	Theory of Computation	Lecture	3	3	-	60	40	100	-	16	40
PCC	ITY23PCL353	Operating Systems	Lecture	2	2	-	60	40	100	-	16	40
PCC	ITY23PCP351	Advanced Algorithm - Lab	Practical	1	-	2	30	20	50	-	8	20
PCC	ITY23PCP353	Operating Systems- Lab	Practical	1	-	2	30	20	50	-	8	20
Program Elective - II												
PEC	ITY23PEL351	Smart Contract	Lecture	3	3	-	60	40	100	-	16	40
	ITY23PEL352	IoT Communications										
	ITY23PEL353	Big Data Modelling and Management										
PEC	ITY23PEP351	Smart Contract - Lab	Practical	1	-	2	30	20	50	-	8	20
	ITY23PEP352	IoT Communications - Lab										
	ITY23PEP353	Big Data Modelling and Management - lab										
Program Elective - III												
PEC	ITY23PEL354	Decentralized Applications	Lecture	3	3	-	60	40	100	-	16	40
	ITY23PEL355	IoT Networking										
	ITY23PEL356	Big Data Integration and Processing										
PEC	ITY23PEP354	Decentralized Applications-Lab	Practical	1	-	2	30	20	50	-	8	20
	ITY23PEP355	IoT Networking-Lab										
	ITY23PEP356	Big Data Integration and Processing-Lab										
MDM		Refer Course no.4 of selected MDM from Appendix A	Lecture	2	2	-	60	40	100	-	16	40
VSEC	ITY23VSP301	Mobile Application Development	Practical	2	-	4	30	20	50	-	8	20
TOTAL				22	16	12	510	340	850			

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation,

Course Category: PC-Program Core, PE-Program Elective, MDM-Minor, OE- Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education

course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project.

Program Name: B.Tech. (Information Technology) Structure												
Semester VII												
Course Category	Course Code	Course Title	Nature of Course	Credit	Teaching Scheme		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
PCC	ITY23PCL401	Information Theory and Coding	Lecture	3	3	-	60	40	100	-	16	40
PCC	ITY23PCL402	Cloud Computing	Lecture	2	2	-	60	40	100	-	16	40
PCC	ITY23PCP402	Cloud Computing Lab	Practical	1	-	2	30	20	50	-	8	20
MDM		Course no.5 of selected MDM	Lecture	2	2	-	60	40	100	-	16	40
PCC	ITY23PCL403	Adv. Database Management System	Lecture	2	2	-	60	40	100	-	16	40
PCC	ITY23PCL404	Adv. Web programming	Lecture	2	2	-	60	40	100	-	16	40
PCC	ITY23PCP403	Adv. Database Management System Lab	Practical	1	-	2	30	20	50		8	20
PCC	ITY23PCP404	Adv. Web programming Lab	Practical	1	-	2	30	20	50		8	20
MDM		Course no.6 of selected MDM	Practical	2		4	30	20	50	-	8	20
RM	MGM21RML401	Research Methodology	Lecture	4	4	-	60	40	100	-	16	40
RP	ITY23RPJ401	Project	Project	4	-	8	60	40	100	-	16	40
				24	15	18	540	360	900			

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation,

Course Category: PC-Program Core, PE-Program Elective, MDM-Minor, OE- Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project.

Program Name: B.Tech. (Information Technology) Structure Semester VIII													
Course Category	Course Code	Course Title	Nature of Course	Credit	Teaching Scheme			Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	S	Internal	External	Total	Internal	External	Total
Program Elective - IV													
PEC	ITY23PEL451	Blockchain Platforms	Lecture	4	4	-	60	40	100	-	16	40	
PEC	ITY23PEL452	IoT Cloud											
PEC	ITY23PEL453	Machine Learning with Big Data											
Program Elective - V													
PEC	ITY23PEL454	Blockchain Security and Applications	Lecture	4	4		60	40	100	-	16	40	
PEC	ITY23PEL455	Cyber-Security in IoT											
PEC	ITY23PEL456	Graph Analytics for Big Data											
OJT/RP	ITY23JTI451 / ITY23RPJ451/	Internship/ Major Project	Internship	12	-	24	100	50	150	-	20	60	
				20	8	24	220	130	350				

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation,

Course Category: PC-Program Core, PE-Program Elective, MDM-Minor, OE- Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project.

Semester I

Course code: APS21BSL101	Course name: Single Variable Calculus	Course category:
Basic Science		
Credits: 4 Teaching scheme: L-4 hrs/week Evaluation scheme: CA–60, ESE–40		
Duration of External Examination- 2 Hrs		
Pre-requisites: Pre-university mathematics.		
Course Objectives:		
1. To develop mathematical models using standard functions.		
2. To determine derivatives of function.		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Represent function verbally, numerically, visually, algebraically and formulate a mathematical model using standard functions.		
CO2: Find Limit of functions and use limit to find tangents and velocities which gives rise to derivative.		
CO3: Trace the Cartesian curve, Parametric curve and Polar curve. Find arc length, area, volume and surface area using integrals.		
CO4: Solve ordinary differential equations analytically and numerically and apply these methods to solve engineering problems.		

Contents –

Unit	Contents	Teaching Hours
1	Differentiation and its Applications Limit ,Continuity and Differentiation, Rate of Change in sciences and Engineering, Chain Rule and implicit differentiation, Related rates, Extreme value theorem, Rolle’s Theorem, Lagrange’s Mean value theorems, Nth derivatives, Taylor and Maclaurin series Expansions, Linear approximations and Differentials.	10
2	Integration and its Applications Integration, Reduction formulae, Beta and gamma function, Properties, Evaluation of integrals using Beta and gamma functions, Application of Definite integrals to volume, arc length, surface of revolution, Work and Fluid Forces..	10
3	Partial Differentiation and its Applications Limit and Continuity, Partial derivatives of first and higher orders, Total differentials, Errors and Approximations, Total derivative, Extreme values and saddle points, Method of Lagrange multipliers, Jacobians, Vector differentiation, Gradient, Curl and Divergence, directional derivatives.	10
4	Multiple Integrals and its Applications Double integrals ,Evaluation of Double integrals, Change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: Area and Volume, Root mean square value, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), Volume by triple integration.	10
5	Vector Integration and its Applications Line integrals, Surface integrals, Green’s Theorem, Stokes Theorems, Divergence theorems	10

Text Books: 1. James Stewart, Calculus Early Transcendental, 7 th edition, Cengage.
2. George B. Thomas, Ross L. Finney, Calculus and Analytical Geometry, 9th edition, Pearson
3. Howard Anton, Irl Bivens, Stephens Davis, Calculus, 10th Edition, Wiley

Reference Books: 1. Shanti Narayan, Differential Calculus, S. Chand & Co.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, New York.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi.
4. P. N. Wartikar, J. N. Wartikar, Applied Mathematics (Vol I & II) , Pune Vidyarthi Griha Prakashan, Pune
5. H. K. Das and Rajnish Verma, Higher Engineering Mathematics , S. Chand & CO. Pvt. Ltd., New Delhi
6. K. D Joshi, Calculus for Scientists and Engineers, CRC Press.
7 Prasad and Reena Garg, Advanced Engineering Mathematics, Khanna Publishing Company Private Limited, New Delhi.

Online Resources: 1. NPTEL / SWAYAM lectures.
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Semester-I

Course code: APS21BSL102 Course name: Engineering Physics Course category: Basic Science
Credits: 3 Teaching scheme: L-3 hrs/week Evaluation scheme: CA–60, ESE–40
Duration of External Examination- 2 Hrs
Pre-requisites: Students should know Basic Physics and basic Mathematics.

Course Objectives: The Objective of this course is

1. To impart knowledge in basic concepts of physics relevant to engineering applications.
3. To introduce advances in technology for engineering applications.
2. To introduce advances in technology for engineering applications
Course Outcomes:
CO1: Summarize fundamentals of electron optics, modern physics and ultrasonic waves related to the engineering fields.
CO2: Identify the importance of the optical phenomenon i.e interference, diffraction and polarization in relevance with its engineering applications.
CO3: Classify the material on the basis of electric conductivity as semiconductor and superconductors and dielectric materials this leads to their fascinating applications
CO4 Recognize the use of laser and optical fibers in various fields.

Contents –

Unit	Contents	Teaching Hours
1	Modern Physics Electron Optics: e/m by Thomson's method, Positive ray, Bainbridge mass spectrograph Quantum Mechanics: Role and concepts, De-Broglie's hypothesis, Uncertainty Principle, Fundamentals of quantum computing, Quantum Fundamentals of quantum computing, Quantum features Ultrasonic Waves: Production of ultrasonic waves (Magnetostriction & Piezoelectric method), Applications Numericals..	10
2	Wave Optics Interference- Interference in thin films (reflected light), Newton's Rings, Engineering applications of Interference. Diffraction- Fresnel's and Fraunhofer Diffraction, Theory of plane transmission Grating Polarization- Polarization by reflection and double refraction, Optical activity, Specific rotation, Construction and working of Laurent's half shade polarimeter, Engineering applications of Polarization. Numerical.	10
3	Materials of Technological Importance Dielectric Materials: Introduction, Types of polarizations: Electronic and Ionic, Orientation Polarizations - Applications of Dielectrics Semiconducting Materials: Introduction, Fermi energy in Intrinsic semiconductors and extrinsic semiconductors, Hall effect, Applications of Semiconductors. Numericals Superconducting Materials: Introduction, Type I and Type – II superconductors, Meissner effect, BCS Theory, Application..	10

4	Optoelectronic Materials and Devices LASER : Absorption, spontaneous and stimulated emission, population inversion pumping mechanism, Construction and working of Ruby laser, Construction and working of He-Ne laser. Lasers in various technological applications. Introduction to Optical Fibers -Introduction Acceptance Angle-Numerical Aperture Applications of optical fibers. Numerical	10
5	Physics of Materials Crystal structure : Unit cell, Coordination number, atomic radius, packing density of cubic system. X-rays : Bragg's law, X-Ray Diffraction (XRD), Industrial Applications of X-Rays. Numerical . Particle detector : G.M. Counter Nano-Materials : Basic principles of nano- science and technology, properties, applications of nanotechnology.	10

Text Books: 1.Engineering Physics- H.K. Malik & A.K. Singh, McGraw Hill publication.		
2.Engineering Physics - R.K. Gaur and S. L. Gupta. Dhanpat Rai Publications Pvt. Ltd.-New Delhi.		
3 M. N. Avadhanulu, P.G. Kshirsagar "A Text book of Engineering Physics"- S. Chand Publications.		
4.B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2012		
Reference Books: 1. Fundamental of Physics - Halliday and Resnik. Willey Eastern Limited.		
2. Introduction to Electrodynamics –David R. Griffiths.		
3 Concepts of Modern Physics – Arthur Beizer. Tata McGraw-Hill Publishing Company Limited.		
4. Optics – Ajoy Ghatak .Mac Graw Hill Education (India) Pvt. Ltd.		
Online Resources: 1. NPTEL / SWAYAM lectures. https://nptel.ac.in/courses/122107035/ Engineering Physics https://youtu.be/98xoZknQjI8 Polarization https://youtu.be/yINtzw63Knc Maxwell's Equations and EM theory https://youtu.be/bwreHReBH2A Maxwell's Equations and EM theory https://www.youtube.com/playlist?list=PLuv3GM6-gsE3-hVNaw-YEb7EeY5XVPZdz Maxwell's Equations and EM theory(nptel) https://nptel.ac.in/courses/115105120/ Experimental Physics https://youtu.be/2CsMpEBI5QY Crystal Structure and X- rays https://youtu.be/z_8aJPLr21E Crystal Structure and X- rays https://youtu.be/_Ckh-60B6LY Condensed matter Physics https://youtu.be/QQZ6EGf0Ju8 Magnetic Properties https://youtu.be/DDLjK1ODeg Magnetic Materials https://youtu.be/etjZmdmrjSU Dielectrics https://youtu.be/k6ZxP9Yr02E Semiconductor https://youtu.be/D-9M3GWoBrw Superconductivity https://youtu.be/GglT1RoBPzg Superconductivity https://youtu.be/VHp2Ff5N_bs Superconductivity https://youtu.be/FNp81kkxj5c LASER https://youtu.be/YvrwVK9ZqQY LASER https://nptel.ac.in/courses/115107095/ Optic Fiber https://youtu.be/cjBPnIXK60U Quantum Mechanics (Prof.H.C. Verma) https://youtu.be/BDuqChhUhM0 Divergence and Curl (Prof.H.C. Verma) https://youtu.be/sCviGSMaYfi Divergence and Curl (Prof.H.C. Verma) https://youtu.be/SZCsFS9izfQ Divergence and Curl		

And other related videos from following resources
www.nptel.ac.in ;www.swayam.gov.in;<https://inflibnet.ac.in/>

www.sciencedirect.com
<http://vlabs.iitb.ac.in/vlab/> www.youtube.com

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Semester-I

Course code: APS21ESL101	Course name: Python Programming	Course category: ESC
Credits: 2 Teaching scheme: L-2hrs/week Evaluation scheme: CA-60, ESE-40		
Duration of External Examination- 2 Hrs		
Pre-requisites: Basic Computer Knowledge		
Knowledge of any programming language (optional)		
Course Objectives:		
1. To understand fundamental concepts in Python Programming		
2. To learn the different Conditional Loops and Iteration.		
3. To understand various data structures and packages		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Describe programming fundamentals of python.		
CO2: Interpret the python syntax and semantics of control flow statements.		
CO3: Identify the methods to create and manipulate programs with python data structures		
CO4: Use modular approach for problem solving.		
CO5: Apply advanced features and packages of python programming required for data science.		

Contents –

Unit	Content	Teaching hours
1	Python for everybody Why Program, Hardware Overview, Python as a Language, Why Python Installation Python Jupyter notebook, Using the Python Playground, how to write program and compile in Jupyter notebook. Writing input and output statements in Python, output formatting, Writing comments keywords in Python .variables and variable assignments, Operators, writing expressions.	6
2	Conditional Loops and Iteration Conditional Statements, in Python, Loops and Iteration, Definite Loops, Finding the Largest Value, Loop Idioms.	6
3	Data Structures in Python Strings, Manipulating Strings, Files, Processing Files, Dictionaries, and sets, Tuples, Lists Manipulating Lists, Lists and Strings, Strings, Manipulating Strings.	6
4	Functions, Modules and Packages Functions, Lambda functions, Recursive function, Types of functions, modules and packages.	6
5	Packages in Python for Data Science Numpy introduction, Numerical operations on Numpy, Introduction of Matplotlib, getting started with Pandas, Data frames basics in Pandas, key operations on data frames. Introduction to Data Science, Binary search, finding elements in common in lists using Hash, Finding largest elements, Introduction of SQL	6

Text Books: 1. D. Lee, “Python Programming Fundamentals”, Second Edition, Springer Publication.. 2. Wes McKinney, “Python for Data Analysis” O’Reilly Publication.
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Reference Books: Reference Books:

1. The Python Language Reference: <http://docs.python.org/2/reference/index.html>
2. The Python Standard Library: <http://docs.python.org/2/library/>
3. <https://docs.scipy.org/doc/scipy/reference/tutorial/stats.html>
4. http://matplotlib.org/api/mlab_api.html#module-matplotlib.mlab
5. <http://conference.scipy.org/proceedings/scipy2010/pdfs/seabold.pdf>
6. <http://seaborn.pydata.org>
7. <https://www.datacamp.com/community/data-science-cheatsheets>
8. PEP 20 -- The Zen of Python: <https://www.python.org/dev/peps/pep-0020/>
9. <https://docs.scipy.org/doc/numpy-dev/user/numpy-for-matlab-users.html>

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Semester-I

Course code: MGM54AEL101 Course name: Communicative English Course category: AEC
Credits: 1 Teaching scheme: L-1hr/week Evaluation scheme: CA-30, ESE-20
Pre-requisites: Basic knowledge of English.
Duration of External Examination- 2 Hrs
Course Objectives:
1. The course aims at grooming the professional ethics of the students through various personality traits and behavioral patterns focusing on communication skills.
Course Outcomes: At the end of the course, the students will be able to -
CO1: Communicate formally with enhanced communication Competency.
CO2: Adapt professional nonverbal communication.
CO3: Construct English formal syntax and apply corporate vocabulary in written and verbal communication
CO4: Acquire listening and drafting skills with professional competency.

Contents –

Unit	Content	Teaching hours
1	Communication and Communication Process: Introduction to Communication, Forms and functions of Communication, Barriers to Communication and overcoming them, Ways of Effective Communication.	5
2	Non-verbal Communication And its types: Kinesics Occulesics Appearance roxemics Chronemics Paralanguage Qualities of effective speech.	3
3	English Grammar Overview of basic Mid-level grammar Tenses & concept of time, Sentence construction, Corporate vocabulary Difference between formal and informal sentences, phrases and words.	3
4	Listening Skills and Writing Skills Listening : Active and Passive Listening writing styles –layouts Business Letters- job application, resignation, resume .	4

Text Books: 1. Ashraf Rizvi, Communication Skills for Engineers, Tata McGraw Hill.
2. Sanjay Kumar, Pushp Lata, Communication Skills, Oxford University Press, 2016..
3. Meenakshi Raman, Sangeeta Sharma, Communication Skills, Oxford University Press, 2017
4. Teri Kwal Gamble, Michael Gamble, Communication Works, Tata McGraw Hill Education, 2010.
5. Anderson, Kenneth. Joan Maclean and Tossny Lynch. Study Speaking: A Course in Spoken English for Academic Purposes. Cambridge: CUP, 2004.
6. Bellare, Nirmala. Reading Strategies. Vols. 1 and 2. New Delhi. Oxford University Press, 1998
7. Bhasker, W. W. S & Prabhu, N. S.: English through Reading, Vols. 1 and 2. Macmillan, 1975

8. Bovee Courtland, L and Thrill, John V. Business Communication, Today McGraw Hill, New York Taxman Publication (1989).
9. Murphy, Raymond. Essential English Grammar, Cambridge: University Press (2000)
10. Hewings Martin Advanced English Grammar Cambridge: University press (2003)
11. Bansal Harrison. Spoken English

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Semester-I

Course code: APS21ESL102	Course name: Engineering Graphics	Course category: ESC
Credits: 2 Teaching scheme: L-2 hrs/week Evaluation scheme: CA-60, ESE-40		
Duration of External Examination- 2 Hrs		
Pre-requisites: NIL		
Course Objectives:		
1. Understand the basic principles of engineering graphics and improve the visualization skills.		
2. To gain knowledge on projection of points, straight lines, planes, solids.		
3. To understand the real life objects through Drawings		
4. To know the principles of orthographic and isometric projections.		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Identify basic concepts in drawing and its application		
CO2: Plan and prepare neat orthographic drawings of points, straight lines, planes and solids.		
CO3: To visualize and draw orthographic and isometric projection of solids.		
CO4: Acquire skill to draw real life engineering objects by using the engineering drawing.		

Contents –

Unit	Content	Teaching hours
1	Projections of Straight Lines Introduction to Engineering Graphics, Need of Engineering Drawing, Drawing Instruments, BIS code of practice for general engineering drawing, Projections of Points in Four Quadrants, Projections of Points in Reference Plane, Line Parallel to both the Plane, Line Parallel to One Plane and Perpendicular to the other, Line Inclined to One Plane and Parallel to The Other, Line Inclined to Both the Reference Planes, Traces of Line (Only first quadrant to be considered).	10
2	Engineering Curves Curves used in Engineering Practice, Conic sections, Construction of conics by different methods, Rectangular-hyperbola, Cycloidal curves, Epi and hypo-cycloids, Involute and Archimedean spiral.	10
3	Projections of Planes Plane with Surface Parallel to One Plane and Perpendicular to other, Plane Inclined to One Plane and Perpendicular to other, Projections of Planes Inclined to both the Planes .	10
4	Projections of Solids Introduction to Solids: Prisms, Pyramid, Cylinder, Cone, Cube, Tetrahedron, Sphere, Projections of above Solids with Axis inclined to one plane, Projections of above solids with Axis inclined to both the Planes, Projection of composite solids (different arrangement of Spheres with above Solids).	10
5	Orthographic Projections Orthographic projections of different Machine Parts (First Angle Projection method only) .	10

6	Isometric Projections ,Introduction to CAD Introduction to Pictorial views, Converting Orthographic Projections into Isometric Projections and Isometric views. Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.	10
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Text Books: 1. N. D. Bhatt and Panchal V. M., “Engineering Drawing”, Charotar Publishing House, Anand
2. P. J. Shah , “ A Text Book of Engineering Drawing”, S.Chand, New Delhi
3. Shah M.B. & Rana B.C, “Engineering Drawing & Computer Graphics”, Pearson Publications,
4. Agrawal B.& Agrawal C.M, “Engineering Graphics”, TMH Publications
5. Narayana K.L. & P. Kannaiyah, “Engineering Drawing”, Scitech Publications
6. P.I Vargese, “Engineering Graphics”, Mcgraw Hill Publications
7. D.A.Hindoliya,” Engineering Graphics”, B. S. Publications
Reference Books: 1 Dabhade M. L., “Engineering Graphics”, Vol.-I and Vol.-II, Vision Publications, Pune
2. K.Venugopal, "Engineering Drawing and Graphics" ,New Age International Publishers.

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Semester-I

Course code: APS21BSP101	Course name: Engineering Exploration	Course category:
VSEC		
Credits: 2 Teaching scheme: P-4 hrs/week Evaluation scheme: TW-60, PR-40		
Pre-requisites: NIL.		
Lab Objectives:		
1. Understand the principles of Engineering Design and apply them to identify product requirements, objectives, and constraints through interactions with clients, users, and relevant stakeholders.		
2. Develop critical thinking and problem-solving skills to analyze existing technologies, conduct surveys, study literature, and generate creative design concepts using various means and combinations		
3. Acquire proficiency in using appropriate tools and techniques to generate electronic and mechanical simulations, schematic diagrams, and product concept sketches or CAD models for effective communication of design ideas.		
4. Demonstrate competency in categorizing inputs and outputs of systems in terms of materials, information, and energy, enabling a holistic understanding of engineering projects.		
5. Cultivate effective teamwork and communication skills to collaborate with peers, mentors, and team members during the development and presentation of engineering prototypes.		
6. Develop the ability to evaluate, defend, and communicate design decisions, progress, and project outcomes, showcasing awareness of course concepts and their application in real-world scenarios.		
Lab Outcomes: On completion of the course, the student should be able to:		
LO1: Effectively interact with clients, users, and stakeholders to gather relevant information and derive product requirements, thereby demonstrating proficiency in Requirement Analysis and Client Interaction.		
LO2: Analyze and compare existing technologies, conduct surveys, and study literature to identify potential solutions, and develop objective trees and function trees, reflecting their competency in C conceptual Design and Analysis.		
LO3: Create product concept diagrams, combining different means, and prepare sketches or CAD models to present their design ideas aesthetically and coherently, indicating proficiency in Product Concept Development.		
LO4: Categorize system inputs and outputs in terms of materials, information, and energy, illustrating their understanding of System Categorization and Analysis.		
LO5: Exhibit hands-on skills in physical assembly, connection, and demonstration of engineering prototypes, showcasing Proficiency in Prototyping and Implementation		
LO6: Explain and defend their design choices, project progress, and outcomes during presentations, demonstrating Communication Skills, Project Evaluation, and Awareness of Engineering Concepts		

Course Contents

The course is conducted in the following modules:

1. Introduction to Engineering Exploration
2. Engineering Design
3. Platform Based Development
4. Mechanisms
5. Data acquisition and analysis
6. Engineering Ethics
7. Project Management

The following practical contents are delivered in an integrated mode along with theory:

1. Conceptualizing a product
2. Designing a product with constraints
3. Simulation of electronic circuits (at least 10 sets)
4. Implementation of electronic circuits (at least 5 sets)
5. Implementation of four bar chain mechanism
6. Conversion of problem statement to need statement
7. Identification of objectives, constraints and functions
8. Generation of black box, glass box and expanded class box
9. Generation of morphological chart
10. Generation of concepts
11. Comparison of concepts
12. Selection of concept
13. Implementation and testing of prototype

Text Books: 1. James Stewart, Calculus Early Transcendental, 7th edition, Cengage.

2. Shanti Narayan, Differential Calculus, S. Chand & Co.

1. **Reference Books:** George E. Dieter and Linda C. Schmidt (2009), Engineering Design, 4ed, McGraw Hill Higher Education
2. Clive L. Dym, Patrick Little, and Elizabeth J. Orwin (2014), Engineering Design: A project-based introduction, 4ed, John Wiley and Sons
G. Pahl, W. Beitz, J. Feldhusen and K.-H. Grote (2007), Engineering Design: A systematic approach, 3ed, Springer, New York.

Semester-II

Course code: APS21BSP101 Course name: Engineering Physics Lab Course category: Basic Science
Credits: 1 Teaching scheme: P-2 hrs/week Evaluation scheme: TW-30, PR-20
Pre-requisites: Student should know the basic aspects of measurements like least count and range of instrument, scale identification, accuracy, error etc..
Lab Objectives: The Objectives of this course is
1. To make the students gain practical knowledge to co-relate with the theoretical studies
2. To achieve perfectness in experimental skills.
3. To study practical applications will bring more confidence
Lab Outcomes: At the end of the course, the students will be able to -
LO1: Plot the I-V characteristics of pn junction diode and determine the value of band gap energy which can be used for core engineering Courses..
LO2: Perform optical experiments; using light properties like interference, polarization, diffraction and their applications
LO3: Interpret the results and analyze the data and use the experimental data to plot the graph for a best fit.
LO4: Discuss the characteristics of plateau region and determine operating voltage of G.M counter.
LO4: Determine the numerical aperture and bending loss of optical fiber cable.

List of Practicals –

Unit	Content
1	Thomson's Bar Magnetic method -Determination of e/m of electron .
2	Newton's rings -Determination of radius of curvature of Plano convex lens.
3	Polarization - Half shade Polarimeter -Determination of specific rotation of optically active material.
4	Diffraction - Determination of wavelength of light by plane transmission grating.
5	Wedge Shaped film -Determination of thickness of thin wire.
6	Semiconductors – To study of forward and reverse bias characteristic of Semiconductors diode.
7	Fibre Optics – Determination of Bending losses in optical fibre
8	Fibre Optics – Determination of Numerical Aperture of given optical fibre
9	Determination of operating voltage of G.M tube and characteristics of plateau region
10	Determination of wavelength of laser source.

Semester-II

Course code: APS21ESP102 Course name: Engineering Graphics Studio Course category: ESC
Credits: 2 Teaching scheme: P-4 hrs/week Evaluation scheme: TW-30, PR-20
Pre-requisites: Nil
Course Objectives: The Objectives of this course is to develop the skills required for Engineering drawing.
Course Outcomes: At the end of the course, the students will be able to -
CO1: Develop competence in correct expression of the visualized objects
CO2: Dimension and annotate two-dimensional engineering drawings
CO3: .Plan and prepare neat orthographic drawings of points, straight lines, planes and solids
CO4: Develop the ability to visualize and draw orthographic and isometric projection of solids

Lab Contents

Lab	Content
1	Drawing three problems based on projections of lines on half imperial size drawing sheet.
2	Drawing three problems based on engineering curves on half imperial size drawing sheet.
3	Drawing three problems based on projections of planes on a half imperial size drawing sheet.
4	Drawing three problems based on projections of solids on a half imperial size drawing sheet.
5	Drawing three problems based on orthographic projection on a half imperial size drawing sheet.
6	Drawing three problems based on isometric projections on half imperial size drawing sheet
7	Demonstration of CAD software in CAD lab, drawing simple objects using various commands

Semester-I

Course code: APS21ESP103 Course name: Recent Trends In Integrated Technologies Course category: ESC
Credits: 1 Teaching scheme: P-2 hrs/week Evaluation scheme: TW–30, PR–20
Pre-requisites: Pre-university mathematics.
Lab Objectives:
1. To introduce students the basics of additive manufacturing/rapid prototyping and its applications in various fields, reverse engineering techniques.
2.To recognize industrial control problems suitable for Industrial Robotics.
3. To acquire basic skills in exploring the potential of the drone technology in professional activities
4. Ability to recognize industrial automation problems suitable for PLC control
Lab Outcomes: , the students will be able to -
LO1: Prepare 3D Model (slice & print) in either Stratasys or Zortrax & generate scan data through Hexagon portable scanning arm
LO2: Describe basic industrial robotics & it's applications.
LO3: Operate a small drone in a controlled environment.
LO4: Explain principles of sensor, PLC & applications.

Contents –

Unit	Content	Teaching hours
1	Scan to CAD, CAD to STL conversion& patching, machine setup & processes for printing	7
2	Programming the TATA Robot(pendant) for pick & place, programming the Yaskawa Robot(pendant) for motion planning, Demonstrate welding exercise by the instructor.	8
3	Introduction to components of drone, Demonstration of assembly of drone, Demonstration of mission planning & flying the drone.	7
4	Controller & sensor & their interfacing, basic ladder logic instructions, pneumatic& hydraulic actuator	8

Text Books:

1. A Step-by-Step Guide For Beginners: Aircraft Design & Construction Design Guide by :Merlin Debrie
2. Industrial Automation & Robotics By A.K. Gupta & S.K.Arora
3. Additive Manufacturing Principles, Technologies & Applications By C.P.Paul (TMH)
4. Basics of unmanned aerial vehicle By Garvit Pandya (Motion press)

Semester-I

Course code: MGM54AEP101 Course name: Communicative English Lab Course category: AEC
Credits: 1 Teaching scheme: P-2 hrs/week Evaluation scheme: TW-30, PR-20
Pre-requisites: Basic knowledge of English.
Lab Objectives: The course aims at grooming the professional ethics of the students through various personality traits and behavioral patterns focusing on communication skills
Lab Outcomes: the students will be able to -
LO1: Introduce themselves formally and informally through practice.
LO2: Pronounce English vowel and Consonant sounds effectively.
LO3: Participate effectively in G.Ds, Presentations, & Interviews.
LO4: Face Interviews competently.
LO5: Draft resume, business letters, reports formally.
LO6: Comprehend the meaning of English text by comprehension techniques.

Contents –

Unit	Content
1	Self Introduction.
2	Pronunciation of Vowel sounds in English
3	Pronunciation of consonant sounds in English.
4	Group discussion.
5	Presentation techniques.
6	Interview techniques.
7	Letter writing.
8	Email writing, Agenda of the meeting and notices.
9	Resume Writing.
10	Report writing.
11	Skimming & Scanning.

Semester-I

Course code: MGM82CCP101 Course name: National Cadet Corps Course category: CCA
Credits: 2 Teaching scheme: P-4 hrs/week Evaluation scheme: TW–30, PR–20
Pre-requisites: Nil

Contents –

Unit	Content	Teaching hours
1	NCC General, National Integration and Awareness, Social Service and Community Development, Drill: Aims, Objectives and Organization of NCC, Duties of NCC Cadet, National Integration Importance and Necessity, Factors Affecting National Integration, Foot Drill, Drill With Arms, Ceremonial Drill with Arms, Social Service and Community Development Activities- Pollution, Mission Indradhanush, Beti Bachao Beti Padhao, Tree Plantation, Digital Awareness.	12
2	Personality Development, Disaster Management, Weapon Training, Map Reading : Critical and Creative Thinking, Decision Making, Self Awareness, Public Speaking, Interview Skills, Types, Org, Capability and Role of NCC cadets, Initiative Trg, Organizing Skills, Do's & Don't, Introduction and Characteristics of .22 rifles, Handling of .22 rifle, Introduction to Map Reading, Conduct of MR-Google and Tourist Maps and Apps.	10
3	Health and Hygiene, Environmental Awareness and Conservation, Adventure, Obstacle Training: Hygiene & Sanitation (Personal & Camp Hygiene) Soch Vichar, First Aid in Common Medical Emergencies, Treatment & Care of Wounds, Introduction Yoga & Exercises, Water Conservation, Energy Conservation, Introduction Adventure Activities. Obstacle Course	10
4	Leadership, Introduction to Infantry Weapons and Equipments: Traits, Indicators, Motivation, Ethics, Case Studies- Chhatrapati Shivaji Maharaj, Maharana Pratap, Jhasi ki Rani, Ratan Tata, Narayan Murty, Rabindra Nath Tagor, Organization of Infantry Battalion and its weapons.	8
5	Armed Forces, Field Craft and Battle Craft, : Armed Forces, Army, CAPF, Police, Modes of Entry to Army, CAPF, Police, Introduction to Field Craft, Indication of Landmark, Observation, Camouflage and Concealment, Fire and Move Capsule.	8

Text Books: 1. James Stewart, Calculus Early Transcendental, 7 th edition, Cengage.
2. George B. Thomas, Ross L. Finney, Calculus and Analytical Geometry, 9th edition, Pearson
3. Howard Anton, Irl Bivens, Stephens Davis, Calculus, 10th Edition, Wiley
References:

1. Cadet's Handbook- Common Subject, all wings by DG NCC, New Delhi.
2. Cadet's Handbook- Common Subject by NCC Directorate- Bhubaneshwar.
3. Cadet's Handbook- Specialised Subjects, Army, Navy, Air-Force by DG NCC, New Delhi.
4. NCC OTA Precise by DG NCC, New Delhi.
5. Chanakya's 7 Secrets of Leadership by Radhakrishanan Pillai and D. Shivnandhan.
6. National Cadets Corps (India) by Lambert M. Suvarkar.
E-Resources:
1. National Cadet Corps, Youth in Action (Google eBook).
2. https://indiancc.nic.in/dg-ncc-lt-gen-gurbirpal-singh/ www.youtube.com

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Semester-I

Course code: APS21BSL102 Course name: Yoga Course category: CCA
Credits: 2 Teaching scheme: P-4 hrs/week Evaluation scheme: TW-30, PR-20
Pre-requisites: Students should know Basic.

Unit	Content	Teaching hours
1	<p>Yoga History of Yoga Yoga is a mind and body practice with a 5,000-year history in ancient Indian philosophy.</p> <p>The word "yoga" comes from the Sanskrit word "yuj," which means "to yoke" or "to unite."</p> <p>Yoga is a system of physical postures, breathing exercises, and meditation designed to help practitioners achieve physical, mental, and spiritual well-being. The earliest written records of yoga date back to the 2nd century BCE, and the practice has been evolving ever since.</p> <p>Yoga has spread to all corners of the world, and there are now many different styles of yoga practiced today.</p> <p>Fundamental Skills of Yoga Postures: The postures, or asanas, are the physical component of yoga. There are many different postures, and they can be practiced in a variety of ways.</p> <p>Breathing: Breathing, or pranayama, is an important part of yoga. There are many different breathing techniques, and they can be used to help relax the body and mind.</p> <p>Meditation: Meditation is the mental component of yoga. There are many different meditation techniques, and they can be used to help focus the mind and achieve a state of peace.</p>	20
2	<p>Swimming History of Swimming Swimming is one of the oldest sports in the world, with evidence of swimming dating back to 2500 BC. The earliest recorded swimming competitions were held in ancient Greece and Rome. Swimming became an Olympic sport in 1896, and it has been a part of every Game since then.</p> <p>Swimming is now a popular sport all over the world, and there are many different types of swimming, including freestyle, backstroke, breaststroke, butterfly, and individual medley.</p> <p>Fundamental Skills of Swimming Breathing: Breathing is one of the most important skills in swimming. It is important to be able to breathe efficiently while swimming in order to avoid getting tired.</p> <p>Body Position: Body position is another important skill in swimming. It is important to maintain a good body position in order to be hydrodynamic and to swim efficiently.</p>	20

Stroke Technique: Stroke technique is the way that the arms and legs are used to propel the body through the water. There are many different stroke techniques, and it is important to develop a good stroke technique in order to swim efficiently.

Drills: Drills are exercises that can be used to improve swimming skills. There are many different drills, and they can be used to improve different aspects of swimming, such as breathing, body position, and stroke technique.

Mental Toughness: Mental toughness is also an important skill in swimming. It is important to be able to stay focused and motivated during long swims, especially in competitions.

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Semester-I

Course code: MGM82CCP103 Course name: Sports Course category: CCA
Credits: 02 Teaching scheme: P-4hrs/week Evaluation scheme: TW-30, PR-20
Pre-requisites: Student should know Basic Physics and basic Mathematics.
Course Objectives: The Objective of this course is
1. To understand the importance of sports in physical and mental development.
2. To learn about the different types of sports
3. To learn about the different types of indoor games .
4. To participate in indoor games.
5. To learn about the different types of outdoor games.
6. To participate in outdoor games
Course Outcomes:
Upon completion of this course, students will be able to
1. Demonstrate knowledge of the history, benefits, types, equipment, and safety of sports.
2. Demonstrate proficiency in the basic skills of indoor and outdoor games
3. Understand the rules and regulations of selected sports
4. Participate in sports competitions.

Contents –

Unit	Content	Teaching hours
	<p>Football</p> <p>The earliest forms of football can be traced back to ancient China, Greece, and Rome.</p> <p>In England, the game of football developed in the 19th century, with different rules being used by different schools and organizations.</p> <p>In 1863, the Football Association (FA) was founded, and it standardized the rules of the game.</p> <p>The first international match was played between England and Scotland in 1872.</p> <p>Football became an Olympic sport in 1900, and the first World Cup was held in 1930.</p> <p>Today, football is the most popular sport in the world, with billions of fans around the globe.</p> <p>Fundamental Skills of Football</p> <p>Dribbling: Dribbling is the ability to move the ball with your feet while keeping control of it. It is an essential skill for all footballers, as it allows you to move past defenders and create scoring opportunities.</p> <p>Passing: Passing is the ability to accurately and effectively throw the ball to your teammates. It is another essential skill, as it allows you to move the ball up the field and create scoring opportunities.</p> <p>Shooting: Shooting is the ability to kick the ball with power and accuracy. It is the most important skill for scoring goals, and it is essential for all footballers to develop a good shot.</p> <p>Heading: Heading is the ability to use your head to control and direct the ball. It is a</p>	10

	<p>valuable skill for both attacking and defending, and it is important for all footballers to learn how to head the ball effectively.</p> <p>Tackling: Tackling is the ability to take the ball away from an opponent. It is an important skill for defenders, but it is also valuable for midfielders and attackers.</p>	
<p>1</p>	<p>Basket Ball</p> <p>Basketball was invented by James Naismith in 1891 at the International YMCA Training School in Springfield, Massachusetts.</p> <p>Naismith was a physical education instructor who was looking for a game that would be less injury-prone than football.</p> <p>He nailed two peach baskets to the lower rail of a balcony and used a soccer ball to play the game.</p> <p>The first game of basketball was played on December 21, 1891, with nine players on each team.</p> <p>The rules of basketball have evolved over time, but the basic premise of the game has remained the same.</p> <p>Today, basketball is one of the most popular sports in the world, with millions of players and fans around the globe.</p> <p>Fundamental Skills of Basketball</p> <p>Dribble: Dribbling is the ability to move the ball with your hands while keeping control of it. It is an essential skill for all basketball players, as it allows you to move past defenders and create scoring opportunities.</p> <p>Passing: Passing is the ability to accurately and effectively throw the ball to your teammates. It is another essential skill, as it allows you to move the ball up the court and create scoring opportunities.</p> <p>Shooting: Shooting is the ability to throw the ball through the hoop with power and accuracy. It is the most important skill for scoring points, and it is essential for all basketball players to develop a good shot.</p> <p>Rebounding: Rebounding is the ability to catch the ball after it has been missed by a shooter. It is an important skill for both offense and defense, as it allows teams to get second chances at scoring.</p> <p>Defense: Defense is the ability to prevent the other team from scoring points. It is an essential skill for all basketball players, as it is impossible to win a game without playing good defense.</p>	<p>10</p>

	<p>Volleyball</p> <ol style="list-style-type: none"> 1. Volleyball was invented in 1895 by William G. Morgan, a physical education instructor at the Young Men's Christian Association (YMCA) in Holyoke, Massachusetts. 2. Morgan was looking for a game that would be less vigorous than basketball and he created volleyball as a way to keep his students active during the winter months. 3. The original name of the game was "mintonette," but it was renamed "volleyball" in 1896. <ol style="list-style-type: none"> 1. Volleyball quickly spread throughout the United States and around the world, and it became an official Olympic sport in 1964. <p>Fundamental Skills of Volleyball</p> <p>Passing: Passing is the ability to receive the ball from the opponent and direct it to a teammate. It is an essential skill for all volleyball players, as it allows the team to keep possession of the ball and start an attack.</p> <p>Setting: Setting is the ability to control the height and direction of the ball so that a teammate can spike it. It is a critical skill for setters, as they are responsible for setting up the team's offense.</p> <p>Spiking: Spiking is the ability to hit the ball over the net with power and accuracy. It is the most important skill for scoring points in volleyball, and it is essential for all attackers to develop a good spike.</p> <p>Blocking: Blocking is the ability to prevent the opponent from spiking the ball over the net. It is an important skill for blockers, as they can prevent the other team from scoring points.</p> <p>Digging: Digging is the ability to prevent the opponent from scoring a point by returning the ball over the net. It is an important skill for all defenders, as they are responsible for preventing the other team from scoring points</p>	10
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2	<p>4 Kabaddi History of Kabaddi Kabaddi is a contact team sport that originated in India.</p> <p>It is believed to have originated in the Indian subcontinent over 4,000 years ago.</p> <p>The game is mentioned in the Sangam literature of Tamil Nadu, which dates back to the 3rd century BC.</p> <p>Kabaddi was first played as a competitive sport in the Indian Olympic Games in 1938.</p> <p>It was included as a demonstration sport at the 1982 Asian Games in Delhi, and it became a full medal sport in the 1990 Asian Games in Beijing.</p> <p>Kabaddi is now played in over 100 countries around the world.</p> <p>Fundamental Skills of Kabaddi</p> <p>Dabki: Dabki is the act of entering the opponent's half of the court while chanting "kabaddi, kabaddi." It is a fundamental skill for all raiders, as it allows them to enter the opponent's half of the court without being tackled.</p> <p>Touch: Touching an opponent is the most important skill in kabaddi. It is how raiders score points for their team. There are many different ways to touch an opponent, such as touching their arm, leg, or torso.</p> <p>Tackling: Tackling is the act of preventing a raider from touching an opponent. It is a fundamental skill for all defenders, as it allows them to prevent the other team from scoring points. There are many different ways to tackle a raider, such as grabbing them, pushing them, or tripping them.</p> <p>Stamina: Stamina is essential for all kabaddi players, as the game is very physically demanding. Players need to be able to run, jump, and tackle for long periods of time.</p> <p>Agility: Agility is also important for kabaddi players, as they need to be able to change direction quickly and avoid being tackled.</p>	10
4	<p>Unit-2</p> <p>Badminton</p> <p>History of Badminton The game of badminton originated in ancient Greece, China, and India.</p> <p>It was brought to England in the 1870s by British army officers stationed in India.</p> <p>The first badminton club was founded in 1873 at Badminton House, the country estate of the Duke of Beaufort.</p> <p>The first official all-England badminton championships for men were held in 1899, and the first badminton tournament for women was arranged the next year.</p> <p>Badminton became an Olympic sport in 1992.</p> <p>Today, badminton is a popular sport played by millions of people around the world.</p> <p>Fundamental Skills of Badminton</p>	10

Grip: The grip is the most important fundamental skill in badminton. It allows you to control the racket and hit the shuttlecock with power and accuracy. There are many different grips, but the most common are the forehand grip and the backhand grip.

Footwork: Footwork is essential for moving around the court and positioning yourself to hit the shuttlecock. There are many different footwork drills that you can practice to improve your footwork.

Racket control: Racket control is the ability to hit the shuttlecock with power and accuracy. It is important to practice hitting the shuttlecock in different directions and with different levels of power.

Timing: Timing is the ability to hit the shuttlecock at the right time. It is important to practice hitting the shuttlecock at the peak of its flight.

Stamina: Stamina is essential for badminton, as it is a physically demanding sport. You need to be able to run, jump, and hit the shuttlecock for long periods of time.

Soft Tennis

History of Soft Tennis

Soft tennis is a racquet sport that originated in Japan in the early 20th century. It was created as a less dangerous alternative to lawn tennis, as the ball used in soft tennis is made of foam rubber and does not travel as fast as a regular tennis ball.

The first soft tennis tournament was held in Japan in 1921, and the sport quickly spread to other countries in Asia.

Soft tennis was first introduced to the United States in the 1950s, and it has since become a popular recreational sport in the country.

Fundamental Skills of Soft Tennis

Grip: The grip is the most important fundamental skill in soft tennis. It allows you to control the racquet and hit the ball with power and accuracy. There are many different grips, but the most common are the forehand grip and the backhand grip.

Footwork: Footwork is essential for moving around the court and positioning yourself to hit the ball. There are many different footwork drills that you can practice to improve your footwork.

Racket control: Racket control is the ability to hit the ball with power and accuracy. It is important to practice hitting the ball in different directions and with different levels of power.

Timing: Timing is the ability to hit the ball at the right time. It is important to practice hitting the ball at the peak of its flight.

Stamina: Stamina is essential for soft tennis, as it is a physically demanding sport. You need to be able to run, jump, and hit the ball for long periods of time.

Here are some additional fundamental skills of soft tennis:

Ball control: The ability to control the direction and speed of the ball.

Serve: The ability to serve the ball accurately and with power.

Volley: The ability to hit the ball before it bounces.

Overhead smash: The ability to hit the ball forcefully and accurately overhand.

Drop shot: The ability to hit the ball softly and precisely so that it bounces low and close to the net.

Tennis

History of Tennis

The origins of tennis can be traced back to a 12th–13th-century French handball game called jeu de paume (“game of the palm”), from which was derived a complex indoor racket-and-ball game: real tennis.

The modern game of lawn tennis was invented in England in the 1870s by Major Walter Winfield.

Wing field created a set of rules and equipment for the game, and he called it "Sphairistike". The game quickly became popular, and it was renamed "lawn tennis" in 1874.

The first lawn tennis tournament was held in 1877 at the All England Club in Wimbledon, England.

Tennis became an Olympic sport in 1896.

Today, tennis is a popular sport played by millions of people around the world.

Fundamental Skills of Tennis **Grip:** The grip is the most important fundamental skill in tennis. It allows you to control the racket and hit the ball with power and accuracy. There are many different grips, but the most common are the forehand grip and the

5	<p>backhand grip.</p> <p>Footwork: Footwork is essential for moving around the court and positioning yourself to hit the ball. There are many different footwork drills that you can practice to improve your footwork.</p> <p>Racket control: Racket control is the ability to hit the ball with power and accuracy. It is important to practice hitting the ball in different directions and with different levels of power.</p> <p>Timing: Timing is the ability to hit the ball at the right time. It is important to practice hitting the ball at the peak of its flight.</p> <p>Stamina: Stamina is essential for tennis, as it is a physically demanding sport. You need to be able to run, jump, and hit the ball for long periods of time.</p>	10
	<p>Fencing</p> <p>History of Fencing The earliest evidence of fencing dates back to ancient Egypt, Greece, and Rome. Fencing was used as a form of training for warfare and as a way to settle disputes. The modern sport of fencing developed in Italy in the 15th century.</p> <p>The first fencing competition was held in 1550 in Paris.</p> <p>Fencing became an Olympic sport in 1896, and it has been a part of every Games since then.</p> <p>Fencing is now a popular sport all over the world, and there are three main disciplines: foil, épée, and sabre.</p> <p>Fundamental Skills of Fencing</p> <p>Footwork: Footwork is essential in fencing, as it allows you to move quickly and efficiently around the piste. There are many different footwork drills that you can practice to improve your footwork.</p> <p>Blade work: Blade work is the ability to use the sword effectively. There are many different blade work techniques, and you need to practice them in order to become proficient.</p> <p>Parrying: Parrying is the ability to deflect an opponent's attack. There are many different parrying techniques, and you need to practice them in order to become proficient.</p> <p>Riposte: The riposte is the counterattack that follows a parry. It is an important skill in fencing, as it allows you to score points.</p> <p>Mental Focus: Mental focus is also an important skill in fencing, as it allows you to stay focused on the opponent and to avoid making mistakes.</p> <p>5 Athletics</p> <p>History of Athletics The history of athletics can be traced back to the ancient Olympic Games, which were held in Greece from 776 BC to 393 AD. The original events included running, jumping, throwing, and wrestling.</p>	10

	<p>The modern Olympic Games were revived in 1896, and athletics has been a part of every Game since then.</p> <p>Athletics is now a global sport, with competitions held at all levels, from local to international.</p> <p>Fundamental Skills of Athletics Running: Running is the most basic skill in athletics. It is the ability to move forward quickly and efficiently. There are many different types of running, including sprinting, distance running, and middle- distance running.</p>	
	<p>Jumping: Jumping is the ability to move upwards from the ground. There are many different types of jumping, including high jump, long jump, and triple jump.</p> <p>Throwing: Throwing is the ability to propel an object through the air. There are many different types of throwing, including shot put, discus throw, javelin throw, and hammer throw.</p> <p>Sprinting: Sprinting is a type of running that involves short bursts of speed. Sprinters need to be able to accelerate quickly and maintain their speed for a short period of time.</p> <p>Distance Running: Distance running is a type of running that involves running for long distances. Distance runners need to be able to pace themselves and maintain their energy levels for long periods of time.</p> <p>Middle-Distance Running: Middle-distance running is a type of running that involves running for distances between 800 meters and 1500 meters. Middle- distance runners need to be able to combine speed and endurance.</p> <p>High Jump: High jumping is a type of jumping that involves clearing a bar that is raised progressively higher. High jumpers need to be able to generate a lot of power in their legs and have good timing.</p> <p>Long Jump: Long jumping is a type of jumping that involves jumping as far as possible. Long jumpers need to have good speed and coordination.</p> <p>Triple Jump: Triple jumping is a type of jumping that involves jumping three times in a row. Triple jumpers need to have good speed, coordination, and power.</p> <p>Shot Put: Shot put is a type of throwing that involves throwing a heavy ball as far as possible. Shot putters need to have good upper body strength and technique.</p> <p>Discus Throw: Discus throw is a type of throwing that involves throwing a disc as far as possible. Discus throwers need to have good upper body strength and technique.</p> <p>Javelin Throw: Javelin throw is a type of throwing that involves throwing a spear as far as possible. Javelin throwers need to have good upper body strength and technique.</p> <p>Hammer Throw: Hammer throw is a type of throwing that involves throwing a heavy ball on a chain as far as possible. Hammer throwers need to have good upper body strength and technique.</p>	10

	<p>Kho-Kho</p> <p>History of Kho-Kho Kho-Kho is a tag game that originated in India.</p> <p>It is believed to have originated in the Indian subcontinent over 4,000 years ago.</p> <p>The game is mentioned in the Sangam literature of Tamil Nadu, which dates back to the 3rd century BC.</p> <p>Kho-Kho was first played as a competitive sport in the Indian Olympic Games in 1938.</p> <p>It was included as a demonstration sport at the 1982 Asian Games in Delhi, and it became a full medal sport in the 1990 Asian Games in Beijing.</p> <p>Kho-Kho is now played in over 100 countries around the world.</p> <p>Fundamental Skills of Kho-Kho</p> <p>Touch: Touching an opponent is the most important skill in Kho-Kho. It is how raiders score points for their team. There are many different ways to touch an opponent, such as touching their arm, leg, or torso.</p> <p>Dive: Diving is a fundamental skill for all Kho-Kho players. It allows players to avoid being touched by the opponents. There are many different types of dives, such as front dive, side dive, and back dive.</p> <p>Stamina: Stamina is essential for all Kho-Kho players, as the game is very physically demanding. Players need to be able to run, jump, and dive for long periods of time.</p> <p>Agility: Agility is also important for Kho-Kho players, as they need to be able to change direction quickly and avoid being touched by the opponents.</p> <p>Teamwork: Teamwork is essential for Kho-Kho, as it is a team sport. Players need to be able to work together to score points and defend their territory</p>	10
	<p>Cricket</p> <p>History of Cricket The history of cricket can be traced back to the 16th century in England.</p> <p>The game is believed to have originated from a game called "stoolball", which was played by children in the 15th century.</p> <p>The first recorded cricket match was played in 1611 between two teams of Kentish cricketers.</p> <p>Cricket became a popular sport in England during the 18th century, and it was first played in Australia in 1826.</p> <p>Cricket became an international sport in the 19th century, and the first Test match was played between England and Australia in 1877.</p> <p>Cricket is now played in over 100 countries around the world.</p> <p>Fundamental Skills of Cricket</p> <p>Batting: Batting is the act of hitting the ball with a bat. It is the most important skill in cricket, as it is how runs are scored. There are many different batting techniques, such as the defensive technique and the attacking</p>	10

	<p>technique.</p> <p>Bowling: Bowling is the act of delivering the ball to the batsman. There are many different bowling techniques, such as the fast bowling technique and the spin bowling technique.</p> <p>Fielding: Fielding is the act of catching the ball and preventing the batsman from scoring runs. It is an important skill for all cricketers, as it helps to prevent the other team from scoring runs.</p> <p>Running: Running is essential for scoring runs in cricket. Players need to be able to run quickly between the wickets to score runs.</p> <p>Stamina: Stamina is essential for all cricketers, as the game is very physically demanding. Players need to be able to run, jump, and field for long periods of time.</p> <p>Agility: Agility is also important for cricketers, as they need to be able to change direction quickly and avoid being run out.</p> <p>Teamwork: Teamwork is essential for cricket, as it is a team sport. Players need to be able to work together to score runs and prevent the other team from scoring runs.</p>	
	<p>Rifle Shooting</p> <p>History of Rifle Shooting The history of rifle shooting can be traced back to the 16th century in Europe. The first recorded rifle shooting competition was held in 1533 in Zurich, Switzerland. Rifle shooting became a popular sport in Europe during the 18th century, and it was first introduced to the United States in the 1770s. Rifle shooting became an Olympic sport in 1896, and it has been a part of every Games since then. Rifle shooting is now a popular sport all over the world.</p> <p>Fundamental Skills of Rifle Shooting</p> <p>Accuracy: Accuracy is the most important skill in rifle shooting. It is the ability to hit the target with the bullet. There are many different factors that affect accuracy, such as the stance, the grip, the breathing, and the trigger control.</p> <p>Consistency: Consistency is also important in rifle shooting. It is the ability to hit the target with the same accuracy shot after shot. There are many different factors that affect consistency, such as the mental focus and the physical preparation.</p> <p>Stance: The stance is the position of the body when shooting. It is important to have a stable stance in order to be accurate. There are many different stances that can be used, such as the standing stance, the kneeling stance, and the prone stance.</p> <p>Grip: The grip is the way that the rifle is held. It is important to have a firm grip in order to be accurate. There are many different grips that can be used, such as the weaver grip and the isosceles grip.</p> <p>Breathing: Breathing is important in rifle shooting because it can affect the accuracy</p>	10

	<p>of the shot. It is important to breathe slowly and evenly before and after the shot. Trigger Control: Trigger control is the ability to pull the trigger smoothly and evenly. It is important to avoid jerking the trigger, as this can cause the shot to go off target.</p>	
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MGMUNIVERSITY

Semester-II

Course code: APS21BSL103 Course name: Linear Algebra and Differential Equations Course category: Basic Science
Credits: 4 Teaching scheme: L-4 hrs/week Evaluation scheme: CA-60, ESE-40
Duration of External Examination- 2 Hrs
Pre-requisites: Pre-university mathematics.
Course Type: Basic Science Course
Course Objectives:
1. This course aims to make the students become familiar with the basic concepts of linear algebra with a thorough understanding of vector spaces, linear transformations and matrix operations enhancing the students' ability to reason mathematically and able to apply this knowledge to many fields in engineering, statistics and computer science.
2. To create and analyze mathematical models using differential equations
Course Outcomes: At the end of the course, the students will be able to -
CO1: Understand basic concepts such as vector spaces, linear dependence / independence of vectors, basis and linear maps.
CO2: Analyze and calculate eigen values, eigen vectors, rank nullity of a matrix / linear map.
CO3: Prove theorems; apply Gram-Schmidt process on inner product spaces, diagonalizable special matrices.
CO4: Solve ordinary differential equations analytically and numerically and apply these methods to solve engineering problems.
CO5: Find the solution of linear differential equations having their applications in mechanical and electrical systems.

Contents –

Unit	Content	Teaching hours
1	Matrices and Vector Spaces - Basic property of matrices, row operations and Gauss elimination, Inverse of a matrix. Basic concepts in linear algebra: vector spaces, subspaces, linear independence and dependence of vectors, bases, dimensions. Row and Column spaces, rank. Applications to systems of linear equations, Inverse transformation..	10
2	Linear mappings and Diagonalization Linear mappings, representation by matrices, rank-nullity theorem, Diagonalization, Eigen values, Eigen vectors and their basic properties, Cayley Hamilton Theorem.	10
3	Inner Product Spaces and Quadratic Inner Product Spaces , Orthogonality, Gram-Schmidt process, Geometric Applications of Linear Transformation, Quadratic Forms: Positive Definiteness and applications	10
4	First order ordinary differential equations and Applications Exact , Linear ,Bernoulli and separable differential equations, Applications to Population growth/decay, Mixing problems, Draining tank/Torricelli's Law problems, Newton's Law of Cooling, Electric circuits, Falling bodies	10
5	Ordinary differential equations of higher orders and Applications Linear differential equations with constant and variable coefficients, method of variation of parameters, Applications to mass spring systems and electrical circuits and	10

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| Text Books: 1. Introduction to Linear Algebra (2nd edition) by Serge Lang, Springer. |
| 2. Elementary Linear Algebra (10th edition) by Howard Anton and Chris Rorres, John Wiley and sons. |
| 3. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005 |
| 4. S. L. Ross, Differential Equations, 3rd Edition, Wiley India, 1984 |

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| Reference Books: 1. Shanti Narayan, Differential Calculus, S. Chand & Co |
| 2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, New York. |
| 3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi. |
| 4. P. N. Wartikar, J. N. Wartikar, Applied Mathematics (Vol I & II), Pune Vidyarthi Griha Prakashan, Pune. |
| 5. Differential Equations with Applications and Historical notes by George Simmons, Tata McGraw Hill publishing company Ltd, New Delhi |
| 6. K.D Joshi, Calculus for Scientists and Engineers, CRC Press |
| 7. Prasad and Reena Garg, Advanced Engineering Mathematics, Khanna Publishing Company Private Limited, New Delhi |
| 8. Schaum's outlines of Linear Algebra (5th edition) by Seymour Lipschutz, Marc Lipson, McGraw-Hill Education (India) Private Limited, New Delhi |

Semester-II

Course code: APS21BSL104 Course name: Engineering Chemistry Course category: Basic Science
Credits: 3 Teaching scheme: L-3hrs/week Evaluation scheme: CA-60, ESE-40
Duration of External Examination- 2 Hrs
Pre-requisites: Fundamentals of basic chemistry.
Course Type: - Basic Science Course
Course Objectives:
1. To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.
2. To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.
3. The objectives of the laboratory sessions are to enable the learners to get hands-on experience on the principles discussed in theory sessions and to recognize the applications of these concepts in engineering.
Course Outcomes: At the end of the course, the students will be able to -
CO1: Illustrate the water quality parameters, water softening processes and causes of hard water in industries.
CO2: Analyze Demonstrate a comprehensive understanding of advanced concepts in polymer chemistry
CO3: Apply fundamental concepts of corrosion science to solve problems arising in engineering applications
CO4: Interpret physical, chemical properties and applications of fuels and lubricants.
CO5: Describe the functions of batteries and applications of modern instrumental techniques like conductometry, pH metry, TLC, gas chromatography, UV-Visible and IR spectroscopy.

Contents –

Unit	Content	Teaching hours
1	Water Treatment - Natural sources of water, Impurities in water, Water quality parameters and its BIS standards, Hardness- Definition, Types, Estimation of hardness by EDTA method, Numerical based on hardness calculation, Disadvantages of hard water, Boiler troubles (causes, effect on boiler operation and methods of prevention), Internal and external treatments, Alkalinity and its determination, Water softening: Ion exchange process, Sewage water analysis- Dissolved oxygen (DO) and its determination, Biological oxygen demand (BOD), Chemical oxygen demand (COD) and their significance, Sewage water treatment.	9
2	Polymer Chemistry Introduction, Classification of polymers, Use and disposal of polymers, Polymerization and its types, Plastics and its types- Thermoplastic and thermosetting plastics, Preparation, properties and engineering applications of: PVC, PMMA, Bakelite and Epoxy resin, Molding constituents of plastics, Methods for molding of plastics into articles, Conducting polymers and Biopolymers (Introduction, types, examples and its applications.	8

3	Corrosion and its Control Introduction, Types of corrosion, Mechanism of dry & wet corrosion, Factors influencing on corrosion – Nature of metal & Nature of environment. Methods of corrosion control, Cathodic and anodic protection, Use of Inhibitors, Protective Coatings: a) Metallic coatings: Types of coatings methods of applications, (hot dipping, cladding and electroplating), b) Nonmetallic coatings: Chemical conversion coatings, Powder coatings.	8
4	Fuels and Lubricants Fuels: Introduction, Classification of fuel, Calorific value of a fuel, Characteristics of a good fuel, Solid fuel- Coal, Various types of Coal, Analysis of coal- Proximate and Ultimate analysis, Numerical based on analysis of coals, Liquid fuel- Refining of Petroleum, Gaseous fuels- LPG and CNG. Lubricants: Introduction, Mechanism of lubrication, Classification of lubricants, Solid, Semi-solid and Liquid Lubricants, Properties of lubricants, Physical properties – Viscosity & Viscosity index, Surface tension, Flash and Fire point, Cloud and pour point. Chemical properties – Acid value, Saponification value, Aniline point.	10
5	Electrochemistry and Instrumental Methods of Chemical Analysis Electrochemistry: Introduction - Basic concepts: Conductance, Specific Conductance, Equivalent conductance, Molecular conductance, Effect of dilution on conductance, Cell constant. Battery: Primary & secondary batteries, Ni-Cd cell, Lithium-air battery, Fuel cell- H ₂ -O ₂ Cell. Instrumental Methods of Chemical Analysis: Basic principle, instrumentation and applications of pH metry, Conductometry, Thin layer chromatography, Gas Chromatography, Ultraviolet-Visible spectroscopy and Infra-Red Spectroscopy.	10

Text Books: 1. Jain P.C & Jain Monica, Engineering Chemistry, Dhanpat Rai & Sons, Delhi

2. O. G. Palanna, Engineering Chemistry, Tata McGraw-Hill Publication, New Delhi.

3. S. S. Dara, A textbook of Engineering Chemistry, McGraw-Hill Publication, New Delhi.

4. Shashi Chawla, Engineering Chemistry, Dhanpat Rai and Co Education and Technical Publishers.

5. Shikha Agrawal, Engineering Chemistry- Fundamentals and Applications, Cambridge Publishers

Reference Books: 1. Barrow G.M., Physical Chemistry, McGraw-Hill Publication, New Delhi

2. Atkins, Physical Chemistry, OUP Oxford

3. Bhal & Tuli, Text book of Physical Chemistry, S. Chand & Company, New Delhi..

4. V. R. Gowariker, Polymer Science, New Age International Ltd

5. B. K. Sharma, Instrumental Methods of Chemical Analysis, Krishna Prakashan Medi

E-Resources: Name of the website/ E-Journals/ Online Videos

1. NPTEL Basic Courses Engineering Chemistry (<https://nptel.ac.in/courses/122/101/122101001/>)

2. <https://www.ncertbooks.guru/engineering-chemistry/>

3. Coursera Chemistry Courses (<https://www.coursera.org/browse/physical-science-and-engineering/chemistry?languages=en&page=2>)

4. "Introduction to Polymer Physics" NPTEL Course
(<https://www.youtube.com/playlist?list=PLwdnzlV3ogoXe67WsgE8f1fOIWcc5GKKS>)
5. "Introduction to Corrosion" NPTEL Course
(<https://www.youtube.com/playlist?list=PL8lylDWRkaW8BXestE4baRnN0699S11Lq>)
6. "Tribology & Lubrication" NPTEL Course (<https://www.youtube.com/playlist?list=PLLwnvFq-JAltJvWafEVU4gcUK27hEA7FD>)
7. "Electrochemistry" NPTEL Course
(https://www.youtube.com/playlist?list=PLVFqK_9GOGXnnriQpsn0z1Rss96Rh0vsm)
8. "Modern Instrumental Methods of Analysis" NPTEL Course
(<https://www.youtube.com/playlist?list=PL400CAFBA72E94CF8>)

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Semester-II

Course code: APS21ESL103	Course name: Engineering Mechanics	Course category: ESC
Credits: 2	Teaching scheme: L-2 hrs/week	Evaluation scheme: CA-60, ESE-40
Duration of External Examination-2 Hrs		
Pre-requisites:		
Coordinate Geometry, Trigonometry, Sine & Cosine Rule, Unit Conversions.		
Fundamentals of Physics		
Course Type:- Basic Science Course		
Course Objectives:		
1.This course aims to make the students become familiar with the basic concepts of linear algebra with a thorough understanding of vector spaces, linear transformations and matrix operations enhancing the students' ability to reason mathematically and able to apply this knowledge to many fields in engineering, statistics and computer science.		
2. To create and analyze mathematical models using differential equations		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Identify the force system for given conditions by applying the basics of mechanics.		
CO2: Determine the unknown forces of different engineering systems by applying equilibrium conditions.		
CO3: Apply the principles of friction and to locate Center of Gravity and find Moment of Inertia of plane lamina		
CO4: Establish the relations between kinematic parameters for different types of motion.		
CO5: Formulate the relevant equations for types of motion in kinetics.		

Contents –

Unit	Content	Teaching hours
1	Force System Introduction to Mechanics, Laws of mechanics, Newton's Laws, Law of Parallelogram, Law of transmissibility, Characteristics of force, System of Forces, Method of resolution and composition moment of a force, Law of Moments, Varignon's Theorem, Problems on moment, Resultant, Equivalent force& couple, properties of couple.	8
2	Equilibrium Introduction to Equilibrium and its types, Equilibrant, Concept of FBD, Analytical conditions of equilibrium, Equilibrium of different force system, Lami's Theorem, Types of loads, beams and supports..	7
3	Friction, Centre of Gravity and Moment of Inertia Friction: Introduction to friction, types and application, Laws of friction, Angle of friction, Angle of repose, Cone of friction, Problems on horizontal & inclined plane, block, and ladder. CG & MI: Centroid of regular and composite plane lamina, MI and its application, Perpendicular axis Theorem, Parallel Axis Theorem, Radius of Gyration, Problems on plane and composite lamina.	8

4	Kinematics Introduction and classification of dynamics motion and its classification, Rectilinear Motion Equation of Motion, Motion curves, Curvilinear Motion, rectangular and tangential components of acceleration, Projectile Motion: General Equation of Projectile Motion.	4
5	Kinetics Applications Basic concepts and laws of motion, D'Alemberts Principle, Problems on rectilinear motion Curvilinear motion, Work, Energy Principle, Work Done by force, Work Done by weight force, Work Done by frictional force, Work Done by spring force, Kinetic and Potential energy of the particle Problems on all cases of Work Done, Principle of Impulse and Momentum, Principle of Conservation Momentum, Impact and its types, Coefficient of restitution, Problems on impact Problems on impulse and momentum, Kinetics of rigid body problems	3

Text Books: 1 Beer, F.P and Johnston Jr. E.R., “Vector Mechanics for Engineers (In SI Units): Statics and Dynamics”, 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004).		
2 Vela Murali, “Engineering Mechanics”, Oxford University Press (2010).		
3. S. Timoshenko, D. H. Young, “Engineering Mechanics”, McGraw Hill, 1995.		
4. Tayal A. K., “Engineering Mechanics”, Umesh Publications, 2010		
5. Singer F. L., “Engineering Mechanics - Statics & Dynamics”, Harper and Row Pub. York.		
6. Khurmi R. S., “Engineering Mechanics”, S. Chand Publications, N. Delhi.		
Reference Books:		
1. McLean, Nelson, "Engineering Mechanics", Schaum's outline Series, McGraw Hill Book Company, N. Delhi, Publication.		
2. Hibbeler, R.C and Ashok Gupta, “Engineering Mechanics: Statics and Dynamics”, 11th Edition, Pearson Education (2010).		
3. Bhavikatti, S.S and Rajashekarappa, K.G., “Engineering Mechanics”, New Age International (P) Limited Publishers, (1998).		
4. Irving H. Shames and Krishna Mohana Rao. G., “Engineering Mechanics – Statics and Dynamics”, 4th Edition, Pearson Education (2006).		
5. Rajasekaran Sand Sankarasubramanian G., “Engineering Mechanics Statics and Dynamics”, 3rd Edition, Vikas Publishing House Pvt. Ltd., (2005).		
6. Meriam J.L. and Kraige L.G., “ Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2”, Third Edition, John Wiley & Sons, (1993).		
7. Kumar, K.L., “Engineering Mechanics”, 3rd Revised Edition, Tata McGraw-Hill Publishing Company, New Delhi (2008).		
E-Resources :		
1. www.nptel.ac.in (Learning platform from IIT professors)		
2. http://www.asnu.com.au (For Engineering applications)		
3. www.discoveryforengineers.com (Investigating Discoveries)		

Semester-II

Course code: APS21ESL104 Course name: Building Programming logic in C Course category: ESC
Credits: 1 Teaching scheme: L-1 hr/week Evaluation scheme: CA–30, ESE–20
Duration of Theory Exam: 1 Hr
Pre-requisites: Basic Knowledge of computers.
Course Objectives:
1. To introduce the basic concepts of programming and the C language, including algorithms, program structure, data types, variables, constants, and tokens.
2. To learn various operators, expressions, type casting, and input/output functions in C
3. To understand decision-making statements, loops, and jump statements for controlling program flow.
4. To learn arrays, strings, and functions, including user-defined and library functions, recursion, and variable scope.
5. To understand structures, unions, and enums for creating user-defined data types in C
Course Outcomes:
After the completion of this course, students will be able to:
CO1: Write a simple C program.
CO2: Apply operators, expressions, and I/O functions to develop simple C programs.
CO3: Design and implement programs using control structures and loops for decision-making and iteration
CO4: Write C programs using arrays, strings, and functions to solve problems efficiently.
CO5: Write C programs using structures, unions, and enums to organize and manage complex data efficiently.

Contents –

Unit	Contents	Teaching Hours
1	Introduction To C Programming: Overview of C: History of C, Algorithm and Structure of C program. Keywords, Tokens, Data types, Constants, Literals and Variables. Operators and Expressions: Arithmetic operators, Relational operators, Logical operators, Expressions. Operator precedence and associativity, Type casting Console I/O Formatting: Formatted I/O, Unformatted I/O functions: getch(), getchar(), getche(), getc(), putc(), putchar()	3
2	Control Statements and Loops: Control statements: if, if-else, Nested if–else, conditional operators, switch and break, nested conditional branching statements, Looping Statements : while, do while, for, Nested loops, Jump Statements: break and continue, goto and label, exit function.	3
3	Array and String: Array: Array declaration, One and Two dimensional numeric and character arrays, Multidimensional arrays, operations on array. String: String declaration, initialization, string manipulation with library function, Without library functions.	3

4	<p>Functions: Functions: Definition, function components: Function arguments, return value, function prototype, function call statement, Types of function: Library Functions(math and character),User-defined Functions, Scope and lifetime of variable, Call by value and call by reference. Function using arrays, function with command line argument. Recursive function.</p>	3
5	<p>Structure and Union: Structure: Basics, declaring structure and structure variable, typedef statement, array of structure, array within structure, Nested structure; passing structure to function, function returning structure. Union: basics, declaring union and union variable, Difference between Structure and Union Enum: declaring enum and enum variable.</p>	3

Text Books:

1. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill, Third Edition.
2. Let Us C, Yashwant Kanetkar, Infinity Science Press, Eighth Edition.
3. Mastering C, K. R. Venugopal, Tata McGraw-Hill.

Reference Books

1. The C Programming Language, Brian W. Kernighan & Dennis M. Ritchie, Prentice Hall, 2nd Edition.
2. Applications Programming in ANSI C, R. Johnsonbaugh & Martin Kalin, Macmillan, 2nd Edition.
3. The Spirit of C, Mullish Cooper, Jaico Publishing House.
4. How to Solve It by Computer, R. G. Dromey, Pearson Education

Semester-II

Course code: APS21PCL101 Course name: Basics of Electrical and Electronics Engineering Course category: PCC
Credits: 2 Teaching scheme: L-2 hrs/week Evaluation scheme: CA-60, ESE-40
Duration of External Examination- 2 Hrs
Pre-requisites: Pre-university mathematics
Course Type:- Professional Core Course
Course Objectives:
1. To understand Electrical circuits and classify circuits as per laws.
2. To understand Magnetic circuits and apply them in transformer devices.
3. To understand the working principle of semiconductor devices.
4. To understand the basics and applications of digital electronics.
Course Outcomes: After completion of this course, students will be able to:
CO1: Solve simple DC and single-phase AC circuits using KCL, KVL and network theorems.
CO2: Explain fundamentals of magnetic circuit and transformers.
CO3: Explain the working of diodes and transistors.
CO4: Explain the importance of number systems and logic gates.

Contents –

Unit	Content	Teaching Hours
1	Electrical Circuits Voltage and current sources: independent, dependent, ideal and practical; V-I relationships of resistor, inductor, mutual inductor and capacitor; Kirchhoff's laws, mesh and nodal analysis, superposition, Thevenin's, maximum power transfer theorems. Alternating voltages and currents, RMS, average, maximum values, Single Phase RL, RC, RLC series circuits, Power in AC circuits, Power Factor, Three phase balanced systems	7
2	Magnetic Circuits & Transformer Concepts of m.m.f, flux, flux density, reluctance, permeability and field strength, their units and relationship, right hand thumb rule and cork screw rule, Faraday's law of electromagnetic induction, Fleming's right-hand rule statically and dynamically induced EMF's self and mutual inductance coefficient of coupling, energy stored in magnetic circuit, Single phase transformers: Construction, principle of working, e.m.f equations.	8
3	Semiconductor Devices Introduction to Semiconductors, P-type and N-type Semiconductors, P- N Junction Diode: Construction and working, V-I characteristics of Diode, Reverse breakdown mechanism. Special purpose diodes: Zener Diode, Light Emitting Diode (LED) and PhotoDiode - Construction, working and applications. Bipolar Junction Transistor (BJT): types, construction and regions of operation.	7
4	Digital Electronics: Binary, Decimal, Octal, Hexadecimal, number systems and their inter-conversion, Binary Addition, Binary Subtraction, One's complement, Two's complement, Logic Gates: Basic, Universal and Special. Boolean Laws (AND, OR, NOT) and DeMorgan's theorems, Realization of basic logic gates using universal gates.	8

Text Books: 1 V. N. Mittal and Arvind Mittal, “Basic Electrical Engineering” McGraw Hill

2. Edward Hughes, “Electrical Technology,” Pearson Education

3. Electrical Technology Vol.1 & Vol.4 by B. L. Theraja & A. K. Theraja, S. Chand Publications.

4. “Electronics Devices and Circuits”, S Salivahanan, McGraw Hill Publications

5. “Modern Digital Electronics”, R.P. Jain, McGraw Hill Publications

Reference Books:

1. Vincent Del Toro, “Electrical engineering Fundamentals”, PHI second edition 2011

1. Robert Boylestad, “Electronics Devices and Circuits Theory”, Pearson Education India

2. “Electronics Devices and Circuits Theory”, Robert Boylestad, Pearson Education India.

E-Resources:

a. Online course on NPTEL “Basic Electrical Engineering”

b. NPTEL Course on “Introduction to Basic Electronics”, Prof. T.S. Natarajan, IIT Madras.

c. NPTEL Course on “Digital Electronic Circuits”, Prof. Goutam Saha, IIT Kharagpur.

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Semester-II

Course code: APS21IKL101	Course name: Indian Knowledge Systems	Course category: IKS
Credits: 2 Teaching scheme: L-2 hrs/week Evaluation scheme: CA-60, ESE-40		
Duration of External Examination- 2 Hrs		
Pre-requisites: NIL		
Course Objectives:		
The objective of this course is		
1. To make students understand foundational concepts in IKS for science, engineering and technology.		
2. To explore ancient Indian pursuits and accomplishments in the various domains of engineering		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Familiarise with key components of the IKS & develop appreciation for Indian philosophical systems		
CO2: Understand key features of the Indian Numeral System, units of measurement and the framework for establishing the right knowledge.		
CO3: Appreciate the unique & specific contributions of ancient Indian mathematicians in Arithmetic, Geometry & Trigonometry.		
CO4: Develop awareness about engineering & technology heritage of India and understand ancient Indian contributions in various engineering domains.		

Unit	Content	Teaching Hours
1	Introduction to IKS: Importance of ancient knowledge, defining IKS, Classification framework for IKS, Historicity of IKS, Indian philosophical systems, Vedic schools of philosophy(Sankhy and yoga, Nyaya and Vaisesika, Purva- Mimamsa and Vedanta), Non- Vedic philosophical systems (Jain, Bauddha and Carvaka) , Wisdom through the ages: Issues of interest in the Puranas, Itihasa as a source of wisdom (Uniqueness of the two epics), Nitisastras.	08
2	Foundational Concepts for Science and Technology: Number system in India, salient features of the Indian numeral system. Measurements for Time, Distance and weight. The knowledge triangle, Prameya- a Vaisesikan approach to Physical Reality, Pramana - The means of valid knowledge, Framework for establishing valid knowledge.	07
3	Science in IKS: Mathematics: Great mathematicians and their contributions. Arithmetic (square of a number, square root, series and progressions). Geometry (Property of right angled triangle in Sulba- sutras, value of tt). Trigonometry, Algebra, Binary Mathematics and combinatorial problems in Chandah- Sastra of Pingala.	08

4	Engineering and Technology in IKS: The Indian Science and Technology Heritage, Mining and ore extraction. Metals and metal working technology. Iron and Steel in India, Lost wax casting of idols and artefacts, apparatuses used for extraction of metallic components. Literary sources for Science and Technology, Physical Structures in India, Irrigation & Water Management, Dyes and Painting Technology, Shipbuilding.	08
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Text Books:

1. Mahadevan B., Bhat Vinayak Rajat & Nagendra Pavana R.N. "Introduction to Indian Knowledge System Concepts and Applications" PHI, 2023.
2. Jha Amit "Traditional Knowledge System in India" Atlantic Publishers and Distributors (P) Ltd, 2023
3. Chauhan Bhag Chand "IKS: The Knowledge system of Bharata" Garuda Prakashan, 2023
4. Bag A.K., "Mathematics in Ancient and Medieval India" Chaukhambha Orientalia, 1979
5. Sengupta Nirmal, "Traditional Knowledge in Modern India" Springer, 2019

Reference Books:

1. Bag A.K., "History of Technology in India, Vol. I" Indian National Science Academy, 1997
2. Kumar Alok, "Ancient Hindu Science" Jaico Publishing House, 2019
3. Datta B and Singh A.N. "History of Hindu Mathematics: Parts I and II" Asia Publishing House, 1962
4. Kapoor Kapil, Singh Awdhesh Kumar "Indian Knowledge Systems Vol. -I & II" D.K. Print World Ltd, 2005

E-Resources:

https://www.youtube.com/watch?v=-cBd6JYPWtY&list=PLRfu94TCePTtWtu0x145H_63WgoeYickE
https://www.youtube.com/watch?v=yvj5ROYbP2E&list=PLRfu94TCePTtLuEYSzmJXNYK_EnDSvY3N
<https://iksindia.org/book-list.php>

Semester-II

Course code: APS21VSP102 Course name: Workshop Practices Course category: VSEC	
Credits: 2 Teaching scheme: P-4 hrs/week Evaluation scheme: TW-60, PR-40	
Pre-requisites: Pre-university English.	
Course Type: Vocational Skill Enhancement Course.	
Course Objectives:	
1. To know about the different carpentry tools and perform various carpentry operations to complete the job	
2. To understand different welding tools, joints, defects and perform welding operation to complete useful article/job.	
3. To learn various types of pipes, plumbing tools, operations and perform thread cutting on GI pipes.	
4. To know different sheet metal tools, operations, applications and perform various operations to complete job.	
Course Outcomes: On completion of the course, the student should be able to:	
CO1: Perform basic carpentry operation on wood and prepare carpentry article.	
CO2: Perform welding processes and prepare welding article by performing various welding operations.	
CO3: Use plumbing tools, processes and perform threading on GI pipe.	
CO4: Use sheet metal tools, processes and prepare sheet metal article .	
Contents –	
Unit	Contents
1	Carpentry Shop Carpentry shop: Types of woods, tools, joints, operations, applications, safety measures etc. Job: Exercises on wood involving operations marking, sawing, chiselling, planning, grooving etc to make useful wooden article/ job e.g. Wooden Trophies, Showpiece articles, Stools etc
2	Welding Shop Welding Shop: Types of welding, welding joints, tools, welding defects, applications, safety measures etc. Job: Exercise in Arc welding to make useful articles like Grills, Stools, Tree Guards, Flower pot stand, Shoe rack, Bag Stand, Showpiece Articles from Scrap etc.
3	Plumbing Shop Plumbing shop: Study of types of pipe, pipe joints, operations, applications, safety measures etc. Job: Prepare threading on GI pipe to make useful items like Nipple, Pipe joints etc.
4	Sheet Metal Shop: Sheet Metal Shop: Sheet metal tools, operations, applications, safety measures etc. Job: Making an utility item using G I sheet involving development, marking, cutting , bending, spot welding/riveting Parts like i) Tray, ii) Funnel etc..

Text Books: 1 Hazra and Chaudhary, Workshop Technology-I, Media promoters & Publisher private limited.
2. Hazra and Chaudhary, Workshop Technology-II, Media promoters & Publisher private limited.

Reference Books: 1.K. C. John, Mechanical Workshop Practice, Prentice Hall Publication, New Delhi, 2010.

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Semester-II

Course code: APS21BSP102 Course name: Engineering Chemistry Lab Course category: Basic Science	
Credits: 1 Teaching scheme: P-2 hrs/week Evaluation scheme: TW-30, PR-20	
Pre-requisites: Pre-university English.	
Course Type: Vocational Skill Enhancement Course.	
Lab Objectives:	
1. To know about the different carpentry tools and perform various carpentry operations to complete the job	
2. To understand different welding tools, joints, defects and perform welding operation to complete useful article/job.	
3. To learn various types of pipes, plumbing tools, operations and perform thread cutting on GI pipes.	
4. To know different sheet metal tools, operations, applications and perform various operations to complete job.	
Lab Outcomes: Upon completion of the Lab Experiments, the students should able to,	
LO1: Perform the experiments as well as accurately record the readings and analyze the results of such experiments	
LO2: Estimate the impurities present in water using titrimetric and instrumental methods.	
LO3: Employ the basic techniques used in chemistry laboratory for analysis such as volumetric titrations, complexometric titrations, Conductometry, pH metry, viscometer, Stalagmometer and TLC.	
Unit	Content
1	Determination of hardness of water sample by EDTA method.
2	Determination of chloride content in water sample by precipitation titration method
3	Determination of dissolved oxygen in water by Iodometric method
4	Determination of percentage purity of bleaching powder
5	Determination of strength of acid / base using pH metric titration
6	Determination of strength of acid / base using conductometric titration.
7	To determine the cell constant of the given conductivity cell.
8	To determine relative surface tension of unknown liquids by using stalagmometer.
9	To determine the viscosity of unknown liquids by using Ostwald / Redwood viscometer.
10	To determine acidity of given water sample.
11	Determination of acid value of an oil sample.
12	Determination of saponification number of an oil sample
13	To determine alkalinity of given water sample.

14	Preparation of phenol- formaldehyde / urea-formaldehyde resin.
15	To find out the Rf value of given sample by thin layer chromatography.
16	To separate the given mixture using thin layer chromatography.
17	Proximate analysis of coal (moisture content, volatile matter, ash content).
18	To study factors influencing on rate of electrochemical corrosion.
19	To determine flash and fire point of given oil by Pensky-Marten flash point apparatus.
20	To determine cloud and pour point of lubricating oil.

Reference Books:

1. A Text book on Experiments and Calculations in Engineering Chemistry by Dr. S. S. Dara, S Chand Publication.
2. Laboratory manual on Engineering Chemistry by S. K. Bhasin & Sudha Rani, Dhanpat Rai Publishing Company.
3. Engineering Chemistry with Laboratory Experiments by M. S. Kaurav, Asia-Pacific the holdings Private Ltd.

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Semester-II

Course code: APS21ESP104 Course name: Engineering Mechanics Lab Course category: ESC
Credits: 1 Teaching scheme: P-2hrs/week Evaluation scheme: TW-30, PR-20
Lab Outcomes:
LO1: Describe the working principle of mechanics and correlate them with day to day engineering applications
LO2: Formulate and solve mechanics problems based on law of moments, conditions of equilibrium.
LO3: Verify theoretical concepts through analytical, experimental and graphical methods.

List of Experiments –

Unit	Content
1	Verification of law of the Machine using Screw jack.
2	Polygon law of coplanar forces.
3	Bell crank lever.
4	Lami's theorem.
5	Support reactions for beam.
6	Problems on beam reaction by graphics statics method.
7	Inclined plane (to determine coefficient of friction).
8	Centroid of irregular shaped bodies.
9	Determine center of gravity for composite sections.
10	Determine moment of inertia for composite sections.
11	Moment of Inertia of fly wheel.
12	Simple / compound pendulum.

Semester-II

Course code: APS21ESP105 Course name: Building Programming logic in C Lab Course category: ESC
Credits: 1 Teaching scheme: P-2 Hrs/week Evaluation scheme: TW–30, PR–20
Lab Objectives:
1.To introduce the basic concepts of programming and the C language, including algorithms, program structure, data types, variables, constants, and tokens.
2.To learn various operators, expressions, type casting, and input/output functions in C.
3.To understand decision-making statements, loops, and jump statements for controlling program flow.
4.To learn arrays, strings, and functions, including user-defined and library functions, recursion, and variable scope.
5.To understand structures, unions, and enums for creating user-defined data types in C
Lab Outcomes: After the completion of this course, students will be able to:
LO1: Write a simple C program.
LO2: Apply operators, expressions, and I/O functions to develop simple C programs.
LO3: Design and implement programs using control structures and loops for decision-making and iteration.
LO4: Write C programs using arrays, strings, and functions to solve problems efficiently
LO5: Write C programs using structures, unions, and enums to organize and manage complex data efficiently

List of Practicals

Unit	List of Practicals	Teaching hours
1	1. Write a C program to find sum and average of three numbers. 2. Write a C program to find the sum of individual digits of a given positive integer.	02
2	1. Write a C program to check whether the given number is perfect or not. 2. Write a C program to check whether the given number is strong or not.	02
3	1. Write a C program to generate the first n terms of the Fibonacci sequence. 2. Write a C program to generate prime numbers between 1 to n.	02
4	1. Write a C program to find the roots of a quadratic equation. 2. Write a C program to perform arithmetic operations using switch statement.	02
5	1. Write a C program to find the largest and smallest number in a list of integers. 2. Write a C program to sort the array in ascending order.	02
6	1. Write a C program to find whether the given matrix is symmetric or not. 2. Write a C program to perform addition of two matrices.	02
7	1. Write a C program that displays the position or index in the main string S where the sub-string T begins, or -1 if S doesn't contain T. 2. Write a C program to count the number of lines, words, and characters in a given text.	02

8	<ol style="list-style-type: none">1. Write a C program to swap the values of two variables using:<ol style="list-style-type: none">i) call by valueii) call by reference2. Write a C program using user-defined functions to determine whether the given string is palindrome or not.3. Write a C program using function to perform multiplication of two matrices.	02
9	<ol style="list-style-type: none">1. Write a C program to use function to insert a sub-string into a given main string from a given position.2. Write a C program to find factorial of a given integer using recursive function.3. Write C program to find GCD of two integers by using recursive function	02
10	<ol style="list-style-type: none">1. Write a C program to calculate total and percentage marks of a student using structure.	02

References:

1. "College of Engineering, Pune"
2. "University of Mumbai"

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Semester-II

Course code: APS21PCP101 Course name: Basics of Electrical and Electronics Engineering Lab	
Course category: PCC	
Credits: 1 Teaching scheme: P-2 hrs/week Evaluation scheme: TW-30, PR-20	
Lab Objectives	
1. Understand the DC circuit as per KCL & KVL and AC circuits as per theorems.	
2. Understand the working of a single-phase transformer.	
3. Understand the working of electronic instruments, components and logic gates .	
4. Understand the working of a PN junction diode.	
Course Outcomes: After completion of this lab, students will be able to:	
CO1: Use of KCL & KVL to solve DC circuits as well as use of AC theorems to solve AC circuits	
CO2: Demonstrate a single-phase transformer & it's working.	
CO3: Use electronic instruments, working of electronic components and logics gates	
Contents –	
Unit	Content
1	Verification of Loop Analysis and Nodal Analysis for DC Circuits
2	Verification of Thevenin's Theorem for DC Circuits
3	Verification of Maximum Power Transfer Theorem for DC Circuits.
4	Determination of Voltage, Current and Power Flow in Single Phase AC Circuit including R, L and C with Combination
5	Determination of Magnetic Material Terms and EMF Induction.
6	Demonstration and Determination of Single-Phase Transformer Terms like Voltage Ratio and Turns Ratio.
7	Study of Electronic Instruments
8	Study of Electronic Components.
9	Study of Logic Gates.
10	Study of V-I characteristics of a PN Junction Diode using V-Lab.
11	Study of Rectifier Circuits using Every Circuit simulation application.
12	Study of working and troubleshooting of Smartphone, Computer & TV (Case Study Approach).

Semester-II

Course code: MGM82CCP104 Course name: National Service Scheme (NSS) Course category: CCA		
Credits: 2 Teaching scheme: P-4 hrs/week Evaluation scheme: TW-30, PR-20		
Pre-requisites: Pre-university English.		
Course Type:- CCA		
Course Objectives:		
Contents –		
Unit	Content	Teaching hours
1	<p>Introduction to National Service Scheme (NSS) Emergence of NSS in India (Historical Background) and its development. Organizational Structure of National Service Scheme from National Level to College Level. Objectives of National Service Scheme (NSS) National Service Scheme (NSS) – Symbol and its meaning Symbol of NSS and its meaning Motto of National Service Scheme (NSS) Various prayers, inspirational songs to be used in NSS Programme.</p>	8
2	<p>National Service Scheme (NSS) Regular Activities Guidelines of Distribution of working hours or academic year. Classification of Regular Activities in the Society 1. Rural 2. Urban 3. Campus Need base with association Associations in NSS Activities 4. Govt. Organization 5. NGO Scope for Innovation (Self-Generated)</p>	8
3	<p>Social Issues in India Concept of Society, Community (Steps involved in evaluation of society) <ul style="list-style-type: none"> ● Features of Indian Society ● Communities in India Basic Social Issues in India Family System, Division of labor, Cast System in India, Gender Issues, Regional Imbalance.</p>	7

4	<p>Indian Constitution and Social Justice</p> <p>Indian Constitution</p> <ul style="list-style-type: none"> ● Preamble ● Structure ● Features ● Fundamental Rights & Duties <p>Social Justice</p> <ul style="list-style-type: none"> ● Social Justice – the Concept and its features <p>Contribution for Social Justice – Mahatma Jyotiba Phule, Dr. Babasaheb Ambedkar, Shahu Maharaj.</p>	7
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References:

- National Service Scheme Manual (Revised) 2006, Government of India, Ministry of Youth Affairs and Sports, New Delhi.
- University of Mumbai National Service Scheme Manual 2009.
 - Avhan Chancellor's Brigade-NSS Wing, Training camp on Disaster Preparedness Guidelines, March 2012.
 - Rashtriya Seva Yojana Sankalpana- Prof. Dr. Sankay Chakane, Dr. Pramod Pabrekar, Diamond Publication, Pune.
 - National Service Scheme Manual for NSS District Coordinators, National Service Scheme Cell, Dept. of Higher and Technical Education, Mantralaya,
 - Annual report of National Service Scheme (NSS) published by Dept. of Higher and Technical Education, Mantralaya,
 - NSS Cell, Dept. of Higher and Technical Education, Mantralaya, UTKARSHA- Socio and cultural guidelines.

Semester-II

Course code: MGM73CCP204 Course name: Fine Art Course category: CCA		
Credits: 2	Teaching scheme: P-4 hrs/week	Evaluation scheme: CA-30, ESE-20
Prerequisites: Nil		
Course Objectives:		
<ol style="list-style-type: none"> 1. Students will be able to draw clean lines. 2. Students will be able to explore shading from light to dark. 3. Students will be able to draw perspective drawing. 4. Students will be able to sketch landscape and portrait drawing. 		
Course Outcomes: After completion of this course, students will be able to:		
CO1: Pay attention to core details in visualization. CO2: Represent on paper what they have observed in terms of 3 and 2 dimensional objects and light and dark play of perspective. CO3: Draw clean lines and neat figures which will gradually help the in fashion illustrations.		

List of Practicals:

Sr. No.	Contents	Lab Hours
1	Explore pencil as medium for drawing and exploration of different types of grades of pencils. Lines - Freeing hand movement by practicing various ways to draw lines (wavy/zigzag/diagonal/vertical/horizontal)	8
2	3D objects with Shading: <ul style="list-style-type: none"> • Exploring and sketching 3D objects with Shading/Hatching - Light to Dark (HB/2B/3B/4B/5B/6B) • Space Division - Studying proportion. Perspectives- Coin / Box / Landscape. 	7
3	Sill Drawing: <ul style="list-style-type: none"> • Introduction to landscape and portrait drawing. • Still drawing (perspective drawing of man- made object) 	7
4	Exploration of color mediums: <ul style="list-style-type: none"> • Exploration of color mediums (chalk/ink/poster/pastels/water) • Landscape perspective of natural and man- made, charcoal rendering. • Still drawing of man- made and natural object by rendering and defining perspective. Ambedkar, Shahu Maharaj. 	8

Reference Books:

1. Mellem, Jeff; Sketching people & Live drawing basics.
2. Belleville- Van Stone, France; Sketch: The Non-Artist's guide to inspiration technique drawing life

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Semester-II

Course code: MGM73CCP204 Course name: Visual Art Course category: CCA		
Credits: 2	Teaching scheme: P-4 hrs/week	Evaluation scheme: CA-30, ESE-20
Course Type:- Professional Core Course		
Course Objectives:		
1.To understand the actual work process in the advertising market. 2. To understand the growth and necessity of advertising in the market.		
Course Outcomes: After completion of this course, students will be able to:		
CO1 :Able to choose a topic for campaign design. CO2: Understand that how campaign design is necessary CO3: Understand the actual work process in advertising market. CO4: Understand the process of designing.		

List of Practicals:

Sr. No	Name of Practical	Lab Hours
1	Topic for campaign design • It should be either product, service or social topic. • Mind mapping	8
2	Different types of media • New digital medias • Use of elective subject in campaign • Software use in designing	11
3	Sill Drawing Final layout • Printing in actual size media • Presentation on ppt of the topic includes artwork with rough work	11

Suggested Tutorial / Practical:

Assignment I: Students will be required to submit a mind map.

Assignment II: Students will be required to submit a list of media selection.

Assignment III: Students will be required to submit different medias in digital form

Assignment IV: Students will be required to submit different medias in print form. Teaching Methods and learning activities-

- Lecture with power point projections
- Demonstration with practical
- Documentaries and Presentation
- Use of different medium and art form to make a new concept of work

Assessment Strategies

Classroom lecture

Power point presentations

Group discussion
digital form

Reference Books:

- Advertising Campaign Design Just the Essentials - By Robyn Blakeman
- Campaign Strategies and Message Design: A Practitioner's Guide from Start to Finish - by Mary Moffitt (Author)
- Student should refer the previous knowledge about medias and refer the internet for help.

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Semester –III

Course Code: ITY23PCL201 Course Name: Discrete Structures and Applications Course Category: PCC
Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40
Duration of Theory Exam: 2 Hrs
Pre-requisites: Basic Mathematics
Course Objectives: This course will enable students to
This course will enable students to
1. Use standard notations to Write English sentences for logical expressions and vice-versa.
2. develop a foundation of set theory concepts, notation and applications.
3. Understand logic, basic counting principles, function and relation.
Course Outcomes: At the end of the course, the students will be able to -
CO1 Verify the correctness of an argument using symbolic logic and truth tables.
CO2 Construct mathematical arguments using logical connectives and quantifiers.
CO3 Construct proofs using mathematical induction And Solve problems involving recurrence relations and generating functions
CO4 Perform operations on discrete structures such as sets, functions, relation.

Contents–

Unit	Content	Teaching Hours
1	Mathematical Thinking Variables - Logical Form and Logical Equivalence, Conditional Statements, Valid and Invalid Arguments, Application: Digital Logic Circuits	6
2	Logic of Quantified Statements -Predicates and Quantified Statements, Statements with Multiple Quantifiers, Arguments with Quantified Statements.	6
3	Sequences, Mathematical Induction- Sequences, Mathematical Induction I, Mathematical Induction II, Strong Mathematical Induction and the Well-Ordering Principle for the Integers, Application: Correctness of Algorithms: Assertions, Loop Variants.	6
4	Set Theory & Function - Set Theory, Definitions and the Element Method of Proof, Properties of Sets, Disproofs: Disproving an Alleged Set Property. Functions: Functions Defined on General Sets, One-to-One and Onto, Inverse Functions, Composition of Functions.	6
5	Relations- Relations on Sets, Reflexivity, Symmetry, and Transitivity, Equivalence Relations: The Relation Induced by a Partition, Definition of an Equivalence Relation.	6

<p>Modular Arithmetic with Applications to Cryptography: Properties of Congruence Modulo n, Modular Arithmetic. Partial Order Relations: Antisymmetry, Partial Order Relations, Lexicographic Order, Hasse Diagrams, Partially and Totally Order Sets.</p>	
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Text Books:

1. Susanna S. Epp, "Discrete Mathematics with Applications" 4th Edition, 2010.
2. K. H. Rosen, "Discrete Mathematics and Its Applications", Tata McGraw Hill Publication, 7 th Edition, 2012.
3. B. Kolman, R. Busby, S. Ross, "Discrete Mathematical Structures", Pearson Education, 6 th Edition, 2009.
4. R. K. Bisht, H. S. Dhami, "Discrete Mathematics", Oxford University Press, 2015.

Reference Books:

1. Kenneth H Rosen, "Discrete Mathematics and its Applications".7th Edition, 2011
2. C L Liu, "Elements of Discrete Mathematics" 4th Edition, July 2017.
3. Norman L Biggs, "Discrete Mathematics", 2nd Edition, December 2002
4. Kenneth Bogart and Robert L Drysdale, "Discrete Mathematics for Computer Science", 1st Edition, Sept.2005
5. R Krishna Kumar, "Discrete Mathematics", 1st Edition, 2005.

Online Resources:

- 1.NPTEL course on Discrete Mathematics.

Semester –III

Course Code: ITY23PCL202 Course Name: Data Structures Course Category: PCC
Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40
Duration of Theory Exam: 2 Hrs
Pre-requisites: Fundamentals of programming logic
Course Objectives: This course will enable students to
1.Build foundation in computer programming
2.Develop programming skills
3.Apply programming constructs to implement different data structures.
Course Outcomes: At the end of the course, the students will be able to -
CO1 Apply knowledge of basic programming constructs to design algorithms and programs.
CO2. Demonstrate functioning of linear data structures (stack, queue and linked list) and apply them in required applications.
CO3. Write neat code by selecting appropriate data structure and demonstrate a working solution for a given problem.
CO4 Analyze performance of algorithms by determining time and space complexity.
CO5. Distinguish between linear and non-linear data structures and determine their applicability.
CO6. Analyze possible solutions for solving a given problem and select the most efficient one. (for eg, Sorting and Searching)

Contents–

Unit	Content	Teaching Hours
1	Introduction to Data Structures Data, Data Structure, operations on data structures, Types of data structures: linear and non-linear Algorithm, characteristics of an algorithm, Pseudo-Code. Performance measurement of an algorithm, time and space complexity. Asymptotic notations. Iterative and Recursive algorithms.	7
2	Linear Data Structures: Stack and Queue Stack, Operations on a stack, Mathematical expressions: Infix, Prefix and Postfix, Conversion of expression from one form to other. Applications of a stack: Evaluation of postfix expression.Queue, Operations on a queue, Circular queue, Double ended queue Priority queue, Application of queue.	7

3	Linear Data Structures: Linked List Static and dynamic memory allocation, Linked list, Types of linked-list: Singly, doubly and circular. Operations on linked list: Create, Insert, Search, Delete etc. Stack and queue implementation using linked list. Application of linked list: Addition of polynomials.	8
4	Non-Linear Data Structures Trees: Binary tree, Binary search tree, Binary tree representation, Operations on binary search trees. Tree traversals, Balanced search tree: AVL Graphs: Graphs, Graph representation, Graph Traversals, Minimum spanning tree, Minimum spanning tree algorithms: Kruskal, Prim's	8

Text Books:

1. E. Horowitz, D. Mehta, S. Sahni, "Fundamentals of Data Structures in C++", Silicon Press, 2nd Edition, 2008.
2. Goodrich, Tamassia, "Data Structures and Algorithms in Java", Wiley publication, 6th Edition, 2014.
3. Seymour Lipschutz, "Data Structures", Schaum's Outlines, McGraw Hill Education, 1 February 2014.
4. E. Balagurusamy. "C Programming and Data Structures", Publisher Tata McGraw - Hill Education, Edition: 4th, 2008

Reference Books:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein, "Introduction to Algorithms", MIT Press, 3rd Edition, 2009.
2. Y. Langsam, M. J. Augenstein and A. M. Tanenbaum, "Data structures using Java", Pearson Education, 2003.
3. Thomas Cormen, Introduction to Algorithms, PHI Publication, 2nd Edition, 2002.

Semester –III

Course Code: ITY23PCL203 Course Name: Object Oriented Programming Course Category: PCC
Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40
Duration of Theory Exam: 2 Hrs
Pre-requisites: Logic Building ability
Course Objectives: This course will enable students to
1.To understand Object oriented concepts like data abstraction, encapsulation, etc.
2.To solve real world scenarios using a top down approach.
3.To understand various C++ programming constructs.
Course Outcomes: At the end of the course, the students will be able to -
CO1. Explain Object-Oriented Programming Paradigm
CO2. Understand the storage concepts in a simple program
CO3. Develop programs using basic concepts of object oriented languages i.e. objects, encapsulation, data hiding etc.
CO4. Construct programs using advanced concepts of object oriented languages i.e. associations, packages, interfaces, exception handling etc.
CO5. Apply knowledge behind exception handling in c++

Contents–

Unit	Content	Teaching Hours
1	Fundamentals of Object Oriented Programming- Object-Oriented Programming Paradigm: Benefits, Applications, Object-Oriented Systems Development, Object-Oriented Design: Class design and algorithm. Tokens, Data types, Operators, Expressions, and Control structures, Array, Functions, Structures and Unions, Class and Objects, specifying a class, Defining member functions, Private member functions, Static data and member functions, Arrays of objects, Friend functions.	6
2	Constructors and Destructors - Constructor, Parameterized constructors, Multiple constructors in a class, Copy constructors, Dynamic constructors, Destructor. Programming for class diagrams and relationships.	6

3	Inheritance - Single inheritance, Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance, Virtual base classes, Abstract classes.	6
4	Polymorphism and Exception handling - Operator overloading, Function overloading, Virtual functions, pure virtual functions, Types of exceptions, Catching 10 exceptions, Multiple catching, Nested try statements, Uncaught exceptions, Throw and throws, Built-in exceptions, Creating exception subclasses, Using exceptions.	6
5	Files and Streams - Working with Files: Classes for file stream operations and I/O stream operation, Opening and closing a file, Detecting end-of-file, More about Open(): File Modes, Sequential input and output operations.	6

Text Books:

1. Robert Lafore, "Object Oriented Programming in C++", Pearson Education, 4th Edition, 2008.
2. E. Balagurusamy, "Object Oriented Programming with C++", Tata McGraw Hill Publication, 6th Edition, 2013

Reference Books:

1. J. R. Hubbard, "Programming with C++: Schaum's Outlines", Tata McGraw-Hill publication, 2005.
2. P. J. Deitel, H.M. Deitel, "C++ How to Program", Pearson Education, 9th Edition, 2016.

Semester –III

Course Code: ITY23PCL204 **Course Name:** Network Communications and Computing
Course Category: PCC

Credits: 2 **Teaching Scheme:** L- 2 Hrs/week **Evaluation Scheme:** CA-60, ESE-40

Duration of Theory Exam: 2 Hrs

Pre-requisites: Computer Basics

Course Objectives: This course will enable students

1. To Understand the working of layers in OSI model
2. To Understand internet protocol.
3. To Understand IPV4 addresses.

Course Outcomes: At the end of the course, the students will be able to -

CO1. Compare intermediate devices such as hub,switch,router.

CO2. Compare OSI and TCP/IP models.

CO3. Compare network types.

Contents–

Unit	Content	Teaching Hours
1	OSI Model and the TCP/IP Protocol Suite - Introduction: Data Communications, Networks, Network Types, Network Models, Internet Standards and Administrations, Network Models: Protocol layering, TCP/ IP Protocol Suite, OSI Model, Layers in the TCP/IP Protocol Suite, Addressing: Physical Addresses, Logical Addresses, Port Addresses, Application-Specific Addresses, Wired Local Area Networks, Addressing, Ethernet Evolution	6
2	Physical and Data Link Layer - Transmission media (cables, wireless,Signal representation (digital/analog)Network interfaces (NICs),Standards and protocols (e.g., Ethernet, Wi-Fi) Error detection and correction (CRC, checksum),Media access control (MAC addressing),Flow control and error handling,,Protocols (e.g., Ethernet II, PPP), , Multiple Access Protocols, Wi MAX, Cellular Telephony	6
3	Network Layer- Network layer design issues, Network Layer Services, Packet Switching, Network Layer Performance, IPv4 addresses, Address space, classful and classless addressing, Internet protocol, ICMPv4, Routing Algorithms: Distance Vector Routing, Link State Routing, Path Vector Routing, Routing in Internet: RIP,	6

	OSPF, BGP, Congestion control and QoS.SMTP, MIME, POP3, Webmail, FTP, TELNET.	
4	Transport and Session Layer - Transport Layer: Services, Addressing, Connection establishment, Connection release, Flow control and buffering, Multiplexing, TCP features, connection, Congestion Control, Real Time Transport protocol (RTP), UDP for wireless, Stream Control Transmission Protocol (SCTP), Differentiated services,Dynamic Host Control Protocol (DHCP), Simple Network Management Protocol (SNMP) Session Layer: Session establishment and termination, Dialog control (synchronization),Security services (e.g., authentication) Presentation Layer:Data encryption and decryption	6
5	Application and Presentation Layer - Presentation Layer:Data encryption and decryption , ,Network services (e.g., email, file transfer, web browsing),Application protocols (e.g., HTTP, FTP, SMTP, SNMP, DNS).	6

Text Books:

1. Fourauzan B., "Data Communications and Networking", 5thEdition, Tata McGraw-Hill, Publications, ISBN: 0 -07 -058408 ,2006
2. Andrew S. Tenenbaum,"Computer Networks",PHI, ISBN 81-203-2175-8 2006
3. Kurose, Rose, "Internet Protocol", Pearson, ISBN-10: 0132856204, 2020
4. William Stalling,"Data and Computer Communication" ,Pearson, 8th edition, ISBN: 0-13-243310-9 , 2007

Reference Books:

1. Kurose, Ross "Computer Networking a Top Down Approach Featuring the Internet",6th edition (March 5, 2012), 2.Pearson , ISBN-10: 0132856204. 2. Andrew S. Tenenbaum, "Computer Networks", 5th Edition, PHI, ISBN 81-23- 2175-8.

Semester –III**Course Code:** ITY23PCP202 **Course Name:** Data Structure LAB **Course Category:** PCC**Credits:** 1 **Teaching Scheme:** P- 2 Hrs/Week **Evaluation Scheme:** TW: 30, PR: 20**Pre-requisites:** Fundamentals of programming logic**Lab Objectives:** This course will enable students to

1. Build foundation in computer programming
2. Develop programming skills
3. Apply programming constructs to implement different data structures.

Lab Outcomes: At the end of the course, the students will be able to -

LO1. Apply knowledge of basic programming constructs to design algorithms and programs.

LO2. Demonstrate functioning of linear data structures (stack, queue and linked list) and apply them in required applications.

LO3. Write neat code by selecting appropriate data structure and demonstrate a working solution for a given problem.

LO4. Analyze performance of algorithms by determining time and space complexity.

LO5. Distinguish between linear and non-linear data structures and determine their applicability.

LO6. Analyze possible solutions for solving a given problem and select the most efficient one. (for eg, Sorting and Searching)

List of Experiments:

1. Implementation of Arrays
 - a. Write a program to accept N elements in an array and find the sum of it.
 - b. Write a program to accept N elements in an array and find even/odd numbers from it.
 - c. Write a program to find the given element present in the array or not.
 - d. Write a program to accept N elements in two arrays and store sum of them in the third array.
 - e. Write a program for multiplication of two matrices
2. Implementation of Stack
 - a. Perform operations on stack using array
 - b. Evaluation of postfix expression using stack
 - c. Reverse a string using array
3. Implementation of Simple Queue
 - a. Perform operations using array

<p>1. Implementation of Arrays</p> <ul style="list-style-type: none">a. Write a program to accept N elements in an array and find the sum of it.b. Write a program to accept N elements in an array and find even/odd numbers from it.c. Write a program to find the given element present in the array or not.d. Write a program to accept N elements in two arrays and store sum of them in the third array.e. Write a program for multiplication of two matrices
<p>4. Implementation of Circular Queue</p>
<p>5. Implementation of Singly Linked List</p> <ul style="list-style-type: none">a. Create a singly linked list and perform insert delete operations on it for all conditionsb. Reverse a singly linked listc. Implementation of stack using singly linked list
<p>6. Implementation of Singly Linked List</p> <ul style="list-style-type: none">a. Create a singly linked list and perform insert delete operations on it for all conditionsb. Reverse a singly linked listc. Implementation of stack using singly linked listd. Implementation of queue using singly linked list
<p>7. Implementation of Doubly Linked List</p> <ul style="list-style-type: none">a. Create a doubly linked list and perform insert delete operations on it for all conditionsb. Reverse a singly linked listc. Implementation of stack using singly linked listd. Implementation of queue using singly linked list
<p>8. Implementation of Circular Singly Linked List</p>
<p>9. Implementation of Circular Doubly Linked List</p>
<p>10. Implementation of Binary Search Tree and Traversing using linked list</p>

Semester –III

Course Code: ITY23PCP203 Course Name: Object Oriented Programming Lab Course Category: PCC
Credits: 1 Teaching Scheme: P-2 Hrs/week Evaluation Scheme: TW- 30, PR- 20
Pre-requisites: Basic understanding of C programming language
Lab Objectives: This course will enable students to
1. To understand the concept of inheritance in C++ and its various forms.
1. To explore advanced features of C++ such as inline functions, operator overloading, and function overloading.
2. To master file handling techniques in C++ for reading from and writing to files.
Lab Outcomes: At the end of the course, the students will be able to -
LO1. Implement single, multiple, multilevel, and hierarchical inheritance in C++ programs, demonstrating proficiency in object-oriented programming principles.
LO 2. Utilize inline functions, operator overloading, and function overloading effectively in C++ programs to improve code efficiency, readability, and maintainability.
LO3. Students will be proficient in performing file operations in C++ programs, including naming files, opening files, writing data into files, reading data from files, and closing files, ensuring data integrity and security.

List of Experiments

1. To write a C++ program to find the sum of the given variables using a function with default arguments.
2. Write a C++ program to display Names, Roll No., and grades of 3 students who have appeared in the examination. Declare the class of name, roll no., and grade. Create an array of class objects. Read and display the contents of the array.
3. Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data members
4. Write C++ programs that illustrate how the following forms of inheritance are supported: a)Single inheritance b)Multiple inheritance
5. Write C++ programs that illustrate how the following forms of inheritance are supported: a) Multiple inheritance b)Multilevel inheritance d)Hierarchical inheritance
6. To write C++ program to implement an inline function.

7. Write a Program to Generate Fibonacci Series using Constructor to Initialize the Data Members.
8. Write a Program to Demonstrate the i) Operator Overloading. ii) Function Overloading.
9. Write a Program to Naming a file, Opening a file, Writing data into the file, Reading data from the file, Closing a file.
10. Write a Program to Demonstrate the Catching of All Exceptions.

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Semester –III

Course Code: ITY23FPJ201 Course Name: Web Technology Course Category : FP
Credits: 2 Teaching Scheme: P- 4 Hrs/week Evaluation Scheme: TW-50
Pre-requisites: Fundamentals of programming logic
Lab Objectives: This course will enable students to
1. To introduce HTML and CSS for web development
2. To familiarize students with JavaScript fundamentals and its application in web development.
3. To teach responsive web design using Bootstrap framework.
4. To provide an introduction to back-end development using PHP and MySQL.
5. To introduce students to front-end development with ReactJS and state management with Redux.
Lab Outcomes: At the end of the course, the students will be able to -
LO 1. Students will be proficient in creating visually appealing and responsive web interfaces using HTML, CSS, and Bootstrap, enhancing user experience across different devices and screen sizes.
LO.2 Students will demonstrate competency in client-side scripting using JavaScript, enabling them to create dynamic and interactive web pages, handle form submissions, and manage events effectively.
LO3. Students will gain the skills necessary to develop modern, interactive web applications using ReactJS, including understanding component-based architecture, managing application state with Redux, and implementing routing for single-page applications.

Contents–

Unit	Content	Teaching Hours
1	Introduction To HTML,CSS - Introduction to HTML: Basic designing elements, components attributes (Structured tags, Block level tags, meta tags, formatting, style, lists, images, tables, frames, audio, video), HTML5 Introduction to CSS Fundamentals of CSS, Inline CSS, external CSS and embedded CSS, Overview and Features of CSS3, creating a webpage with CSS, Media Query, Introduction to responsive website.	6
2	Introduction To JavaScript - JavaScript: Fundamentals of JS , Functions , Arrays, Array Methods, Object object methods, Errors, Debugging. Working on Forms, Event handling.	6

3	Front-End UI development with Bootstrap - Bootstrap Overview: Basics of Bootstrap, setting up a web project using Bootstrap. Responsive design and the Bootstrap grid system, Bootstrap CSS Components(Navigation and Navigation bar, buttons, forms, tables, cards, images and media, tags, alerts and progress bars) , Bootstrap Javascript Components (pills and tabbed navigation, collapse, accordion, scrollspy, affix, tooltips, popovers, modals and the carousel	6
4	Introduction to Back-End Technology- PHP: Introduction to PHP, Features of PHP, Basics of PHP, Syntax, Variable, Functions, Array, Object oriented PHP with MySQL and Forms	6
5	Introduction to React JS - ReactJS – Overview, Features, Limitations, ReactJS - Environment Setup, ReactJS – JSX, ReactJS – Components. React Router and Single Page Applications ReactJS – State, ReactJS - Props Overview, ReactJS - Props Validation, ReactJS - Component API, ReactJS - Component Lifecycle React Forms, Flow Architecture and Introduction to Redux Working with forms, different components in the forms, basics of Redux, installation, core concepts, ecosystem.	6

List of Experiments

1. Introduction to HTML: Demonstration of all the necessary tags in HTML, HTML5
2. Introduction to CSS: CSS, Inline, external and embedded CSS, Overview and Features of CSS3, media query.
3. Create a website for an organization/personal portfolio using HTML and CSS
4. Introduction to Javascript: Demonstration of Variables, Operators, Arithmetic, Assignment, Data Types, Functions, Objects, Scope, Events, Strings, String Methods, Numbers, Number Methods, Math, Random, Dates, Date Formats, Date Methods, Arrays, Array Methods, Array Sort, Booleans, Comparisons, Conditions, Switch, Loop For, Loop While, Break
5. Demonstration using javascript
 - a. Create an application for temperature conversion degree Celsius to Fahrenheit
 - b. Create an application for currency conversion rupee to dollar
 - c. Dropdown events based on options (UG->UG courses , PG->PG Courses)
6. Introduction to Bootstrap, CDM, grid system, typography , components
7. Create a theme using bootstrap components
8. Introduction to PHP: Installation of XAAMP, WAAMP, APACHE,MySQL Workbench, syntax of PHP
9. Create a web page with form and perform crud operation through PHP using MySQL
10. Introduction to React : Create a static webpage using ReactJS.

Semester –III

Course Code: ITY23HSL201 Course Name: Business Management and Financial Accounting Course Category: EEMC
Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40
Duration of Theory Exam: 2 Hrs
Pre-requisites: Basic Management
Course Objectives: This course will enable students to
1. To enable students to describe the estimated cash flows from a project, including operating, net working capital, and capital spending.
1. To provide the students to understand the related information of business Finance. Students can prepare basic financial statements.
2. To enable students to prepare final financial statements.
Course Outcomes: At the end of the course, the students will be able to -
CO1: Analyze the risk and return of alternative sources of financing.
CO2. Estimate cash flows from a project, including operating, net working capital, and capital spending.
CO3. Define basic terminology used in finance and accounts.
CO4. Prepare Financial Statements.

Contents–

Unit	Content	Teaching Hours
1	Introduction to Business Management - Aims, Objective And Function of Business Management, Principles of Management, Concept of business finance, Goals & objectives of financial management, Sources of financing-Long Term financing and Short Term Financing	7
2	Business Capital Management- Concept of business working Capital, significance, types. Adequacy of working capital, Factors affecting working capital needs, financing approaches for working capital, Methods of forecasting, working capital requirements	8
3	Basics of Financial Accounting - Meaning, Scope and importance of Financial Accounting. Financial Accounting - concepts and conventions,	7

	classification of accounts, Rules and principles governing Double Entry Book-keeping system, Meaning, Preparation of Journal, Ledger, Cash book & Trial balance.	
4	Financial Statement Preparation and analysis- Preparation of financial statements. Profit & Loss Account, Balance Sheet, Ratio Analysis.	8

Text Books:

1. Financial Management by Khan & Jain, Text, Problem & Cases, Tata McGraw Hill Publication 5th Edition.
2. Tulsian Financial Management by Dr.P.C.Tulsian, S Chand Publication 5th Edition.
3. Taxman's Financial Management by Ravi M. Kishore, Taxmann 2017 Edition.

Reference Books:

1. A Textbook of Financial, Cost & Management Accounting by Dr.P.Periasamy, Himalaya Publishing House.
2. Fundamentals of Financial Management by Bhabhtosh Banerjee, PHI publication, 2nd Edition.

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Semester –III

Course Code: MGM55VEL103 Course Name: Constitution of India Course Category: VEC
Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-30, ESE-20
Duration of Theory Exam: 1 Hr
Pre-requisites: Bare Act of Indian Constitution.
Course Objectives: This course will enable students to
1. To make students understand the Constitution and its importance.
2.To sensitise the students about Fundamental Rights and duties enshrined under Indian Constitution
3.To familiarise students with the working of the Indian Constitution.
Course Outcomes: At the end of the course, the students will be able to -
CO1: Understand and explain the significance of Indian Constitution as the fundamental law of the land
CO2. Will be able to exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national building.
CO3. To Analyse the Indian political system, the powers and functions of the Union, State and Local Governments in detail
CO4. To Understand Electoral Process, Emergency provisions and Amendment procedure

Contents–

Unit	Content	Teaching Hours
1	Historical Background and Philosophy of Indian Constitution -Societies before and after the Constitution adoption,Introduction to the Indian constitution. Making of the Constitution.,Role of the Constituent Assembly,Preamble and Nature of Indian Constitution,Salient features of Indian Constitution.	6
2	Fundamental Rights & Duties - Right to equality ,Right to freedom ,Right against exploitation ,Right to freedom of religion ,Cultural and educational rights ,Right to Constitutional remedies,Fundamental Duties.	6

3	Directive principles of state policy- Meaning and significance of Directive Principles ,Economic Principles ,Political Principles.	6
4	Organs of Government- Centre and State Legislature,Centre and State Executive ,Centre and State Judiciary ,Local Self Government.	6
5	Other Important Constitutional Provisions- Emergency Provisions under Indian Constitution,Election Commission.	6

Text Books:

1. D. D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2013.
2. Subhash Kashyap, Our Constitution (An Introduction of Indian constitution and Constitutional Law), National Book Trust, India, 2001
3. M. P. Jain, Outline of Indian Legal and Constitutional History, Lexis Nexis, 2014
4. Constitutional Law of India-J.N.Pandey-

Reference Books:

1. G. Austin, The Constitution of India, Cornerstone of a Nation. Oxford University press 1966.
2. M.V.P ylee- Constitutional Government in India, Bombay Asia publishing House 1975.
3. Chandra, Bipan and Others, India Since Independence, Penguin Books, New Delhi, 20015.
- 4.H.M.Seervai Constitution of India.
5. Narendra Chapalgaonker, Mahatma Gandhi and the Indian Constitution, Routledge (Manohar) Publications, 2016.

Semester –IV

Course Code: ITY23PCL251 Course Name: Statistics Course Category: PCC
Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40
Duration of Theory Exam: 2 Hrs
Pre-requisites:
Course Objectives: This course will enable students to
1.To learn Probability Theory and probability distribution
2.To know the significance of Regression and correlation
3.To learn Time series analysis
Course Outcomes: At the end of the course, the students will be able to -
CO1.Understand Probability Theory and distribution
CO2: Understand and apply appropriate regression and correlation methods and interpret results.
CO3: perform Time series analysis

Contents–

Unit	Content	Teaching Hours
1	Theory of probability- Axiomatic approach of probability, Random variable, Probability distributions, PMF, PDF, Binomial distribution, Poisson distribution, Normal distribution	6
2	Correlation- Introduction, Types of correlation, Correlation and causation, Methods of studying correlation, Karl Pearson's correlation coefficient, Spearman's rank correlation, Properties of Karl Pearson's correlation coefficient, Properties of Spearman's rank correlation coefficient, Probable errors, Examples	6
3	Regression- Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Angle between the regression lines, Coefficients of regression, Properties of regression coefficient, Examples.	6
4	Introduction to Sampling Theory- Introduction, Universe or Population, parameters and statistics of sampling Distributions, Principles of Sampling, Limitations of Sampling, Errors in Statistics	6

5

Time Series Analysis- Introduction, Components of Time Series, Analysis of Time Series, Mathematical model for Time Series, Measurement of Trend.

6

Text Books:

1. S. C. Gupta, "Fundamentals of Statistics", 46th Edition, Himalaya Publishing House, 1 May 2018.
2. G. V. Kumbhojkar, "Probability and Random Processes", 14th Edition, C. Jamnadas

Reference Books:

1. Jay Devore" Probability and Statistics for engineers and sciences" 8th edition ,Cengage Learning

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Semester –IV

Course Code: ITY23PCL252 Course Name: Programming in JAVA Course Category: PCC
Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40
Duration of Theory Exam: 2 Hrs
Pre-requisites: Fundamentals of programming logic
Course Objectives: This course will enable students to
1. To enable the students to understand the core principles of the Object-Oriented Language
2. To understand the concept of packages and applet programming
3. To understand the concept of Multi-threading
4. To understand the concept of graphic programming
5. Introduce the students to database connectivity
Course Outcomes: At the end of the course, the students will be able to -
CO1. Apply Object Oriented concepts to develop programs in Java.
CO2. Develop programs using packages and applet programming.
CO3. Develop programs using Inheritance, Interfaces. Multithreading.
CO4. Develop programs using graphic programming
CO5. Develop applications using databases.

Contents–

Unit	Content	Teaching Hours
1	Introduction to JAVA- Fundamentals of Object Oriented Programming, Overview of JAVA, Data types, Operators and expressions, Control Statements and Loops, Arrays, Strings Collection Framework: Array List class, Linked List class, List Iterator interface, Hash Set classes, Vector	8
2	Object Oriented Programming - Classes and Objects, methods, method overloading, method overriding, static methods, visibility controls, Constructors, Inheritance, Interface, Packages	8

3	<p>Multithreading and Exception Handling Thread - MultiThreading: Creating threads, Extending Thread Class, Stopping and Blocking a thread, Life cycle of a thread, using thread method, Thread exceptions, Implementing the Runnable interface, Inter-thread communication.</p> <p>Managing Errors and Exceptions: Types of errors, Exceptions, Syntax of exception handling code, Multiple catch statements, throwing your own exception, Using exceptions for debugging</p>	8
4	<p>SWING and JDBC - Introduction to AWT, Graphics classes, Introduction to swing, difference between awt and swing, Components of swing</p> <p>Introduction to JDBC, connectivity with database (MySQL, SQLServer, etc)</p>	8

Text Books:

1. E. Balagurusamy, "Programming with Java – A Primer", Tata – McGraw-Hill Publication, 1998
2. Steven Holzner et al. "Java 2 Programming", Black Book, Dreamtech Press, 2006
3. Herbert Schildt, "Java 2: The Complete Reference", 2002
4. Ken Arnold, James Gosling, David Holmes, "THE Java™ Programming Language", Addison Wesley Professional, 2000

Reference Books:

1. H.M. Deitel, P.J. Deitel, "Java - How to Program", PHI Publication
2. Bruce Eckel, "Thinking in Java", PHI Publication.
3. Patric Naughton, Michael Morrison, "The Java Handbook", McGraw Hill Publication.
4. Tim Lindholm, Frank Yellin, Bill Joy, Kathi Walrath, "The Java Virtual Machine Specification", Addison Wesley Publication.

Online Resources:

1. https://www.java.com/en/download/help/index_using.xml
2. <https://docs.oracle.com/javaee/6/tutorial/doc/>

Semester –IV

Course Code: ITY23PCL253 Course Name: Digital Logic Design Course Category: PCC
Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40
Duration of Theory Exam: 2 Hrs
Pre-requisites: nil
Course Objectives: This course will enable students to
1. To train the students on fundamentals of digital logic design.
2. To train the students for minimization of digital circuits.
3. To study combinational and sequential Logic Design (Multiplexer, De-multiplexers).
Course Outcomes: At the end of the course, the students will be able to -
CO1. Perform binary arithmetic; explain logic gates, universal gates, K-map.
CO2. Design different Combinational and Sequential Logic circuits.
CO3. Demonstrate the working of flip-flops.

Contents–

Unit	Content	Teaching Hours
1	Number Systems and Codes - Number systems: Binary, Octal, Hexadecimal number systems, Binary arithmetic, 2's Complement Arithmetic, Codes: Binary code, Excess-3 code, grey code, Error detecting and correcting codes.	6
2	Combinational Logic Design - Introduction, Standard Representation of Logic functions, Karnaugh Map Representation of Logic functions, Simplification of Logic functions using K Map, Minimization of logic functions, Don't-care Conditions, Design Examples, Five and Six Variable K Maps, Quine – McCluskey Minimization Technique	6
3	Combinational Functions - Introduction, Multiplexers and their use in Combinational Logic Design, Demultiplexers/ Decoders and their use in Combinational Logic Design, Digital Comparators	6
4	FLIP-FLOPS -Introduction, A 1 Bit Memory Cell, Clocked S-R FLIP FLOP, J-K FLIP FLOP, D and T FLIP FLOP, Excitation table of FLIP FLOP, Conversion from one type of FLIP FLOP to Another Type	6

5	Introduction to Sequential Logic Design - Introduction, Registers, Applications of Shift registers, Ripple and synchronous counters	6
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Text Books:

1. R.P. Jain, "Modern Digital Electronics", Tata McGraw Hill Publication, 4th Edition, 2010.
2. M. M. Mano, "Digital Logic and Computer Design", Prentice Hall of India Publication, 4th Edition, 2006.

Reference Books:

1. D. P. Leach, A. P. Malvino, G. Saha, "Digital Principles and Applications", Tata McGraw Hill Publication, 8th Edition, 1993.
2. Comer, "Digital Logic & State Machine Design", Oxford Universities Press, 3rd Edition, 2014

Online Resources:

1. NPTEL videos

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Semester –IV

Course Code: ITY23PCL254 Course Name: Digital Image Processing Course Category: PCC
Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40
Duration of Theory Exam: 2 Hrs
Pre-requisites: 1.Elements of visual perception. 2.Basic linear algebra and Fourier transform Set theory
Course Objectives: This course will enable students to
1. Understand fundamental digital image processing steps and mathematical models in digital image
2.Apply enhancement restoration segmentation image processing algorithm.
3.Develop time and frequency domain techniques for image enhancement.
Course Outcomes: At the end of the course, the students will be able to -
CO1. Introduce basic image processing techniques.
CO2. Learn image enhancement techniques in spatial and frequency domain.
CO3. Apply different Segmentation techniques on Image
CO4. Explore Morphological Image Processing and Object Representation and description.

Contents–

Unit	Content	Teaching Hours
1	Fundamentals of Image Processing - Introduction & Applications, Components of Image Processing System, Fundamentals Steps in Image Processing, Image sensing and acquisition, simple image formation, Image sampling and Quantization, Representing digital pixels, Some basic relationships like Neighbours, Connectivity, Distance Measures between pixels Image quality, Introduction to colour image – RGB and HSI Models	7
2	Image Enhancement - Image Enhancement in the Spatial and Frequency Domain: Image enhancement by point processing, Image enhancement by neighborhood processing, Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Basics of Spatial Filters, Smoothing and Sharpening Spatial Filters, Combining Spatial Enhancement Methods. Introduction to Fourier Transform and the frequency Domain, Smoothing and Sharpening Frequency Domain Filters	8

3	Segmentation - segmentation and threshold function, Different algorithms in thresholding, Line detection, Edge detection, Edge linking by graph search method, Hough transform, Region based segmentation, Matching.	8
4	Morphological operations- Morphological-dilation and erosion, opening and closing, Hit/ miss transforms, Representation Boundary descriptors, Regional descriptors.	7

Text Books:

1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2007
2. S. Jayaraman, S. Esakkirajan, T. Veerakumar "Digital Image Processing", McGraw Hill Publication, 2014
3. Anil K. Jain, "Fundamentals of Digital Image Processing", Pearson 2004

Reference Books:

1. B. ChaB. Chanda, Dutta Majumdar, "Digital Image Processing and Analysis", PHI, 2000.
2. Ze-Nian Li and Mark S. Drew, "Fundamentals of Multimedia", PHI 2011.
3. Murat Tekalp, "Digital Video Processing", Pearson, 2010.
4. John W. Woods, "Multidimensional Signal, Image and Video Processing", Academic Press 2012.
5. Gonzalez, R. C., & Woods, R. E. (2017). Digital Image Processing. 4th edition. Pearson Education

Semester –IV

Course Code: ITY23PCP252 Course Name: Programming in JAVA LAB Course Category: PCC
Credits: 1 Teaching Scheme: P-2 Hrs/week Evaluation Scheme: TW-30, PR-20
Pre-requisites: Basic Programming
Lab Objectives: This course will enable students to
1. To enable the students to understand the core principles of the Object-Oriented Language
2. To understand the concept of packages and applet programming
3. To understand the concept of Multi-threading
4. To understand the concept of graphic programming
5. Introduce the students to database connectivity
Lab Outcomes: At the end of the course, the students will be able to -
LO1. Apply Object Oriented concepts to develop programs in Java.
LO2. Develop programs using packages and applet programming.
LO3. Develop programs using Inheritance, Interfaces. Multithreading.
LO4. Develop programs using graphic programming
LO5. Develop applications using databases.

List of Experiments**Unit I:****Introduction to Java****Aim: To study the working environment of java.**

1. Wap to print your Biodata?

2. Wap to add, subtract, divide, multiply two numbers using command line arguments? Wap to print your Biodata using command line arguments?

Aim: To study Decision Control structures and loop control structures in java

1. Wap to find out the Factorial of a number using For loop, While loop, Do while loop.

2. Wap to find out the square root of a number without using any library function?

3. Wap to find out whether a number is palindrome or not?

4. Write a program to print the kth digit from last. e.g. input 23617 and k=4 output 3.
5. Write a program to find the sum of all digits. Input 23617 output 2+3+6+1+7=19.
Aim: To study Arrays in java
1. Find the smallest and largest number in an array.
2. Count even numbers in an array.
3. Count occurrence of a given number in an array.

Aim: To study interface in java
1. WAP to find out the factorial of a number using the interface ?
2. WAP to find out the greatest among three numbers using the interface?
3. WAP to find out gcd and lcm using the interface ?
4. WAP to find out area and perimeter of rectangle using interface ?
Aim: To study packages in JAVA
WAP to check whether a number is palindrome or not using a package ?
WAP to find out square root of a number without using sqrt or pow function and use packages
WAP to check whether a number is prime or not using a package ?

Unit II:
Object Oriented Programming
Aim: To study classes and objects in JAVA
1. WAP to find out the area of a triangle having three sides using class?
2. WAP to find out the volume of a box using class ?
3. WAP to find out the area and perimeter of a rectangle ?
4. WAP to insert 10 no into stack using push operation and delete 2 elements using pop and display rest using class ?
Aim: To study methods, method overloading , constructors in java
1. WAP to find out the area of a triangle,rectangle,square and circle using method overloading and constructor overloading.
2. Write a JAVA program which contains a method square() such that square(3) returns 9, square(0.2) returns 0.04.
3. Write a JAVA program which contains a method cube() such that cube(3) returns 27, cube(0.2) returns 0.008.
4. Write a JAVA program which contains a method fun() such that fun(x) returns x and fun(x,y) returns x ² +y ² (where x and y are integers).
5. Write a JAVA program which contains a method fun() such that fun(x) returns x and fun(x,y) returns x + y and fun(x,y,z) returns x*y*z. (where x, y and z are integers).
6. Write a set of overloaded methods min() that returns the smaller of two numbers passed to them as arguments. Make versions for int and float.
Aim: To study Inheritance and types of inheritance in java

- | |
|--|
| 1. WAP to find out the volume of a box using simple inheritance ? |
| 2. WAP to find out volume, cost and weight of a box using multilevel inheritance ? |
| 3. WAP to find out volume, cost and weight of a box using multilevel inheritance and use super keyword at appropriate place? |

Unit III. Multithreading and Exception Handling Thread:

Aim: To study exception handling in JAVA

- | |
|---|
| 1. WAP to create your own Exception to check whether a number is Prime or not, Palindrome or not, even or odd. |
| 2. WAP to illustrate Arithmetic Exception, ArrayIndexOutOfBoundsException using nested Try Block with suitable example? |
| 3. WAP to detect and resolve divide by zero error using Exception with suitable example? |

Unit- IV: Multithreading

Aim: To study threads and multithreading in java

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|--|
| 1) WAP to perform following using Multithreading i) Sort 10 numbers in ascending order |
| ii) Find Avg. of 10 numbers |
| Search a number in an array |
| 2) WAP to detect and resolve deadlock using suitable examples? |
| 3) WAP to illustrate the need of synchronization using suitable examples? |

Unit- IV: Graphics Programming

Aim: To study java AWT

Program to set the background color of the panel using the color specified in the constants of the class.

Aim: To study swings in java

Create an applet for arithmetic operations.

Aim: Create a application to connect JDBC application to JDBC

Semester –IV

Course Code: ITY23PCP254 Course Name: Digital Image Processing - Laboratory Course Category: PCC
Credits:1 Teaching Scheme: P-2 Hrs/week Evaluation Scheme: TW- 30, PR- 40
Pre-requisites: signals and systems, Basic programming skills
Lab Objectives: This course will enable students to
1. To master image processing programs utilizing point processing methods for operations like obtaining negative images, flipping images, thresholding, and contrast stretching.
2. To develop proficiency in implementing image arithmetic operations, including addition, subtraction, mean value calculation, and brightness adjustment, for image manipulation and enhancement.
3. To understand and apply histogram calculation and equalization techniques to analyze and improve image contrast and visual quality.
Lab Outcomes: At the end of the course, the students will be able to -
LO1 Execute image processing programs effectively, achieving tasks such as obtaining negative images, flipping images, thresholding, and contrast stretching with precision.
LO2 Demonstrate expertise in performing image arithmetic operations, including addition, subtraction, mean value calculation, and brightness adjustment, resulting in enhanced and manipulated images as per specific requirements.
LO3.Acquire the skills necessary to calculate histograms and perform histogram equalization, leading to improved contrast and visual quality in images, thereby enhancing their understanding and application of image enhancement techniques.

List of Experiments

Sr.No	Name of Experiment
1	To write and execute image processing programs using point processing method a. Obtain Negative image b. Obtain Flip image c. Thresholding d. Contrast stretching
2	To write and execute programs for image arithmetic operations a. Addition of two images b. Subtract one image from other image c. Calculate mean value of image d. Different Brightness by changing mean value
3	Write a program for histogram calculation and equalization.
4	Perform noise removal using different spatial filters and compare their performances.
5	To write and execute program for geometric transformation of image a. Translation b. Scaling c. Rotation

	d. Shrinking e. Zooming
6	Apply Smoothing, Sharpening Spatial domain kernels on Images for Enhancement.
7	Apply low pass and high pass frequency domain filters on Images for Enhancement.
8	Demonstration of Thresholding and Region Based Image Segmentation Methods.
9	Write and execute a program for image morphological operations erosion and dilation.
10	Case study : Group of 2-3 Students should study recent international journal research papers and present case study

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Semester –IV

Course Code: ITY23VSP251 Course Name: Advanced Python Course Category: VSEC
Credits: 2 Teaching Scheme: P- 4 Hrs/week Evaluation Scheme: TW-30, PR- 20
Pre-requisites: Fundamentals of python programming logic
Lab Objectives: This course will enable students to
1. To give idea about the functions in Python
2. To get acquainted with OOP concepts, modules and packages in Python
3. To familiarize with MySQL and Python connectivity.
4. Creating application using TKinter and Flask
Lab Outcomes: At the end of the course, the students will be able to -
LO1. Student can use the functions in Python
LO2. Student can implement with OOP concepts, modules and packages in Python
LO3. Student can connect MySQL with Python
LO4. Student can create application using TKinter and Flask

Contents–

Unit	Content	Teaching Hours
1	Functions in Python - Built-In functions, User Defined functions, scope, Flow of Execution , Arguments and Parameters , Default Arguments, Named Arguments, Scope of Variables , Lambda function. MAP, ZIP, REDUCE, FILTER, ANY, CHR, ORD, SORTED, GLOBALS, LOCALS, (ALL Built in Functions)	6
2	Object Oriented Programming - Introduction to OOP concepts, Classes and objects, Inheritance and polymorphism, Encapsulation and abstraction, Class methods and static methods, packages	6
3	Exception Handling in Python - Understanding exceptions, Handling exceptions using try-except blocks, Multiple except blocks and else clause, Using finally block for cleanup	6
4	File Handling in Python - Working with binary files, Reading and writing CSV files, JSON serialization and deserialization, Exception handling in file operations	6
5	Application Development using TKinter, Flask and MySQL - Introduction to MySQL, CRUD Operations, GUI: Tkinter programming, Tkinter widgets, Frame, Button, Label, Entry.	6

	Introduction to Flask framework, Building a simple RESTful API, Handling HTTP methods and request parameters	
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Suggestive Practical List

1.Functions :

Built-In Functions: len(), print(), type(), int(), str(), max(), min(), sum(), range(), input(), lambda function, MAP, ZIP, REDUCE, FILTER, ANY, CHR, ORD, SORTED

- User Defined Functions:
- Define a function add_numbers(a, b) to add two numbers.
- Define a function square(num) to calculate the square of a number.
- Provide practical examples of each built-in function.

2. Introduction to OOP:

2. Create a class Car with attributes and methods.
3. Implement inheritance and demonstrate polymorphism.
4. Show examples of encapsulation and abstraction.
5. Implement __str__ and __add__ methods in a class.
6. Define class methods and static methods.

3. Exception Handling:

- Introduce exceptions and their types.
- Write code using try-except, multiple except blocks, else, and finally

4. File Handling:

- Read and write binary files.
- Use the csv module for file operations.
- Serialize and deserialize data using JSON.
- Implement exception handling in file operations.

5. Database Connectivity:

- Connect to MySQL, create a database, and perform CRUD operations.

6. GUI:

- Build a basic Tkinter GUI application.
- Tkinter Widgets, Frame, Button, Label, Entry
- Create an application using Tkinter and Database (MySQL)
- Create an Application using Flask and Database (MySQL)

Text Books:

1. "Python Crash Course" by Eric Matthes, (Latest edition: 2021)
2. "Fluent Python" by Luciano Ramalho (Latest edition: 2021)
3. "Head First Python" by Paul Barry (Latest edition: 2016)

Reference Books:

1. "Fluent Python" by Luciano Ramalho (Latest edition: 2021)
2. "Python Cookbook" by David Beazley and Brian K. Jones (Latest edition: 2018)

Semester –IV

Course Code: ITY23HSL252 Course Name: Entrepreneurship Development Course Category: EEMC
Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40
Duration of Theory Exam: 2 Hrs
Pre-requisites: Knowledge of Planning
Course Objectives: This course will enable students to
1. To provide an overview of entrepreneurship development, covering its evolution, concepts, role in economic development, and factors affecting it.
2. Types of Entrepreneurship: Introduce various types of entrepreneurship such as techno entrepreneurship, women entrepreneurship, social entrepreneurship, and intrapreneurship, along with the decision-making process and entrepreneurial environments.
3. To equip students with essential skills for successful entrepreneurship, including project planning, business laws, communication, creativity, problem-solving, innovation, negotiation, and risk management, while also exploring different business organizations and legal aspects in India.
Course Outcomes: At the end of the course, the students will be able to -
CO1. Develop skills related to various functional areas of management (Marketing Management, Financial Management, Operations Management, Personnel Management etc.)
CO2. To develop skills related to Project Planning and Business Plan development.
CO3. To determine and compare various skills of successful entrepreneurs, business organizations and business laws.
CO4.To examine essentials to avoid failure in Entrepreneurship.

Contents–

Unit	Content	Teaching Hours
1	Introduction - Entrepreneurship Development, Evolution of Entrepreneurship, Meaning, Definition, and Concept of Enterprise, Concepts of Entrepreneurship, Role of Entrepreneurship in Economic Development, Factors Affecting Entrepreneurship, Entrepreneurial Development models and Theories, Entrepreneurial Trait Tests; Business Opportunity Identification.	8

2	Entrepreneur- Major types of Entrepreneurship – Techno Entrepreneurship, Women Entrepreneurship, Social Entrepreneurship, Intrapreneurship (Corporate entrepreneurship), Rural Entrepreneurship, Family Business etc. The entrepreneurial decision process, Entrepreneurial Environment – Political, Legal, Technological, Natural, Economic, Socio – Cultural etc.	7
3	Project Planning - Project Planning, Skills for Successful Entrepreneurs & Business Organizations and Business Laws: Project report; Project appraisal; Setting up an Industrial unit – procedure and formalities in setting up an Industrial unit; Business Plan Development, Communication Skills, Creativity and Problem-solving, Innovation, Negotiation Skills, Risk management. Types of Business Organizations –Sole, Proprietorship, Joint Hindu Family Business, Partnership, Limited Liability Partnership (LLP), Corporate Governance, Franchising, Business Laws in India to Start Business.	8
4	Concepts of Entrepreneurship Failure - Issues of Entrepreneurial failure, Reasons of Entrepreneurial Failure, Essentials to Avoid Failure in Entrepreneurship. Case Study of Failure in Entrepreneurship.	7

Text Books:

1. Dynamics of Entrepreneurship Development – Vasant Desai.
2. Entrepreneurship Development and small business management – Poornima M. Charantimath
3. Dynamics of Entrepreneurship Development – Vasant Desai.
1. Innovation and Entrepreneurship – Peter F. Drucker
2. Kathleen R Allen, Launching New Ventures, An Entrepreneurial Approach, Cengage Learning, 2016.
3. Vijay Sathe, Corporate Entrepreneurship, Cambridge, 2009.

Semester –IV

Course Code: MGM21VEL101 Course Name: Environmental Studies Course Category: Basic Science
Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40
Duration of Theory Exam: 2 Hrs
Pre-requisites: Basic Science
Course Objectives: This course will enable students to
1. To study the environment and ecosystems.
2. To study different types of natural resources
3. To study concept of biodiversity and its conservation
4. To study the concept of causes, effects and control of different types of environmental pollution
5. To study population growth and its impact on environment
Course Outcomes: At the end of the course, the students will be able to -
CO1. Describe environment and ecosystem
CO2. Explain environmental impacts of human activities on natural resource
CO3. Identify the importance of conservation of biodiversity.
CO4. Describe the problems of environmental pollution, its impact on human and ecosystem and control measures
CO5. Identify the impact of increased population on environment

Contents–

Unit	Content	Teaching Hours
1	Ecosystem and the Environment - a. Definition, Scope and importance of Environmental studies, Need for Public awareness. b. Concepts of an Ecosystem, Structure and functions of an Ecosystem. a. Producers, Consumers and Decomposers in an Ecosystem	6
2	Natural Resources - a. Renewable and non-renewable resources, Role of individuals in conservation of natural resources for sustainable lifestyles.	6

	a. Use and over exploitation of Forest resources, Deforestation, Timber extraction, Mining, Dams and their effects on forest and tribal people b. Use and over exploitation of surface and ground water resources, Floods, Drought, Conflicts over water, Dams- benefits and problems.	
3	Biodiversity and its Conservation - a. Definition, Genetic, Species and Ecosystem diversity, Bio-geographical classification of India. b. Value of biodiversity: Consumptive use, Productive use, Social, Ethical, Aesthetic and option values.	6
4	Environmental pollution- a. Definition, Causes, effects and control measures of Air pollution. Water pollution and Soil pollution. b. Causes, effects and control measures of Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards	6
5	Population issues and the Environment - a. Population growth, Variation among nations, Population explosion- Family welfare programmes, Environment and Human health, Human rights, Value education, HIV/AIDS. b. Woman and Child welfare, Role of information technology in environment and human health, Case studies	6

Text Books:

1. Bharucha Erach (ed) Text Book of Environmental Studies., University Press (India) Pvt. Ltd
2. Bharucha Erach, 2003. The Biodiversity of India, Mapin Publishing Pvt. Ltd, Ahmedabad – 380013
3. Kaushik, Anubha & Kaushik, C.P. 2006. Perspectives in Environmental Studies, New Age International (P) Ltd. Publisher, New Delhi
4. Deswal, S. and Deswal, A. 2005. A Basic Course in Environmental Studies. Dhanpat Rai & Co ltd., Delhi.

Reference Books:

1. IndiaSantra S.C, (ed), Environmental Science, New Central Agency Pvt Ltd. Kolkata, India.
2. Botbin, D., and Keller, E.1995. Environmental Science. John Wiley and Sons, USA.
3. Cunningham, W.P. and Saigo, B.W. 1997. Environment Science. McGraw-Hill, USA.
4. Lal, R. and Stewart, B.A. 1992. Advances in Science: Soil Restoration Springer Verlag, New York.

Semester-V

Course code: ITY23PCL301	Course name: Design and Analysis of Algorithms	Course category: PCC
Credits: 3	Teaching scheme: L-3 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Duration of Theory Exam: 2 Hrs		
Pre-requisites: 1. Knowledge of C programming, Data Structures		
Course Objectives:		
1. To learn fundamentals of algorithm design techniques.		
2. To understand basic knowledge of computational complexity, approximation and randomized algorithms, selection of the best algorithm to solve a problem.		
3. To design and analyse the performance of algorithms and to compare algorithms with respect to time and space complexity.		
4. 4. To develop proficiency in problem solving and programming		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Gain understanding of concepts of time and space complexity in terms of worst, average and best case using Asymptotic Notations.		
CO2: Design standard algorithms such as sorting, searching, problems involving graphs etc. using various design techniques and compute complexity measures of these algorithms.		
CO3: Design algorithms for optimization problems.		

Contents –

Unit	Content	Teaching hours
1	Introduction- Fundamental concepts of algorithm: characteristics, Specifications; Frequency count and its importance in analysis of an algorithm; Asymptotic Notations, Time complexity & Space complexity of an algorithm; Sorting methods: bubble, insertion, heap sort. Analysis of each sorting technique for best, worst and average cases	8
2	Divide and Conquer - The general method, Binary Search, finding the maximum and minimum, Merge Sort, Quick Sort, selection and Strassen's matrix multiplication.	8
3	Greedy Method - The general method, optimal storage on tapes, Knapsack problem, Job sequencing with deadlines, Optimal merge patterns, Minimum spanning trees, Single source shortest paths.	8
4	Dynamic Programming and Traversal Techniques - The general method, Multistage graphs, All pairs shortest paths, 0/1 Knapsack, The Travelling salesman problem. Tree traversal techniques, Graph traversal techniques: DFS, BFS, connected components, Bi-connected components & spanning trees	8
5	Backtracking - The general Method, The 8-Queens Problems, Sum of subsets, Graph coloring. Hamiltonian cycles.	8

Text Books: 1. E. Horowitz, S. Sahni and S. Rajasekaran, "Computer Algorithms", Silicon Press, 2nd Edition, 2008.
2. Thomas Cormen, Charles Leiserson, Ronald Rivest and Clifford Stein, "Introduction to Algorithms", MIT Press, 3rd Edition, 2009

Reference Books: 1. B. K. Joshi, "Data Structures and Algorithms in C++", Tata McGraw Hill Education, 2010.

2. G. T. Heineman, Gary Pollice, Stanley Selkow, “Algorithms in a Nutshell”, Shroff Publication, 1st Edition, 2008.

Online Resources: 1. NPTEL / SWAYAM lectures.

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Semester-V

Course code: ITY23PCL302	Course name: Machine Learning.	Course category: PCC
Credits: 2	Teaching scheme: L-2 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Duration of Theory Exam: 2 Hrs		
Pre-requisites:		
1. Probability and statistics		
2. Linear Algebra		
3. Basics of Programming		
Course Objectives:		
1. To understand human learning aspects and relate it with machine learning concepts.		
2. To understand the nature of the problem and apply machine learning algorithms.		
3. To find optimized solutions for a given problem.		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Distinguish different learning based applications		
CO2: Apply different preprocessing methods to prepare training data set for machine learning		
CO3: Design and implement supervised and unsupervised machine learning algorithms.		
CO4: Implement different learning models		
CO5: Learn Meta classifiers and deep learning concepts		

Contents –

Unit	Content	Teaching hours
1	Introduction to Machine Learning - What Is Machine Learning? Machine Learning Applications, Learning Associations, Classification, Regression, Unsupervised, Reinforcement, Supervised Learning, Classic and adaptive machines, Machine learning matters.	6
2	Feature Selection - Scikit-learn Dataset, Creating training and test sets, managing categorical data, Managing missing features, Data scaling and normalization, Feature selection and Filtering, Principal Component Analysis (PCA)-non negative matrix factorization, Sparse PCA, Kernel PCA. Atom Extraction and Dictionary Learning	6
3	Regression- Linear regression- Linear models, A bi-dimensional example, Linear Regression Robust regression with random sample consensus, Polynomial regression, Isotonic regression Logistic regression- Linear classification, Logistic regression, Implementation and Optimizations, Stochastic gradient descent algorithm.	6
4	Naïve Bayes and Support Vector Machine - Naïve Bayes Theorem, Naïve Bayes' Classifiers, Naïve Bayes in Scikit-learn- Bernoulli Naïve Bayes, Multinomial Naïve Bayes, and Gaussian Naïve Bayes. Support Vector Machine (SVM)- Linear Support Vector Machines, Scikit-learn implementation Linear Classification, Kernel based classification, Non-linear Examples. Controlled Support Vector Machines, Support Vector Regression.	6
5	Decision Trees and Clustering Techniques - Decision Trees- Impurity measures, Feature Importance. Decision Tree Classification with Scikitlearn, Ensemble Learning-Random Forest, Voting Classifier. Clustering Fundamentals- Basics, K-means: Finding optimal number of	6

clusters, Hierarchical Clustering, Expectation maximization clustering, Agglomerative Clustering Dendrograms, Agglomerative clustering in Scikit-learn.

Text Books: 1. Giuseppe Bonaccorso, "Machine Learning Algorithms", Packt Publishing Limited, ISBN10: 1785889621, ISBN-13: 978-1785889622

2. Josh Patterson, Adam Gibson, "Deep Learning: A Practitioner's Approach", O'REILLY, SPD, ISBN: 978-93-5213-604-9, 2017 Edition 1st

3. George B. Thomas, Ross L. Finney, Calculus and Analytic Geometry, 9th edition, Pearson.

Reference Books: 1. Ethem Alpaydin, "Introduction to Machine Learning", PHI 2nd Edition-2013, ISBN 978-0-262-01243-0

2. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make

Online Resources: 1. NPTEL / SWAYAM lectures.

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Semester-V

Course code: ITY23PCL303	Course name: Database Management Systems	Course category: PCC
Credits: 2	Teaching scheme: L-2 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Duration of Theory Exam: 2Hrs		
Pre-requisites: No prerequisite is required, however having knowledge on Set Theory will help.		
Course Objectives:		
1. To understand architecture and functioning of database management systems.		
2. To learn relational mode.		
3. To use structured query language (SQL) and its syntax, transactions, database recovery and techniques for query optimization.		
4. To acquaint with various normalization forms and query processing.		
5. To learn indexing methods		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Implement the underlying concepts of database technologies		
CO2: Design and normalize database schema for a given problem-domain		
CO3: Populate, query and enforce integrity constraints on databases using commands.		
CO4: Apply basics of transaction management.		

Contents –

Unit	Content	Teaching hours
1	Introduction to DBMS and ER Model - Introduction, An Example of Database, Characteristics of Database Approach, Actors on the Scene Workers behind the Scene, Data models ER Model Entity Types, Entity sets, Attributes, Keys, Relationship Types, S Relationship Sets, Roles, Structural Constraints, Strong and Weak entity types, E-R diagram: Naming Conventions, The Enhanced ER Model: Subclasses, Super classes and Inheritance , Specialization and Generalization, Union Types using Categories, Data Abstraction.	8
2	Structured Query Language - SQL Data Definition and Data Types, Specifying Constraints in SQL, INSERT, DELETE, and UPDATE Statements in SQL, DDL, Tables: creating, modifying, deleting Views: creating, dropping, Updation using views, DML, Operators, SQL DML queries, SELECT, Set operations, Predicates and joins, Set membership, Tuple variables, Set comparison, Ordering of tuples, Aggregate functions, Nested queries, Integrity Constraints, Triggers	8
3	Normalization - Normalization, Functional Dependencies, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Properties for Relational Decompositions: Relation, Dependency Preservation, Property of a Decomposition, Multi-valued Dependencies and 4NF.	8
4	Transaction Management and Concurrency control - Introduction to Transaction Processing ACID Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability, Concurrency Control, Concurrency Control Based on Lock Based Protocol, Deadlock Handling, Multiple Granularity, Timestamp Based Protocol, Validation Based Protocol.	8

Text Books: 1. Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, “Database System Concepts”, McGraw Hill Education, 6th Edition, 2011.

2. Ramez Elmasri and Shamkant B. Navathe, “Fundamental Database Systems”, Pearson Education, 7th Edition, 2015.

Reference Books: 1. Carlos Coronel, Steven Morris “Database systems: Design Implementation and Management”, Cengage Learning Press, 11th Edition, 2014.

2. J. Murach, “Murach’s MySQL”, Shroff Publication, 2nd Edition, 2016.

Online Resources: 1. NPTEL / SWAYAM lectures.

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Semester-V

Course code: ITY23PCL304	Course name: Geographical Information Systems	Course category: PCC
Credits: 2	Teaching scheme: L-2 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Duration of Theory Exam: 2Hrs		
Pre-requisites: Basic Geographical concepts.		
Course Objectives:		
1. To learn basics of GIS		
2. To understand Spatial data modeling and Database		
3. To Understand GIS data Analysis		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Understand basic concepts of GIS		
CO2: Model Spatial data and Database		
CO3: Apply various Analysis Techniques on GIS data		

Contents –

Unit	Content	Teaching hours
1	GIS – An Overview- Introduction, Defining GIS, Components of GIS, Spatial Data, Maps & their Influence on the Character of Spatial Data, Thematic Characters, Other Sources of Spatial Data.	6
2	Spatial Data Modeling and Database Management - Spatial Data Modeling, Entity Definition, Spatial Data Models, Spatial Data Structures, Modeling Surfaces Modeling, Networks, Building, Computer Worlds, Modeling the Third and Fourth Dimension.	6
3	Database Management and Data Editing - Database Approach, Attribute Data in GIS, Relational Model, Attribute Data Entry, Manipulation of Fields and Attribute Data, GIS Database Applications, Web GIS, Developments in Databases, Data Input and Editing, Methods of Data Input, Data Editing, Integrated Database.	6
4	Data Analysis- Measurements in GIS-Lengths, Perimeters, Areas, Queries, Reclassification, Buffering and Neighborhood Functions, Map Overlay, Spatial Interpolation, Analysis of Surfaces, Network Analysis.	6
5	Modeling and Output- Analytical Modeling in GIS, Modeling Physical and Environmental Processes, Modeling Human processes, Modeling the Decision-Making Process, Output: from New Maps to Enhanced Decisions, Maps as Output, Non-Cartographic Output, Spatial Multimedia, Mechanisms of Delivery, GIS and Spatial Decision Support.	6

Text Books: 1. Ian HeyWood, Sarah Cornelius Steve Carver, “An Introduction to Geographical Information Systems”, Pearson Education, Second Edition

2. Kang-tsung Chang, “Introduction to Geographic Information Systems”, Tata McGrawHill, Fourth Edition.

Reference Books: 1. Peter A. Burrough, Rachael A. McDonnell, “Principles of Geographical Information System”, Oxford University Press.

2. . Keith C. Clarke, Bradley O. Parks, Michael P. Crane, “Geographical Information Systems and Environmental Modeling”, Prentice-Hall India.

Online Resources: 1. NPTEL / SWAYAM lectures.
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Semester-V

Course code: ITY23PCP301	Course name: Design and Analysis of Algorithms - Lab	Course category: PCC
Credits: 1	Teaching scheme: P-2 Hrs/Week	Evaluation scheme: TW–30, PR–20
Pre-requisites: Knowledge of any programming language		
Lab Objectives:		
1.To familiarize students with different algorithm design paradigms, including divide and conquer, greedy, dynamic programming, backtracking, and branch-and-bound.		
2.To enhance problem-solving skills by solving real-world problems through appropriate algorithmic approaches.		
Lab Outcomes: At the end of the course, the students will be able to		
LO1: Design algorithms using various strategies to solve computational problems effectively.		
LO2: Demonstrate the ability to implement algorithms efficiently in a programming language of their choice.		
LO3: Apply algorithms to solve real-world problems in domains such as sorting, searching, graph traversal, and optimization.		
LO4: Develop critical thinking skills to select the most appropriate algorithm for a given problem based on its constraints and requirements.		

List of Experiments

1. Program to implement Heap sort.
2. Program to implement Insertion, bubble and selection sort.
3. Program to implement binary search algorithm using DnC method.
4. Program to implement maxmin algorithm using DnC method.
5. Program to implement merge sort algorithm using DnC method.
6. Program to implement a quick sort algorithm using DnC method.
7. Program to implement knapsack problem using greedy method.
8. Program to implement Job Sequencing with Deadlines using greedy method.
9. Program to implement Prim's/Kruskal's Algorithm using Greedy method.
10. Program to implement graph traversal technique: BFS.
11. Program to implement graph traversal technique: DFS.

Semester-V

Course code: ITY23PCP302	Course name: Machine Learning Lab	Course category: PCC
Credits: 1	Teaching scheme: P-2 Hrs/Week	Evaluation scheme: TW-30, PR-20
Pre-requisites:		
1. Probability and statistics		
2. Linear Algebra		
3. Basics of Programming		
Lab Objectives:		
1. To familiarize students with the basic concepts, terminologies, and methodologies of machine learning.		
2. To enable students to implement and experiment with supervised, unsupervised, and reinforcement learning algorithms.		
3. To equip students with the ability to evaluate machine learning models using appropriate performance metrics.		
Lab Outcomes: At the end of the course, the students will be able to -		
LO1: Demonstrate proficiency in handling and preprocessing datasets for machine learning tasks.		
LO2: Evaluate models using metrics such as accuracy, precision, recall, F1-score, and mean squared error and interpret their results.		
LO3: Apply machine learning algorithms to solve real-world problems and develop solutions that generalize well.		
LO4: Optimize the performance of machine learning models by tuning hyperparameters effectively.		

List of Experiments

1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Bayes rule in python to get the result.
2. Extract the data from the database using python.
3. Implement k-nearest neighbours classification using python.
4. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k means clustering with 3 means (i.e., 3 centroids) VAR1 VAR2 CLASS 1.713 1.586 0 0.180 1.786 1 0.353 1.240 1 0.940 1.566 0 1.486 0.759 1 1.266 1.106 0 1.540 0.419 1 0.459 1.799 1 0.773 0.186 1
5. Implement linear regression using python.
6. Implement Naïve Bayes theorem to classify the English text
7. Implement the Naïve Bayes Classifier using https://archive.ics.uci.edu/ml/datasets/Gait+Classification dataset
8. Implement an algorithm to demonstrate the significance of genetic algorithm

9. Implement the finite words classification system using Back-propagation algorithm

10. Project - (in Pairs) Your project must implement one or more machine learning algorithms and apply them to some data.

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Semester-V

Course code: ITY23PCP303			Course name: Database Management System - Lab			Course category: PCC		
Credits: 1			Teaching scheme: P-2 Hrs/Week			Evaluation scheme: TW-30, PR-20		
Pre-requisites:								
1. Basic Programming Knowledge								
2. Understanding of Data Structures								
Lab Objectives:								
1. To introduce students to the foundational concepts of databases, including data modeling, database architecture, and relational algebra.								
2. To enable students to write, execute, and debug SQL queries for data definition, data manipulation, and data control.								
3. To provide hands-on experience in using popular DBMS tools and platforms, such as MySQL, PostgreSQL, or Oracle.								
Lab Outcomes: At the end of the course, the students will be able to -								
LO1: Demonstrate the ability to design and develop relational database schemas using Entity-Relationship (ER) modeling techniques.								
LO2: Write and execute SQL queries for data definition, data manipulation, and data control, including complex queries using joins, subqueries, and aggregations.								
LO3: Perform basic database administration tasks such as backup, restore, and user privilege management.								
LO4: Gain proficiency in using database management tools like MySQL Workbench, PostgreSQL, SQL Server Management Studio, or Oracle SQL Developer.								

List of Experiments

1. Study of E-R Diagram
2. Study of Data Definition Language command
3. Study of Data Manipulation Language
4. Study of data communication using SQL functions.
5. Writing subqueries in join operation
6. Creation of triggers.
7. Creating Views
8. Writing and Executing PL/SQL block
9. Study of GRANT and REVOKE DBA commands
10. Normalization in oracle

Semester-V

Course code: ITY23PEL301	Course name: Basics of blockchain	Course category: PEC
Credits: 3	Teaching scheme: L-3 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Duration of Theory Exam: 2Hrs		
Pre-requisites:		
1. Data Structure and Files		
2. Expertise in Programming		
3. Database Management Systems, Cryptography		
Course Objectives:		
1. To explain what blockchain is and how it works.		
2. To describe how bitcoin operates and how it relates to blockchain		
3. To explore consensus algorithms		
5. To learn about Hyperledger and Ethereum		
6. To describe other applications of blockchain		
7. To articulate and describe the limitations of blockchain		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Explore major components of blockchain		
CO2: Describe Cryptocurrency, Bitcoin and its operations		
CO3: Describe bitcoin's consensus algorithms		
CO4: Distinguish Hyperledger and Ethereum platform		
CO5: Evaluate potential blockchain use cases from business, legal and engineering perspective		

Contents –

Unit	Content	Teaching hours
1	Introduction - Brief history and overview of Blockchain, Decentralization, ledgers, distributed ledgers, how blockchain differs from traditional databases, consensus, Fundamentals of Block in a Blockchain, Transactions-Distributed Consensus, Cryptographic -Hash Function, Properties of a hash function-Hash pointer, Types of Blockchain- Public vs. Private blockchains and Permissioned vs. Permissionless blockchains	9
2	Bitcoin and Cryptocurrency - A basic crypto currency, decentralized nature of and role of cryptography in securing transactions, Creation of coins, Payments and double spending, Bitcoin basics, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay, Consensus introduction, Distributed consensus in open environment and consensus in bitcoin network	9
3	Bitcoin Consensus - Bitcoin consensus, Proof of Work (PoW), Bitcoin PoW, Attacks on PoW (51% attack and double spending), monopoly problem, -Alternatives to PoW-Proof of	9

	Stake(PoS), Proof of Burn, proof of Elapsed Time- Bitcoin Miner, Mining Difficulty, Mining Pool etc. consensus in permissioned blockchain - Practical Byzantine Fault Tolerance(PBFT)	
4	Hyperledger Fabric and Ethereum - Architecture of Hyperledger fabric, Introduction to Hyperledger fabric, the plug and play platform and mechanisms in permissioned blockchain Ethereum- Ethereum Network, EVM, Transaction fees, Ether, Gas, Solidity, Smart Contracts, Distributed Applications (DApps), Decentralized Autonomous Organizations(DAO)	9
5	Blockchain Uses - When to use Blockchain (Limitations and Misconceptions), blockchain in healthcare- - Medical Record Management System, Supply chain Management, Internet of Things, Blockchain Security etc.]	9

Text Books: 1. Draft version of “S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, ‘Blockchain Technology: Cryptocurrency and Applications’, Oxford University Press, 2019.

2. Josh Thompson, ‘Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming’, Create Space Independent Publishing, Platform, 2017.

3. Kevin Werbach, The Blockchain and the New Architecture of Trust

Reference Books: 1. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks by Bashir, Imran, 2017.

2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.

3. Andreas Antonopoulos, The Internet of money, 2016 & Mastering Bitcoin

4. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and Cryptocurrency IEEE Symposium on security and Privacy, 2015

5. Wattenhofer, The Science of the Blockchain

6. Blockchain: The next Everything by Stephen P. Williams

7. Paul Vigna and Michael J. Casey, The age of Cryptocurrency, 2015

Online Resources: 1. NPTEL / SWAYAM lectures.

1. <https://nptel.ac.in>

2. <https://www.coursera.org>

3. <https://ocw.mit.edu/courses/15-s12-blockchain-and-money-fall-2018/>

4. Youtube: <https://www.youtube.com/watch?v=EH6vE97qIP>

Semester-V

Course code: ITY23PEL302 Course name: Microprocessor, Microcontroller and IOT devices Course category: PEC		
Credits: 3	Teaching scheme: L-3 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Duration of Theory Exam: 2Hrs		
Pre-requisites: Digital logic Design		
Course Objectives:		
1. To Understand Microprocessor Basics		
2. To Understand Assembly Language Programming		
3. To study of Microcontroller Architecture and Organization		
4 To study of IoT Fundamentals		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Understand Microprocessor Architecture		
CO2: Apply instruction set knowledge for writing programs		
CO3: Interface various peripherals with microprocessor and microcontroller		
CO4: Understand the basic concepts and principles of the Internet of Things.		

Contents –

Unit	Content	Teaching hours
1	Architecture of 8085 - Microprocessor and Programming: Functional Block Diagram, Registers, ALU, Bus systems, Timing and control signals, Machine cycles and timing diagrams. Instruction formats, Addressing modes, Instruction set, Need for Assembly language, Development of Assembly language programs	9
2	Interfacing: Memory Interfacing - Interface requirements; Address space partitioning, Buffering of Buses, timing constraints, Memory control signals, Read and write cycles, interfacing SRAM, EPROM and DRAM sections. I/O Interfacing: Memory mapped I/O Scheme, I/O mapped I/O scheme, Input and Output cycles, Simple I/O ports, Programmable peripheral interface (8255). Data transfer schemes: Programmable data transfer, DMA data transfer, Synchronous, Asynchronous and interrupt driven data transfer schemes, Interfacing, Simple keyboards and LED displays.	9
3	Interrupts and DMA- Interrupt feature, Need for interrupts, Characteristics of Interrupts, Types of Interrupts, Interrupt structure, Methods of servicing interrupts, Development of Interrupt service subroutines, Multiple interrupt request and their handling, need for direct memory access, Devices for Handling DMA, Programmable DMA controller 8237, Applications of microprocessors.	9
4	Intel 8051 Microcontroller - Architecture of 8051, Memory Organization, Addressing modes, Instruction set, Boolean processing, Simple programs.	9
5	IOT device- Fundamentals of IoT: Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M	9

Text Books: 1. Gaonkar, R.S., “Microprocessor Architecture Programming and Applications with the 8085/8080A, 3rd Edition, Penram International Publishing House, 1997.

Reference Books:

1. Singh. I.P., “Microprocessor Systems”, Module 9: Microcontrollers and DR. BABASAHEB MBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE INSTRUMENTATION ENGINEERING their Applications”, IMPACT Learning Material Series IIT, New Delhi, 1997.

2. Douglas, V. Hall. “Microprocessor and Interfacing Programming and Hardware”, 2ndEdition, McGraw Hill Inc., 1992.

3. Kenneth, L. Short., “Microprocessors and Programmed Logic”, Prentice Hall of India, 2nd Edition, 1987.
Hakima Chaouchi, — “The Internet of Things Connecting Objects to the Web” ISBN : 978-1- 84821-140-7, Wiley Publications

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Semester-V

Course code: ITY23PEL303	Course name: Introduction to Big Data	Course category: PEC
Credits: 3	Teaching scheme: L-3 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Duration of Theory Exam: 2Hrs		
Pre-requisites: Any Programming Language (Java preferably), DBMS		
Course Objectives:		
1. To understand the Big Data Platform and its Use cases		
2. To provide HDFS Concepts and Interfacing with HDFS		
3. To understand Map Reduce Jobs		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Understand the key issues in big data management		
CO2: Demonstrate knowledge of big data concepts, technologies, and applications		
CO3: Understand of Big Data Architecture		
CO4: Apply technical skills in data processing, modelling, and analysis using various tools and frameworks.		
CO5: Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics		

Contents –

Unit	Content	Teaching hours
1	Fundamentals of Big Data - What is Big data? Characteristics of big data and its role in current world, Types of Big Data: Defining Unstructured, Semi-Structure and Structured Data, Technologies being Used to handle and process Big data, Five V's of big data, Big data challenges, Fallbacks of traditional RDBMS in handling and processing Big data, Some Real-world Examples to adopt in major industries	9
2	Understanding Hadoop Ecosystem- What is Hadoop? Hadoop Key Characteristics, Differences between RDBMS & Hadoop, Brief History of Hadoop, Hadoop Ecosystem (Version 1.x & 2.x), Hadoop commands, Components of Hadoop (Version 2.x): HDFS & MapReduce, Architecture of HDFS & Map Reduce, Basic Operations to store and access from HDFS via Command Line, Phases in MapReduce Algorithm, YARN architecture, YARN advantages.	9
3	Introduction to Apache Pig -Pig Architecture, Modes of Pig Execution, Operations in Pig: Intro to Pig Latin, Pig Latin Data types, Basic Pig Latin Statements: Loading and Storing Data, Relational and Arithmetic Operators, Debugging Techniques (Dump, Describe, Explain etc.)	9
4	Introduction to Apache Hive -Hive architecture, Modes of Hive Execution, Operations in Hive: Intro to HiveQL, Basic HiveQL, Hive Tables (Managed Tables & External Tables), Hive Data Types and Data Models, commands: DDL Operations (creating, browsing, updating and deleting tables), DML Operations (Load, Update, Insert and delete data into Hive tables).	9
5	HBase & Sqoop - Apache HBase: HBase Architecture, HBase Vs RDBMS, HBase Shell Commands. Apache Sqoop: Sqoop Architecture, importing data: Transferring an entire	9

	table, specifying a target directory, importing only a subset of data, Incremental Uploads: Importing only new data.	
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Text Books: 1. Tom White, Hadoop: The Definitive Guide. O’reilly, Fourth Edition, 2011. 2. "Hadoop in Action" Third Edition, Chuck Lam.
Reference Books: 1. "Programming Hive", Jason Rutherglen, Dean Wampler & Edward Capriolo, O’Reilly Publication. 2. "Programming in Pig", Alan Gates, O’Reilly Publication. 3. "HBase: The Definite Guide", Lars George, O’Reilly Publication. 4. “Apache Sqoop Cookbook” Kathleen Ting, Jarek Jarcec Cecho, O’Reilly Publication.
Online Resources: 1. NPTEL / SWAYAM lectures. 1. https://cognitiveclass.ai/courses/introduction-to-hadoop 2. https://cognitiveclass.ai/courses/course-v1:BDU+BD0133EN+v1 3. https://cognitiveclass.ai/courses/hadoop-hive 4. https://cognitiveclass.ai/courses/using-hbase-for-real-time-access-to-your-big-data 5. https://cognitiveclass.ai/courses/what-is-spark Big Data Computing by PROF. RAJIV MISRA, Dept. of Computer Science and Engineering, IIT Patna. NPTEL COURSE.

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Semester-V

Course code: ITY23PEP301	Course name: Basics of Blockchain Lab	Course category: PEC
Credits: 1	Teaching scheme: P-2 Hrs/Week	Evaluation scheme: TW-30, PR-20
Pre-requisites: Distributed databases, data structures		
Lab Objectives:		
1. To understand the foundational principles of blockchain technology.		
2. To analyze the benefits and challenges of using blockchain for specific use cases.		
3. To understand how cryptocurrency transactions work, including wallets and digital signatures.		
Lab Outcomes: At the end of the course, the students will be able to -		
LO1: Explain the significance of decentralization, immutability, and cryptographic security in blockchain.		
LO2: Set up an Ethereum development environment and deploy smart contracts.		
LO3: Analyze the role of Ethereum in enabling decentralized applications (dApps).		

List of Experiments

Sr. No.	Name of Practical
1	Introduction to Blockchain
2	Understanding Blockchain use cases with real world examples
3	Studying basics of Bitcoin and Cryptocurrency
4	Studying BFT in distributed systems
5	Studying various consensus algorithms: PoW, POS, PBFT and PET
6	Studying Hyperledger Fabric and setting up environment
7	Studying Ethereum and setting up environment
8	Understanding limitations of Blockchains
9	Exploring various real world blockchain use cases
10	Understanding Blockchain for e-governance

Semester-V

Course code: ITY23PEP302	Course name: Microprocessor, Microcontroller and IoT Devices- LAB
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Course category: PEC		
Credits: 1	Teaching scheme: P-2 Hrs/Week	Evaluation scheme: TW-30, PR-20
Pre-requisites: Knowledge of digital electronics		
Lab Objectives:		
1. To provide hands-on experience with assembly language programming and interfacing techniques.		
2. To apply theoretical knowledge of microprocessors/microcontrollers in practical scenarios		
3. To understand how microcontrollers are utilized in various industrial and domestic applications		
Lab Outcomes: At the end of the course, the students will be able to -		
LO1: Write and execute assembly and embedded C programs for microprocessors and microcontrollers.		
LO2: Integrate sensors, actuators, and communication modules with microcontrollers.		
LO3: work in teams to design and implement mini-projects using microcontrollers.		

List of Experiments

Sr. No.	Name of Practical
1	Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
2	Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.
3	To perform multiplication and division of two 8 bit numbers using 8085.
4	To find the largest and smallest number in an array of data using the 8085 instruction set.
5	To write a program to arrange an array of data in ascending and descending order.
6	To convert a given Hexadecimal number into its equivalent ASCII number and vice versa using the 8085 instruction set.
7	Arduino connect with DHT sensor
8	Arduino connects with Ultrasonic sensor
9	8051 interfacing with LED, LCD, stepper motor, ADC, DAC etc.

1.

Semester-V

Course code: ITY23PEP303	Course name: Introduction to Big Data Lab	Course category: PEC
Credits: 1	Teaching scheme: P-2 Hrs/Week	Evaluation scheme: TW-30, PR-20
Pre-requisites: Basic Programming Skills		
Lab Objectives:		
1. To guide students in downloading, installing, and configuring Hadoop in different modes		
2. To introduce students to Hadoop Distributed File System (HDFS) and its basic commands.		
3. To implement real-world scenarios such as word counting, matrix multiplication, and weather data analysis using MapReduce.		
Lab Outcomes: At the end of the course, the students will be able to -		
LO1: Set up and configure virtual machines for distributed computing environments.		
LO2: Write and execute MapReduce programs to solve problems like word counting, matrix multiplication, and weather data collection.		
LO3: Develop hands-on skills for managing and analyzing large-scale data using distributed computing frameworks.		

List of Experiments:

Sr. No.	Name of Practical
1	Installation of Hadoop; Understanding different Hadoop modes.
2	Hadoop Implementation of file management tasks, such as Adding files and directories, Retrieving files and Deleting files
3	Develop a MapReduce program to calculate the frequency of a given word in a given file.
4	Develop a MapReduce program to find the grades of students.
5	Develop a MapReduce program to implement Matrix Multiplication.
6	Write a Map Reduce program to count words from a given text file.
7	Write a Map Reduce program for weather data collection.
8	Implement the following using map reduce a) Sorting b) Indexing.
9	Installation of pig latin language.
10	Instructions executions in Pig Latin Language
11	Installation of single and multi node deployment using putty.
12	Case study: Hadoop and Hive at Facebook.

Semester-VI

Course code: ITY23PCL351	Course name: Advanced Algorithms	Course category: PCC
Credits: 3	Teaching scheme: L-3 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Duration of Theory Exam: 2Hrs		
Pre-requisites: Programming in C/C++ Language, Design and Analysis of Algorithms		
Course Objectives:		
1. To study advanced data structures and algorithms for solving problems efficiently and their theoretical behavior.		
2. To study network flow algorithms, NP completeness and backtracking.		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Implement and empirically analyze advanced data-structures like B trees.		
CO2: Apply string matching algorithms.		
CO3: Develop more sophisticated algorithms using techniques like divide and conquer, dynamic programming, greedy strategy, and augmentation.		
CO4: Prove that certain problems are too hard to admit fast solutions.		
CO5: Develop algorithms using backtracking for the hard problems.		

Contents –

Unit	Content	Teaching hours
1	Advanced Data Structures - Augmenting Data Structures, Dynamic order statistics, Interval trees, B-Trees, Data Structures for Disjoint Sets Disjoint-set operations Linked-list representation of disjoint sets Disjoint-set forests, Analysis of union by rank with path compression	9
2	String Matching and Processing - The Naive string-matching algorithm, The Rabin-Karp algorithm, String matching with finite automata, The Knuth-Morris-Pratt algorithm, Suffix arrays	9
3	Approximation Algorithms - The vertex-cover problem, The traveling-salesperson problem, The set-covering problem, Randomization and linear programming, The subset-sum problem	9
4	NP Completeness - Polynomial time, Polynomial-time verification, NP-completeness and reducibility, NP-completeness proofs NP-complete problems	9
5	Network Flows - Max-flow problem, Ford Fulkerson Algorithm, Maximum flows and Minimum Cuts in a network, Bipartite Matching.	9

Text Books: 1. Cormen, T.H., Leiserson, C.E., Rivest, R. L., & Stein, C. (2010). Introduction to Algorithms. 3rd edition. Prentice-Hall of India Learning Pvt. Ltd.

2. Kleinberg, J., & Tardos, E. (2013). Algorithm Design. 1st edition. Pearson Education India.

Reference Books: 1. Basse, S., & Gleder, A. V. (1999). Computer Algorithm – Introduction to Design and Analysis. 3rd edition. Pearson Education.

2. Dasgupta, S., Papadimitriou, C., & Vazirani, U. (2017). Algorithms. 1st edition. TataMcGraw Hill.

3. Skiena, S. S. (2008). The Algorithm Design Manual. 2nd edition. Springer-Verlag London

Semester-VI

Course code: ITY23PCL352	Course name: Theory of Computation	Course category: PCC
Credits: 3	Teaching scheme: L-3 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Duration of Theory Exam: 2Hrs		
Pre-requisites: Discrete Structures and Applications		
Course Objectives:		
1. To give an overview of the formal languages, regular expressions and languages.		
2. To illustrate finite state machines to solve problems in computing		
3. To familiarize Regular grammars, context free grammar.		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Use basic concepts of formal languages of finite automata techniques		
CO2: Design Finite Automata for different Regular Expressions and Languages		
CO3: Construct context free grammar for various languages		
CO4: Solve various problems of applying normal form techniques, push down automata and Turing Machines		

Contents –

Unit	Content	Teaching hours
1	Introduction to language - Representation for Formal Languages: Functions, Relations. Set theory - Definition, Finite and infinite set, Countability of a set, Cardinality of a set, Closure of a set, Closure properties of relations. Symbols, Strings, Language. Finite State Machine. Regular Expressions and Languages: Recursive definition of regular expression, regular set, identities of regular expressions, regular expressions, examples, identity rules, regular sets properties, pumping lemma for regular sets.	9
2	Finite Automata - Finite automata (FA) - Definition of Deterministic Finite Automaton (DFA) and Non deterministic, Finite Automaton (NFA), Language acceptance by FA, Conversion of NFA to DFA, Minimization of a DFA, Conversion of NFA with ϵ to NFA without ϵ , Construction of RE equivalent to FA using Arden's Theorem. FA with output: Moore and Mealy machines -Definition, models, inter conversion between Moore and Mealy machine.	9
3	Grammars - Context Free Grammar (CFG) - Definition, Production rules, Derivation trees, Ambiguous grammar. Reduced form grammar - removal of unit productions, useless symbols, null production. Simplification of CFG, Chomsky hierarchy, Context Free Language (CFL). Normal Forms - Chomsky Normal Form (CNF), Griebach Normal Form (GNF). Regular grammar - definition, Left linear & right linear Regular Grammar. Inter conversion between left linear and right linear regular grammar. Regular grammar and Finite Automata.	9
4	Push Down Automata - Formal definition, Pushdown Automata (PDA), Deterministic Push Down Automata (DPDA), Nondeterministic Push Down Automata (NPDA), Inter conversion between PDA and CFG, closure properties of CFLs	9
5	Turing Machine - Definition and Construction of Turing Machines. Languages of TM. Types of TM. Halting Problem, Church's Turing Hypothesis, recursively enumerable sets, decidability, undecidability Post Correspondence Problem.	9

Text Books: 1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman (2007), Introduction to Automata Theory Languages and Computation, 3rd edition, Pearson Education, India.

Reference Books: 1. K. L. P Mishra, N. Chandrashekar (2003), Theory of Computer Science-Automata Languages and Computation, 2nd edition, Prentice Hall of India

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Semester-VI

Course code: ITY23PCL353	Course name: Operating Systems	Course category: PCC
Credits: 2	Teaching scheme: L-2 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Duration of Theory Exam: 2Hrs		
Pre-requisites: 1. Knowledge of Basic computer Hardware Components, Microprocessor and peripheral Components.		
Course Objectives:		
1. To study the basic concepts and functions of operating systems.		
2. To understand the structure, important system resources and their Management policies.		
3. To learn about Processes, Threads and Scheduling algorithms.		
4. To understand the principles of concurrency and Deadlocks		
5. To learn various memory management schemes.		
Course Outcomes: At the end of the course, the students will be able to -		
After learning this course students will be able to		
CO1: To understand functions, structure of OS, describe process management, memory management, file systems, input/output management.		
CO2: Concurrency and implement various process Scheduling algorithms.		
CO3: To implement deadlock prevention and avoidance algorithms.		
CO4: To compare various memory management methods, file system and IO Management.		

Contents –

Unit	Content	Teaching hours
1	Introduction: Objectives and Functions: The OS as a User/Computer Interface, OS as a Resource manager. Evolution of Operating system: Operating System Structure, System Calls and Shells	6
2	Process Management: Process concept, Process states, Process Description, PCB, CPU scheduling- Scheduling criteria, scheduling Algorithms. Thread: Process and Threads, Thread functionality, User level and Kernel Level	6
3	Process Synchronization and Deadlock: Process Synchronization Principle of concurrency, Race condition, Critical Sections/Regions, Mutual Exclusion, Sleep and wakeup Producer consumer problem, Semaphore, Monitors, Message Passing Dining Philosopher Problem, Readers and writers problem System model, Characterization, Deadlock Prevention Deadlock avoidance – Bankers Algorithm for single and multiple resources, Deadlock detection and Recovery.	6
4	File System: Overview: File, File Management System, File System Architecture, File Management Functions. File Organization and access File System Layout File Directories, File Sharing. Secondary Storage Management: File Allocation, Disk space management, File System Consistency.	6
5	Memory Management and Device Management: Memory Management Requirements: Relocation, Protection, Sharing, Logical & Physical Organization. Memory Partitioning: Fixed, Dynamic Partitioning, Buddy Systems, Relocation Fragmentation, Swapping, Managing free	6

Memory, Paging, Segmentation, Virtual Memory: Demand Paging, Page replacement Algorithms, Allocation of Frames, Thrashing, Principles of I/O Hardware, Principle of I/O software, I/O Software Layers, Disk, Disk hardware, Disk Formatting, Disk Scheduling Algorithms, Clocks.
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Text Books:

1. Abraham Silberschatz, Peter Galvin, "Operating System Concepts", 6th edition, Addison Wesley
2. Andrew S. Tanenbaum, "Modern Operating Systems", Prentice Hall 3 rd Edition
3. Andrew S. Tanenbaum, "Operating System Design & Implementation", Second Edition, Pearson Education
4. Operating systems, William Stallings, Prentice Hall, 4th Edition.

Reference Books:

1. Operating Systems, Deital H.M., Addison Wesley, Addison Wesley
2. Operating systems internals and Design Principles, William Stallings, Pearson Education. 6th Edition.
3. Milan Milenkovic, "Operating System: Concepts & design" - TMH publication
4. Dhamdhere, "Operating System -A Concept based approach" Third edition, Mc Graw Hill Publication.

Online Resources: 1. NPTEL / SWAYAM lectures.

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Semester-VI

Course code: ITY23PCP351	Course name: Advanced Algorithm - Lab	Course category: PCC
Credits: 1	Teaching scheme: P-2 Hrs/Week	Evaluation scheme: TW-30, PR-20
Pre-requisites: Programming in C/C++ Language		
Lab Objectives:		
1. To design and develop various algorithms and analyze its efficiency to a specific problem.		
Lab Outcomes: At the end of the course, the students will be able to -		
LO1: Understand how BSTs can be used for efficient data organization and retrieval.		
LO2: Understand the concept of self-adjusting trees and how they optimize access to frequently used data.		
LO3: Understand the application of greedy techniques in solving optimization problems.		

List of Experiments:

Sr. No.	Name of Practical
1	Write a programs that use both recursive and non-recursive functions for implementing the following searching methods: a) Linear search b) Binary search
2	Write programs that use recursive and non-recursive functions to traverse the given binary tree in a)Preorder b) Inorder c) Postorder
3	Write a program that reads an infix expression and converts the expression to postfix form.
4	Write a program to perform the following operations: a) Construct a binary search tree of elements. b) Search for a key element in the above binary search tree. c) Delete an element from the above binary search tree.
5	Write a program to perform the following operations: a) Insertion into a B-tree b) Searching in a B-tree.
6	Write a program to perform subset sum using recursion.
7	Write a program to perform The Naive string-matching algorithm.
8	Write a program to perform The Rabin-Karp algorithm.
9	Write a program to perform the vertex-cover problem.
10	Write a program to perform Ford Fulkerson Algorithm.
11	Write a program to find maximal Bipartite matching.

Semester-VI

Course code: ITY23PCP353	Course name: Operating Systems- Lab	Course category: PCC
Credits: 1	Teaching scheme: P-2 Hrs/Week	Evaluation scheme: TW-30, PR-20
Pre-requisites: 1. Knowledge of Basic computer Hardware Components, Microprocessor and peripheral Components.		
Lab Objectives:		
1. To introduce the core functions and components of an operating system, including process management, memory management, file systems, and scheduling.		
2. To develop the ability to write system-level programs in languages like C for simulating operating system functionalities.		
3. To understand and implement concepts like process creation, termination, synchronization, and inter-process communication (IPC)		
4. To study deadlock prevention, avoidance, and detection algorithms.		
Lab Outcomes: At the end of the course, the students will be able to -		
LO1: Implement and simulate various CPU scheduling algorithms to understand their functionality and analyze their performance		
LO2: Gain practical knowledge of process synchronization and how semaphores are used to coordinate processes in shared memory environments.		
LO3: Simulate the Dining-Philosophers problem to understand deadlock and starvation scenarios		

List of Experiments

Sr. No.	Name of Practical
1	Simulate the following CPU scheduling algorithms. a) FCFS b) SJF c) Round Robin d) Priority.
2	Write a C program to simulate producer-consumer problem using Semaphores
3	Write a C program to simulate the concept of Dining-philosophers problem.
4	Simulate MVT and MFT.
5	Write a C program to simulate the following contiguous memory allocation Techniques a) Worst fit b) Best fit c) First fit.
6	Simulate all page replacement algorithms a) FIFO b) LRU c) OPTIMAL
7	Simulate all File Organization Techniques a) Single level directory b) Two level directory
8	Simulate all file allocation strategies a) Sequential b) Indexed c) Linked.
9	Simulate Bankers Algorithm for Dead Lock Avoidance
10	Simulate Bankers Algorithm for Dead Lock Prevention.
11	Write a C program to simulate disk scheduling algorithms. a) FCFS b) SCAN c) C-SCAN

Semester-VI

Course code: ITY23PEL351	Course name: Smart Contract Elective (II)	Course category: PEC
Credits: 3	Teaching scheme: L-3 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Duration of Theory Exam: 2Hrs		
Pre-requisites:		
1. Expertise in Programming		
2. Cryptography		
Course Objectives:		
1. To introduce smart contract concepts		
2. To understand Practical use of cryptocurrency and best practices		
3. To install and use Solidity Software for Creating Contracts		
4. To install and use Ethereum for Smart Contracts		
5. To create Awareness regarding Security		
6. To identify Security and Trust issues in Smart Contracts		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Justify importance of Smart Contracts		
CO2: Install and use Solidity Framework		
CO3: Create a simple program and write functions		
CO4: Write program for creating contracts		
CO 5: Do error handling and debugging		

Contents –

Unit	Content	Teaching hours
1	Smart Contract and Blockchain basics- Smart Contract Basics: Defining Smart Contracts, Advantages of Smart Contracts, Challenges in implementing and negotiating with non-technical users. Blockchain Basic: Introduction, Basic Cryptographic primitives used in Blockchain - Secure, Collision-resistant hash functions, digital signature, public key cryptosystems, zero-knowledge proof systems, Using smart contracts to enforce legal contracts.	9
2	Solidity and Ethereum Virtual Machine- Industry applications of smart contracts, Basics of solidity, Structure, Basic Data Types & statements, Ethereum Virtual Machine, Transactions, Storage, Memory and the stack, comparing bitcoin scripting vs. Ethereum smart contracts	9
3	Installing the Solidity Compiler- Installing with Different Tech Stack: Versioning, Remix, Node etc., Layout of Solidity Source File, Structure of Contract, types, Units & Globally Available Structures, Contracts.	9
4	Using Ethereum for Creating Smart Contract - Intro to Ethereum, Intro to DApps, Web2 vs. Web3, Accounts, Transactions, EM, Gas, Nodes & Clients, Networks, Ethereum Smart Contracts, Development Framework	9
5	Trust, Security & Efficiency-	9

Trust, Security & Efficiency of Smart Contracts “in the field”, Market impact & scientific innovation of Smart Contracts, The double importance of Security in Smart Contracts, Famous Smart Contract related Hacks(DAO)	
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Text Books: .

1. Mastering Ethereum: Building Smart Contracts and Dapps, Andreas Antonopoulos, Dr. Gavin Wood
2. Solidity Programming Essentials: A beginners’ Guide to build smart contracts for Ethereum and Blockchain
3. Smart Contract Development with Solidity & Ethereum: Building Smart Contracts with the Azure Blockchain, Akhil Mittal

Reference Books: 1.

1. Blockchain: The Untapped Goldmine of Blockchain that Virtually No One Knows About: Alex Barnett, Writers International Publishing
2. A Beginner’s Journey to Ethereum’s Smart Contracts, Engineering Smart Contracts and DApps in Solidity and Web3.Js: Mr. Peter Namisiko Wanjala PNW
3. Ethereum Smart Contract Development: Build Blockchain-based decentralized applications using solidity: Mayukh Mukhopadhy

Online Resources: 1. NPTEL / SWAYAM lectures.

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Semester-VI

Course code: ITY23PEL352	Course name: IOT Communications	Course category: PEC
Credits: 3	Teaching scheme: L-3 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Duration of Theory Exam: 2Hrs		
Pre-requisites:		
<ol style="list-style-type: none"> 1. Basics of Electrical and Electronics 2. Basics of Digital Electronics, Microcontroller and Internet Networking 		
Course Objectives:		
<ol style="list-style-type: none"> 1. To understand the basics of the Internet of Things (IoT) and the protocols that enable communication between devices. 2. To learn about the middleware architecture used in IoT systems for efficient data management and device integration. 3. To explore real-world application areas of IoT across industries such as healthcare, smart homes, and transportation. 		

Course Outcomes: At the end of the course, the students will be able to -
CO1: Acquire the basics and Applications of Internet of Things
CO2: Explore an architecture and Protocols of an IoT
CO3: Design of Embedded Systems with Arduino
CO4: Explore design methodology using Sensors and Actuators
CO5: Do Programming with Python for IOT
CO6: Interface with Raspberry Pi communication

Contents –

Unit	Content	Teaching hours
1	INTRODUCTION TO IOT- Understanding Internet of Things Fundamentals, IoT Architecture and Protocols, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Object. Real time Applications, Challenges in IOT	8
2	EMBEDDED SYSTEMS WITH ARDUINO- Arduino Uno architecture, Setup the IDE, Writing Arduino Software, Arduino Libraries, Basics of Embedded C programming for Arduino, Interfacing LED, Push button and buzzer with Arduino with LCD	8
3	Sensor and Actuators - Overview of sensors working, Analog and Digital Sensors, Interfacing of temperature , Humidity, Motion, Light Gas Sensors with Arduino, Interfacing of Actuators with Arduino, Interfacing of Relay Switch and Servo motor with Arduino	8
4	Scripting Language Python for IOT Communication- Python functions, Setting up the pins, General purpose IO Pins, Protocol Pins, Python on Raspberry Pi, GPIO Access, Accessing pins through a Graphic User Interface.	8
5	Interfacing Hardware with Raspberry Pi for IOT Applications-	8

	Basic functionality of Raspberry Pi Board, Setting up the Board, configuration and use, Downloading an Operating System, format SD card, Booting OS, Basics of Linux, Main features including Navigating the file System .	
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Text Books:

1. Internet of Things – A hands-on approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2015
2. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
3. Internet of Things with Raspberry Pi and Arduino by Rajesh Singh, Anita Gehlot, Lovi raj Gupta, Bhupendra Singh, Mahendra ISBN9780367248215 by CRC Press

Reference Books:

1. Eben Upton and Gareth Halfacree, “Raspberry Pi User Guide”, 4th Edition, John Wiley & Sons
2. Alex Bradbury and Ben Everard, ”Learnning Python with Raspberry Pi” John Wiley & Sons

Online Resources: 1. NPTEL / SWAYAM lectures.

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Semester-VI

Course code: ITY23PEL353	Course name: Big Data Modelling and Management	Course category: PEC
Credits: 3	Teaching scheme: L-3 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Duration of Theory Exam: 2Hrs		
Pre-requisites: Any one Programming Language (Java preferably), DBMS		
Course Objectives:		
1. To understand the Big Data Platform and its Use cases		
2. To provide HDFS Concepts and Interfacing with HDFS		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Identify the Issues for Big Data		
CO2: Manage data Storage in Hadoop Environment		
CO3: Access and Process Data on Distributed File System		

Contents –

Unit	Content	Teaching hours
1	Management Issues for Big Data- Challenges of big data-a. Storage b. Infrastructure c. Technologies d. Processing, key management issues for big data- a. Staffing b. Skillsets c. Strategies d. Total cost of ownership, service provisions for big data management- a. Sourcing (ingestion) b. Storage c. Quality d. Operations e. Scalability, security, ethical and legal considerations-a. Personal data b. Internal data c. Considerations of data privacy in national laws, e.g. EU GDPR, US data regulations and UK data privacy regulations	9
2	Storage, data and programming interface models used for Big Data - Key storage data, data types and documentation-a. Key-value b. Relational c. Extensible d. Document, data storage- a. Block b. File c. Object-based, data modelling. Structured data b. Unstructured data c. Streamed data, data modelling in real time-Pipelines with Kafka and similar technologies, Compare programming interface models a. Hadoop b. MapReduce c. Spark d. Yarn.	9
3	Data Storage and Management - NoSQL databases- introduction to MongoDB Document-oriented data modeling, Cassandra) Importance of effective data storage Data Warehousing-Traditional vs. modern data warehousing	9
4	Columnar Data Model - Data warehousing schemas: Comparison of columnar and row-oriented storage, Column-store Architectures: C-Store and Vector-Wise, Column-store internals and, Inserts/updates/deletes, Indexing, Adaptive Indexing and Database Cracking. Advanced techniques: Vectorized Processing, Compression, Write penalty, Operating Directly on Compressed Data	9
5	Architecture for Big Data and Big Data infrastructures- techniques for storing data in secondary storage- a. MapReduce b. HDFS c. Yarn, compare noSQL and RDBMS- Definition, benefits, and comparison to RDBMS b. ACID properties, Brewers theorem-Use of CAP 9 Consistency Availability Partition Tolerance Correct in NoSQL frameworks, use of data with cloud-based networks- a. In-house b. Outsourced, distributed file systems - Specialised applications, e.g. GFS, ownership and financial implications of cloud use.	9

Text Books: 1. Vignesh Prajapati, "Big Data Analytics With R and Hadoop."

2. Tom White “Hadoop: The Definitive Guide” Third Edit on, O’reily Media, 2012

3. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015

Reference Books: 1. Anand Rajaraman and Jef rey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012

2. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.

3. “Hadoop in Action”, Third Edition, Chuck Lam

Online Resources: 1. NPTEL / SWAYAM lectures.

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Semester-VI

Course code: ITY23PEP351	Course name: EL-II: Smart Contract - Lab	Course category: PEC
Credits: 1	Teaching scheme: P-2 Hrs/Week	Evaluation scheme: TW-30, PR-20
Pre-requisites: Knowledge of any programming language, data structures		
Lab Objectives:		
1. To study interaction between metamask, Ganache and remix IDE		
2. To study various data types like struct and mapping		
3. to study external, internal and payable functions		
Lab Outcomes: At the end of the course, the students will be able to -		
LO1: Interact metamask with remix IDE, Ganache		
LO2: Create struct, arrays and use them in advance contracts		
LO3: Implement fallback() and receive() functions to receive ethers in contract.		

List of Experiments

Sr. No.	Name of Practical
1	Introduction to Blockchain, Ethereum & Solidity framework.
2	Installation of Meta Mask and study spending Ether per transaction
3	Create your own wallet using Meta Mask for crypto transactions
4	Write a smart contract on a test network, for the bank account of the customer for following operations: Deposit Money, 2. Withdraw money, 3. Show balance
5	Write a program in solidity to create student data. Use following constructs: Structures, Arrays, Fallback
6	Write a program to receive ether in a contract using fallback(), receive() functions.
7	Write an contract to for internal and external function calling
8	Write a survey report on types of blockchains and its real time use cases

Semester-VI

Course code: ITY23PEP352	Course name: EL-II: IoT Communications - Lab	Course category: PEC
Credits: 1	Teaching scheme: P-2 Hrs/Week	Evaluation scheme: TW-30, PR-20
Pre-requisites: Basics of Electrical and electronics		
Lab Objectives:		
1. To learn about communication devices like Sensors and Actuators.in IoT.		
2. To implement basic IoT Communication systems using various Sensors and Actuators		
3. To understand the System designs with Arduino and Raspberry Pi		
Lab Outcomes: At the end of the course, the students will be able to -		
LO1: Set up and configure an Arduino and Raspberry Pi for communication in IoT		
LO2: Gain practical experience in using various IoT communication protocols.		
LO3: Understand the strengths and weaknesses of different protocols for real-time IoT applications.		

List of Experiments

Sr. No.	Name of Practical
1	Introduction to IoT Fundamentals: Explore the basic concepts of the Internet of Things (IoT), IoT architecture, protocols, and functional blocks of an IoT ecosystem.
2	Exploring IoT Communication Devices: Learn and implement communication systems with LED, Push Button Switch.
3	Understanding Embedded Systems with Arduino: Get hands-on experience with the Arduino Uno architecture, setup, programming in Embedded C, and basic interaction with sensors and actuators.
4	Interfacing Sensors with Arduino: Interface various sensors (temperature, humidity, motion, light) with Arduino. Learn how to process and display sensor data using Arduino IDE.
5	Interfacing Actuators with Arduino: Interface and control actuators like relays and servo motors with Arduino. Write programs to control actuator behavior based on sensor input.
6	Python for IoT Communication: Learn how to use Python for controlling GPIO pins on Raspberry Pi, and implementing the same .
7	Interfacing Hardware with Raspberry Pi: Set up Raspberry Pi, install necessary OS, and interface it with various sensors and actuators. Create a basic IoT application that involves hardware communication.
8	Real-Time IoT Application and Challenges: Develop a real-time IoT application, addressing practical challenges such as data latency, network issues, security concerns, and power management.

Semester-VI

Course code: ITY23PEP353			Course name: Big Data Modelling and Management - lab			Course category: PEC		
Credits: 1			Teaching scheme: P-2 Hrs/Week			Evaluation scheme: TW-30, PR-20		
Pre-requisites: Any one Programming Language (Java preferably), DBMS								
Lab Objectives:								
1. To introduce students to the basics of configuring and deploying a Hadoop mini-cluster for distributed computing.								
2. To implement foundational MapReduce programs for large-scale data processing.								
3. To introduce students to Apache Spark and its advantages over traditional Hadoop MapReduce.								
Lab Outcomes: At the end of the course, the students will be able to -								
LO1: Configure and deploy a basic Hadoop cluster for distributed computing.								
LO2: Understand Apache Spark and its operations for processing big data in real-time and batch modes.								
LO3: Apply machine learning models to large datasets using big data tools.								

List of Experiments

Sr. No.	Name of Practical
1	Set Up a Mini Hadoop Cluster
2	Implement Basic MapReduce Programs
3	Write a Map Reduce program to count words from a given text file.
4	Write a Map Reduce program for weather data collection
5	Explore Apache Spark
6	Build Data Pipelines
7	Practice Data Cleaning and Transformation
8	Analyze Real-World Data with Machine Learning
9	Visualize Big Data Insights
10	How to Participate in Open-Source Projects

Semester-VI

Course code: ITY23PEL354	Course name: Decentralized Applications	Course category: PEC
Credits: 3	Teaching scheme: L-3 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Duration of Theory Exam: 2Hrs		
Pre-requisites:		
1. Basics of Blockchain technology.		
2. Basic Knowledge of Internet of Things, Computer Security, Cryptography		
3. Knowledge of Programming languages like javascript, Python, C++, Java		
Course Objectives:		
1. To explain what are decentralized applications (Dapps)		
2. To understand use cases and limitations of Dapps		
3. To describe how to set up environment to run		
4. To Dapps Learn Truffle Development		
5. To learn programming in solidity and Ethereum to create Dapps		
6. To study real world case study of Spotify		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Learn basic concepts of Dapps		
CO2: Describe the suitable use cases for Dapps		
CO3: Develop simple Dapps considering an example use case		
CO4: Describe Truffle IDE		
CO 5: Illustrate Solidity and Ethereum platform		
CO6: Evaluate potential Dapps uses cases from a business, legal, and engineering perspective		

Contents –

Unit	Content	Teaching hours
1	Introduction to DApps - Introduction to Decentralized Apps (Dapps), Understanding Dapps, History of Dapps, Definition, Decentralized Application Architecture, Classification of Dapps, Operations of Dapps, Ethereum APIs.	8
2	DApps Dynamics - Decentralized Apps - Coding Details, State Machine, Ethereum Virtual machine, Coding Style Guide, Design Patterns, Code Layout, Naming Conventions, Common Design Patterns, Withdrawal from Contracts.	8
3	Solidity Details - Programming Smart Contracts: Understanding of solidity programming, Solidity Features, Data Types, Functions, Inheritance, Error Handling, Event Handling, Oraclize.	8
4	Truffle Suite Essentials & Ganache- Setting Up: Truffle Suite Ganache/Geth, Metamask, Remix Environment. Remix IDE, Truffle IDE, Web Interface: Web3.js Test-Driven Development, Testing.	8
5	Auction Smart Contract-	8

	Auction and mining contract: Running smart contract, Deployment of the Smart contract, Simple auction contract, blind auction contract, mining Ether, purpose of crypto economics.	
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Text Books:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016

Reference Books:

1. Draft version of "S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, 'Blockchain Technology: Cryptocurrency and Applications', Oxford University Press, 2019.
2. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.

Online Resources: 1. NPTEL / SWAYAM lectures.

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Semester-VI

Course code: ITY23PEL355	Course name: IoT Networking	Course category: PEC
Credits: 3	Teaching scheme: L-3 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Duration of Theory Exam: 2Hrs		
Pre-requisites:		
1. Arduino & Raspberry Pi Controller Programming		
2. Networking Technologies		
3. Fundamentals of computer network,		
4. Network Security & Internet technology		
Course Objectives:		
1. To understand the various IoT Protocols		
2. To networking Between the devices		
3. To study of IoT Network Architecture		
4. To study Smart IoT Connected Cities		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Interface Arduino with wireless devices		
CO2: Explore the smart objects		
CO3: Connect the smart objects with IT		
CO4: Explore the IoT Network Architecture		

Contents –

Unit	Content	Teaching hours
1	Arduino Interface Arduino-Ethernet Interface, Connect Arduino using the Ethernet, Ethernet Library, Simple Ethernet Client Example, Simple Ethernet Server Interface Example, Arduino using the Wi-Fi Connect Arduino using the Wi-Fi WiShield Library, WiFly Shield Library, Using the Arduino Library for Processing.	8
2	- Basic Networking with ESP8266 WI-Fi module- Basics of Wireless Networking Introduction to ESP8266, Various Wi-Fi library, Web server-introduction, installation, configuration. Posting sensor(s) data to web server, Introduction to ESP8266 NodeMCU Module , Pin out, Block diagram	8
3	IP as the IoT network Layer - Key advantages of Internet protocol, Adoption or Adaptation of the Internet Protocol, Need for Optimization, Optimizing IP for IoT.	8
4	Connecting smart objects - Communication Criteria, IoT Access Technologies, IEEE 82.15.4, Standardization and alliances, Physical Layer, MAC Layer, topology Security	8
5	Smart and connected cities and Public safety- An IoT Strategy for smarter cities, Smart city architecture, Smart city Security architecture, Smart city use case example.	8

Text Books:

1. Vijay Madiseti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach” Orient Blackswan Pvt. Ltd., New Delhi, 2015

Reference Books:

1. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things by Pearson Paperback — 16 Aug 2017 by Hanes David (Author), Salgueiro Gonzalo (Author), Grossetete Patrick (Author), Barton Rob
2. Internet of Things with Raspberry Pi and Arduino By Rajesh Singh, Anita Gehlot, Lovi Raj Gupta, Bhupendra Singh, Mahendra Swain, ISBN 9780367248215, Published November 12, 2019 by CRC Press
3. IoT (Internet of Things) Programming: A Simple and Fast Way of Learning, 10T Kindle Edition by David Etter (Author) Format: Kindle Edition

Online Resources: NPTEL / SWAYAM lectures.

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Semester-VI

Course code: ITY23PEL356	Course name: Big Data Integration and Processing (Elective III)	Course category: PEC
Credits: 3	Teaching scheme: L-3 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Duration of Theory Exam: 2Hrs		
Pre-requisites:		
1. Any programming Language (Java preferably), Basics of DBMS		
Course Objectives:		
1. To equip students with the theoretical and practical knowledge of big data integration and processing techniques.		
2. To develop skills in designing, implementing, and managing big data pipelines.		
3. To understand the challenges and solutions related to data diversity, volume, and velocity.		
4. To apply various tools and frameworks for big data integration and processing tasks.		
5. To gain insights into the applications of big data in different engineering disciplines		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Understand theoretical and practical knowledge of big data integration and processing techniques.		
CO2: Develop skills in designing, implementing, and managing big data pipelines		
CO3: Understand the challenges and solutions related to data diversity, volume, and velocity.		
CO4: Apply various tools and frameworks for big data integration and processing tasks.		
CO5: Gain insights into the applications of big data in different engineering disciplines.		

Contents –

Unit	Content	Teaching hours
1	Introduction to Big Data - Introduction to Big Data, What is Big Data? Definition, Characteristics, and Challenges V Model, Sources of Big Data (Sensor Data, Social Media, Web Logs, etc.), Applications of Big Data in Engineering (Manufacturing, Energy, Robotics).	8
2	Big Data Integration- Data Integration Challenges (Heterogeneity, Schema Matching, Privacy), Data Warehouse vs. Data Lake Architectures, ETL (Extract, Transform, Load) Processes for Data Integration, Introduction to Apache Spark for Data Integration Pipelines, Building and Managing Data Pipelines with Cloud Platforms (AWS Glue, Azure Data Factory).	8
3	Big Data Processing Techniques - Distributed File Systems (Hadoop, HDFS), Map Reduce Programming for Big Data Processing, Introduction to Apache Spark for Big Data Processing (RDDs, DataFrames), Real-time Data Processing with Apache Kafka, Stream Processing Applications in Engineering, Data Cleaning and Transformation Techniques, Data Quality Management in Big Data Environments	8
4	Big Data Analytics and Visualization -	8

	Introduction to Big Data Analytics Tools (Pig, Hive, Spark SQL), Machine Learning for Big Data Analysis -Regression, Classification, Clustering, Big Data Visualization Techniques, Interactive Dashboards and Reporting with Big Data	
5	Case Studies and Applications - Big Data in Smart Grid and Energy Management, Predictive Maintenance and Anomaly Detection in Industrial Processes, Big Data for Personalized Learning and Educational Technology, Big Data for Disaster Management and Environmental Monitoring	8

Text Books:

1. Big Data: A Revolution That Will Transform How We Live, Work, and Think, Viktor Mayer-Schönberger and Kenneth Cukier
2. Hadoop: The Definitive Guide, by Tom White
3. Spark: The Definitive Guide, Bill Chambers and Matei Zaharia
4. Data Integration: Tools and Techniques for Building a Unified View of Your Data, by William H. Inmon

Reference Books:

1. Designing Data-Intensive Applications, Martin Kleppmann
2. Big Data: Principles and Best Practices, Thomas Erl, Wajid Khattak, and Paul Buhler
3. Data Science for Business, Foster Provost and Tom Fawcett
4. Learning Scala for Spark and Big Data, O'Reilly Media

Online Resources: 1. NPTEL / SWAYAM lectures.

Semester-VI

Course code: ITY23PEP354 Course name: EL-III Decentralized Applications-Lab Course category: PEC		
Credits: 1	Teaching scheme: P-2 Hrs/Week	Evaluation scheme: TW-30, PR-20
Pre-requisites: Data Structures, any one programming language		
Lab Objectives:		
1. To explore the Ethereum platform and its role in creating decentralized applications (DApps).		
2. To study state variables, functions, and events and their role in defining and executing smart contracts.		
3. To learn the setup and configuration of the Solidity development environment.		
4. To understand error handling mechanisms in Solidity, such as require, revert, and assert.		
Lab Outcomes: At the end of the course, the students will be able to -		
LO1: Write, deploy, and test smart contracts with well-defined state variables, functions, and events.		
LO2: Install, configure, and use Solidity development tools like Remix IDE, Truffle, and Ganache.		
LO3: Enhance problem-solving skills through debugging, testing, and refining Solidity code for correctness and security.		

List of Experiments:

Sr. No.	Name of Practical
1	Introduction to Blockchain, Ethereum & Solidity framework.
2	To study Basic Data Types & Statements (Bidder Data & Functions Demos).
3	To study State Variables, Functions, Events.
4	To install and Study Configuration procedures of Solidity framework.
5	To study Error Handling, Ether Units, Time Units.
6	To study Internal & External Function Call.
7	To study how to create Contract, Visibility & Getters.
8	To implement Inheritance in Solidity.
9	To study Abstract Contract & Interfaces.
10	To create an Inline Assembly using Solidity framework.

Semester-VI

Course code: ITY23PEP355	Course name: IOT Networking-Lab	Course category: PEC
Credits: 1	Teaching scheme: P-2 Hrs/Week	Evaluation scheme: TW-30, PR-20
Pre-requisites: Basics of IoT, microcontrollers		
Lab Objectives:		
1. To understand the fundamentals of interfacing sensors and modules with Arduino for real-time data acquisition.		
2. To develop and implement IoT applications using Arduino with various communication modules.		
3. To design and configure web-based applications using Arduino for remote monitoring and control.		
4. To integrate cloud platforms like ThingSpeak and Blynk for data visualization and analytics.		
5. To demonstrate the ability to troubleshoot and optimize IoT-based systems.		
6. To apply Arduino programming techniques to develop automated solutions for real-world problems.		
Lab Outcomes: At the end of the course, the students will be able to -		
LO1: Interface sensors and communication modules with Arduino to acquire and transmit real-time data.		
LO2: Develop and deploy web-based and mobile-based IoT applications using cloud platforms like ThingSpeak and Blynk.		
LO3: Implement IoT communication using WiFi, Ethernet, and GSM modules for remote monitoring and control.		
LO4: Troubleshoot and optimize hardware and software components in IoT-based systems.		
LO5: Design and implement automation solutions using Arduino for real-world applications.		
LO6: Document experimental results effectively through reports and presentations.		

List of Experiments

Sr. No.	Name of Practical
1	Arduinio connect with DHT and Ultrasonic server
2	Create a web server using Ethernet with Arduinio
3	Arduinio connects with WiFi
4	Arduinio connects with Android mobile for data transmission
5	Thing speak cloud connects to Arduino for real time data transmission in Thing speak
6	Explore the interfacing of GSM module to make gateway
7	Create Simple ESP8266 NodeMCU Webserver in Arduino IDE.
8	Creating an IoT-based weather monitoring system using sensors
9	Pulse rate and heartbeat monitoring system using Arduino and a pulse sensor

Semester-VI

Course code: ITY23PEP356			Course name: Big Data Integration and Processing -Lab			Course category: PEC		
Credits: 1			Teaching scheme: P-2 Hrs/Week			Evaluation scheme: TW–30, PR–20		
Pre-requisites:								
Lab Objectives:								
1. To introduce the architecture and setup of a Hadoop cluster on virtual machines or cloud platforms.								
2. To implement basic MapReduce programs for large-scale data processing tasks.								
3. To practice data preprocessing techniques such as cleaning, filtering, and transforming raw data for analytical use.								
Lab Outcomes: At the end of the course, the students will be able to -								
LO1: Gain practical knowledge of setting up and managing Hadoop clusters.								
LO2: Apply machine learning algorithms to real-world datasets for predictive and descriptive analysis.								
LO3: Use tools like Tableau, Power BI, or libraries like Matplotlib and D3.js for visualization.								

List of Experiments

Sr. No.	Name of Practical
1	Set up a Hadoop cluster using a virtual machine or cloud platform
2	Implement basic MapReduce programs for data processing tasks
3	Work with Apache Spark for real-time and batch processing
4	Build a data pipeline using ETL tools and cloud platforms
5	Practice data cleaning and transformation techniques with big data tools.
6	Analyze real-world datasets using machine learning algorithms.
7	Visualize big data insights using interactive dashboards and tools.
8	Participate in open-source big data projects or contribute to online coding challenges.

Semester-VI

Course code: ITY23VSP301	Course name: Mobile Application Development Lab	Course category: VSEC
Credits: 2	Teaching scheme: P-4 Hrs/Week	Evaluation scheme: TW-30, PR-20
Pre-requisites: Fundamentals of Programming Logic		
Lab Objectives:		
1. To enable the students to understand the core principles of the Object-Oriented Language		
2. To understand the concept of packages and applet programming		
3. To understand the concept of Multi-threading		
4. To understand the concept of graphic programming		
5. Introduce the students to database connectivity		
Lab Outcomes: At the end of the course, the students will be able to -		
LO1: Apply Object Oriented concepts to develop programs in Java.		
LO2: Develop programs using packages and applet programming.		
LO3: Develop programs using Inheritance, Interfaces. Multithreading.		
LO4: Develop programs using graphic programming		
LO5: Develop applications using databases.		

Contents –

Unit	Content
1	Introduction To android- A little Background about mobile technologies • Android – An Open Platform for Mobile development • Native Android Application • Android SDK Features • what does Android run on? Free Additional Benefits Only At WEBCOM • Why Develop for Mobile? • Why develop for Android? • Android Development Framework • Android Application Architecture • Android Libraries
2	User Interface - •Developing for Android • First Android application Using Android Studio/Visual studio xamarin • Running and Debugging •Creating Application and Activities • Application Manifest Introduction • Android Application Life Cycle • Application Priority and process states• Fundamental Android UI Design •Study of different layouts (Linear, relative, table, absolute, frame, Constraint) • Introducing Views • Creating new Views • Draw able Resources • Creating and Using menus
3	Intent and Broadcast receiver- • I Introducing Intents • Intents and Intent filters • What are Pending Intents • Adapters • Internet Resources • Notifications • Introducing Dialogs • Saving Application Data in external and internal memory• Creating and saving preferences • Retrieving shared preferences• Creating a standard preference activity • Saving Activity State • Saving and Loading Files • Including static files as Resources • File management tools
4	Database Content Provider - Introducing Android Databases • Introducing SQLite • Cursors and content values • Working with SQLite Database • Creating new content Provider •Introduction to Firebase •Real time/ Cloud •Authentication in firebase• Introduction to MySQL database •Connecting to MySQL by JSON, PHP scripts.
5	Telephony, hardware, network services, google services/map and multimed-

<p>Telephony • Reading Phone device details • Reading Sims Details • Incoming and outgoing call monitoring • Tracking Service Change • Introducing SMS and MMS • Sending SMS and MMS • Sending SMS messages manually • Use of Bluetooth • Managing Network Connectivity • Managing Wi-Fi</p> <p>Google Map - Layout file • Google Map – Android Manifest file • Customizing Google Map • Adding Marker • Changing Map Type • Enable/Disable zoom • Using Sensors and Sensor Manager Interpreting sensor values • Using Compass, Accelerometer and orientation services • Controlling Device Vibration • Working with multimedia players (Audio/Video)</p>

Text Books/ Reference Books/ Internet Resource:

1. Hello Android: Pragmatic Bookshelf 2009
2. Professional Android Development, Wrox
3. Mobile App Development

List of Experiments: Design, develop and implement following assignments using Android Studio/ Visual studio Xamarin.

Sr. No.	Name of Practical
1	Design and develop Android Application to display “Hello World” using basic Widgets
2	Design and develop Android Application to demonstrate Activity Life Cycle
3	Design and develop Android Application to demonstrate GUI by using different Layouts/widgets
4	Design and develop Android Application to demonstrate views in Android
5	Design and develop Android Application to demonstrate Intents(Implicit/ Explicit)
6	Design and develop Android Application to demonstrate Broadcast Receivers/Services
7	Design and develop Android Application to demonstrate Saving Files in External/Internal Storage
8	Design and develop Android Application to demonstrate Content Providers
9	Design and develop Android Application to demonstrate SQLite database (Dictionary, Quiz, etc.)
10	Design and develop Android Application to demonstrate firebase operations (data push, retrieval, delete, update etc.)
11	Design and develop Android Application to demonstrate MySQL database
12	Design and develop Android Application to demonstrate use of Telephony (Call/SMS)
13	Design and develop Android Application to demonstrate use of Bluetooth/wi-fi
14	Design and develop Android Application to demonstrate use of google map API
15	Design and develop Android Application to play audio/video files
16	Design and develop Android Application to demonstrate sensors (Accelerometer/Campass)

Semester-VII

Course code: ITY23PCL401 Course name: Information Theory and Coding Course category: PCC
Credits: 3 Teaching scheme: L-3 Hrs/Week Evaluation scheme: CA-40, MSE-20, ESE-40
Theory Exam Duration: 2 Hrs
Pre-requisites: Basic Mathematics
Course Objectives:
1. To provide an insight into the concept of information in the context of communication theory
2. To understand various Coding Techniques
Course Outcomes: At the end of the course, the students will be able to -
CO1: Explain concept of Source, measure of information, Entropy.
CO2: Implement the various types of source coding algorithms
CO3: Explain various types of error correcting codes ,Convolutional codes.

Contents –

Unit	Content	Teaching hours
1	Information Theory - Introduction, Measure of information, Information content of message, Average Information content of symbols in Long Independent sequences, Average Information content of symbols in Long dependent sequences, Markov Statistical Model for Information Sources, Entropy and Information rate of Markov Sources	10
2	Source Coding - Source Coding: Encoding of the Source Output, Shannon's Encoding Algorithm Shannon Fano Encoding Algorithm, Source coding theorem, Prefix Codes, Kraft McMillan Inequality property KMI, Huffinan codes	9
3	Information Channels - Communication Channels, Discrete Communication channels Channel Matrix, Joint Probability Matrix, Binary Symmetric Channel, System Entropies. Mutual Information, Channel Capacity, Channel Capacity of Binary Symmetric Channel	7
4	Error Control and Convolution Coding - Introduction, Examples of Error control coding, methods of Controlling Errors, Types of Errors, types of Codes, Linear Block Codes: matrix description of Linear Block Codes, Error detection & Correction capabilities of Linear Block Codes, Single error correction Hamming code, Convolution Encoder, Time domain approach, Transform domain approach	10
5	Applications of Information Theory: Applications of Information Theory in Communication Systems, Data Compression, Multimedia Communication, Wireless Communication, and Cryptography. Advanced Coding Techniques: Cyclic Codes, CRC (Cyclic Redundancy Check), Reed-Solomon Codes, Introduction to Turbo Codes, Introduction to LDPC Codes, Convolutional Codes, Trellis and State Diagrams	9

Text Books: 1. Ranjan Bose, "Information Theory, Coding and Cryptography", Tata McGraw Hill, 2nd edition.
2. P.S. Satyanarayana, "Concepts of Information Theory and Coding", Dynaram Publication, 2005
3. Digital and Analog Communication Systems, K. Sam Shanmugam, John Wiley India Pvt Ltd, 1996.
Reference Books:
1. Shu Lin and Daniel Castello, "Error Control Coding – Fundamentals and Applications", second edition 2004
2. Thomas M Cover, Joy Thomas, "Elements of Information Theory", MGH 2006.
E Resources: NPTEL Course on ITC by Ranjan Bose and Lecture by Prof S.N. Merchant

Semester-VII

Course code: ITY23PCL402	Course name: Cloud Computing	Course category: PCC
Credits: 2	Teaching scheme: L-2 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Theory Exam Duration: 2 Hrs		
Pre-requisites: Computer Networks		
Course Objectives:		
1. To give students an insight into the basics of cloud computing along with virtualization.		
2. To provide the students basic understanding about cloud and virtualization along with how one can migrate over it		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Understand the concepts of Cloud Computing		
CO2: Classify the different services in Cloud service models		
CO3: Identify various virtualization techniques		
CO4: Demonstrate the virtualization process using a simulator.		

Contents –

Unit	Content	Teaching hours
1	Introduction - Cloud concept The Emergence of Cloud Computing, Cloud deployment Models, Characteristics of Cloud Computing, Challenges for the Cloud.	6
2	Cloud Service Models - Introduction to IaaS - IaaS definition, Examples: Amazon EC2 - Renting, EC2 Compute Unit, Platform and Storage, pricing. Introduction to PaaS -What is PaaS, Cloud Platform and Management -Computation, Storage, Google App Engine , Microsoft Azure. Software as a Service (SaaS)- Introduction to SaaS, Web services, Salesforce.com platform.	8
3	Virtualization - Transaction Speed, Transaction Fees, Network Size, Complexity, Interoperability Problems, Lack of Standardization. Lack of Supportive Regulations Related to Blockchain Applications.	8
4	Cloud Simulator - Cloud Simulators CloudSim and GreenCloud Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture(User code, CloudSim, GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud	8

Text Books: 1. “Cloud Computing: Concepts, Technology & Architecture” By Ricardo Puttini, Thomas Erl, and Zaigham Mahmood, ISBN- 9789332535923, Pearson Education

Reference Books:

- Gautam Shroff, “ Enterprise Cloud Computing Technology, Architecture, Applications”, Cambridge University press.

Semester-VII

Course code: ITY23PCP402	Course name: Cloud Computing Lab	Course category: PCC
Credits: 1	Teaching scheme: P-2 Hrs/Week	Evaluation scheme: TW-30, PR-20
Pre-requisites: Computer Networks		
Lab Objectives:		
1.To study the emergence and evolution of cloud computing		
2.To understand and explore different cloud service models		
3.To study and demonstrate virtualization techniques using various virtualization tools		
Lab Outcomes: At the end of the course, the students will be able to -		
LO1: Use Google Cloud services for printing and collaborative tasks effectively.		
LO2: Apply and analyze virtualization techniques using different tools and platforms.		
LO3: Access and utilize AWS cloud services for basic computing and storage requirements.		
LO4: Identify and differentiate between various cloud services and deployment models		

List of Experiments

1. To study Emergence of cloud computing
2. To study different cloud services
3. Demonstration of Google cloud Print
4. Collaborating on Google Calendars, Google docs, sheets and Presentations
5. Creating a warehouse application in salesforce.com
6. Demonstration of Virtualization techniques using different tools
7. Demonstration of AWS service using Amazon
8. Virtualization using a Cloud Simulator

Semester-VII

Course code: ITY23PCL403	Course name: Advanced Database Management System	Course category: PCC
Credits: 2	Teaching scheme: L-2 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Duration of Theory Exam: 2 Hrs		
Pre-requisites: SQL and Query Processing, Data Structures and Algorithms		
Course Objectives:		
1. Understand database storage structures and access techniques.		
2. Describe the design of Distributed Databases		
3. Know how to design a Database and XML		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Understand the concept of Data storage and querying.		
CO2: Use XML and understand unstructured data.		
CO3: Understand the basics of query processing, object-oriented, distributed databases.		
CO4: Analyse and use emerging technologies such as Big Data, NoSQL.		

Contents –

Unit	Content	Teaching hours
1	Data Storage and Querying - RAID – File Organization – Organization of Records in Files – Indexing and Hashing: Basic concept, Ordered Indices, B+ tree Index Files: Structure of a B+- Tree (structure only, algorithms not needed) - B tree index files – Static Hashing – Dynamic Hashing – Query Processing: Overview - Selection Operation.	6
2	Object Based Databases - Object Based Databases overview, Complex data types, Structured types and inheritance in SQL, Table inheritance, Array and multiset types in SQL, Object identity (OI) and reference types in SQL, Object-Oriented vs Object-Relational Databases	6
3	XML - Introduction, structure of XML data, XML document schema, Querying and Transformation, Application Program Interfaces to XML, Storage of XML Data, XML Applications	6
4	Parallel and Distributed Databases - Architectures for parallel databases; Parallel query evaluation; Parallelizing individual operations, Introduction to distributed databases; Distributed DBMS architectures; Storing data in a Distributed DBMS, Distributed Query processing; Updating distributed data; Distributed transactions	6
5	Advanced Database Techniques - Structured versus Unstructured Data, NoSQL database concepts : Types of NoSQL databases, NoSQL data modelling, Benefits of NoSQL, Comparison between SQL and NoSQL database system, NoSQL using MongoDB : Introduction to MongoDB Shell, Running the MongoDB shell, MongoDB client, Basic operations with MongoDB shell, Basic Data Types, Arrays, Embedded Documents, Querying with MongoDB : find() function, specifying which keys to return, query criteria OR queries	6

Text Books: 1. Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, “Database System Concepts”, McGraw Hill Education, 6th Edition, 2011.

2. Ramez Elmasri and Hammant B. Navathe, “Fundamental Database Systems”, Pearson Education, 7th Edition, 2015.

Reference Books:

1. Carlos Coronel, Steven Morris “Database systems: Design Implementation and Management”, Cengage Learning Press, 11th Edition, 2014.
2. J. Murach, “Murach’s MySQL”, Shroff Publication, 2nd Edition, 2016.

E Resources: 1. Udemy – “Mastering Database Management Systems From Basics to Advance”

2. GeeksforGeeks DBMS Tutorial

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Semester-VII

Course code: ITY23PCL404	Course name: Advanced Web Programming	Course category: PCC
Credits: 2	Teaching scheme: L-2 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Theory Exam Duration: 2 Hrs/Week		
Pre-requisites: basic knowledge of HTML5, JavaScript, CSS		
Course Objectives:		
1. To deepen understanding of the Java Servlet and JavaServer Pages (JSP) technologies		
2. To explore advanced web application concepts like security, concurrency, and scalability		
3. To introduce popular Java web frameworks for efficient development		
4. To build real-world web applications using best practices		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Demonstrate an in-depth understanding of the Java Servlet and JavaServer Pages (JSP) technologies		
CO2: Explore advanced web application concepts like security, concurrency, and scalability		
CO3: Identify and use popular Java web frameworks for efficient development		
CO4: Build real-world web applications using best practices		

Contents –

Unit	Content	Teaching hours
1	Java Enterprise Edition - Introduction, Overview of J2EE, J2EE Architectures JEE Services, HTTP protocol: Request and Response, Web Containers, Web Server., Introduction to Ajax, XML HTTP Request & Response, Introduction to RMI, RMI Architecture	7
2	Servlet Programming & Java Server Pages(JSP) - Basics of Servlet, Introduction to JSP: Life cycle of JSP, JSP API, Architecture. Scripting elements: scriptlet tag, expression tag, declaration tag, Implicit Objects: out, request, response, config, application, session, pageContext, page, exception, Directive Elements: page directive, include directive, taglib directive, Exception Handling, Action Elements: jsp:forward, jsp:include, Bean class, jsp:useBean, jsp:setProperty & jsp:getProperty, Displaying applet in JSP, Custom tags: Custom Tag : What and Why? Custom Tag API? Custom Tag Example, Attributes, Iteration, Custom URI	8
3	Hibernate - Introduction to Hibernate: Overview of ORM and its importance Introduction to Hibernate framework Hibernate architecture and components 2. Setting Up Hibernate: Downloading and configuring Hibernate Configuring Hibernate properties Integrating Hibernate with Java applications 3. Hibernate Mapping: Entity mapping and Hibernate annotations Hibernate XML mapping files Composite keys and associations Inheritance mapping strategies 4. Hibernate Query Language (HQL): Basics of HQL and its syntax Retrieving and updating entities using HQL Named queries and native SQL queries Query caching and performance optimization	8
4	Introduction to spring - Introduction to Spring : Overview of Spring, Spring Architecture and Container, dependency injection, Spring Web MVC Framework.	7

Text Books: 1. Subrahmanyam Allamaraju, Samir Tyagi, Karl Avedal, John Griffin, “Professional Java Server Programming”, Wrox Publication.

2. James Holmes, “The Complete Reference Struts”, TataMcGraw Hill.

Reference Books:

1. Java Server Programming (Java EE 5) Black Book by Wiley Publication.
2. Sharanam Shah, Vaishali Shah, “Java EE 6 for Beginners”, Shroff Publishers & Distributors Pvt. Ltd.

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Semester-VII

Course code: ITY23PCP403 Course name: Advanced Database Management System Lab		
Course category: PCC		
Credits: 1	Teaching scheme: P- 2 Hrs/Week	Evaluation scheme: TW-30, PR-20
Pre-requisites: Basic DBMS Concepts, SQL Fundamentals		
Lab Objectives:		
1.To understand methods of connecting to and accessing databases.		
2. To perform basic database operations using client tools or applications.		
3.To study database connectivity and session handling.		
Lab Outcomes: At the end of the course, the students will be able to -		
LO1: Connect to and access databases successfully.		
LO2: Execute basic queries on a database.		
LO3: Understand relational data management.		
LO4: Understand advanced SQL type handling.		
LO5: Understand XML processing mechanisms.		

List of Experiments

1. Accessing the database
2. Basics of SQL-DDL and DML
3. To create arrays and multiset types in SQL
4. Design XML Schema and XML instance document
5. Study of Application Program Interfaces to XML
6. To perform database activity using Indexing
7. To study hashing techniques
8. Querying with MongoDB : find() function, specifying which keys to return
9. To study parallel and distributed databases.
10. Perform basic operations with MongoDB shell

Semester-VII

Course code: ITY23PCP404	Course name: Advanced Web Programming Lab	
Course category: PCC		
Credits: 1	Teaching scheme: P-2 Hrs/Week	Evaluation scheme: TW-30, PR-20
Pre-requisites: core JAVA, OOP principles, web fundamentals		
Lab Objectives:		
1. To deepen understanding of the Java Servlet and JavaServer Pages (JSP) technologies		
2. To explore advanced web application concepts like security, concurrency, and scalability		
3. To introduce popular Java web frameworks for efficient development		
4. To build real-world web applications using best practices		

Lab Outcomes: At the end of the course, the students will be able -
LO1: To deepen understanding of the Java Servlet and JavaServer Pages (JSP) technologies
LO2: To explore advanced web application concepts like security, concurrency, and scalability
LO3: To introduce popular Java web frameworks for efficient development
LO4: To build real-world web applications using best practices

List of Experiments

<ol style="list-style-type: none"> 1. Develop simple applications using AJAX and JSON. 2. Develop application using for Servlet life cycle 3. Develop a Servlet program to print HTTP header information. 4. Develop application using JSP 5. Develop application using JSP Elements: Directives, Scripting, Action tags 6. Develop application using JSP Directives, Scripting, Action tags, 7. Develop application using JSP object scope page, request, session 8. Develop application program using custom tags 9. Develop application stateless JavaBeans 10. Develop application stateful JavaBeans 11. Develop application entity JavaBeans 12. Develop a hibernate application to store the feedback of website visitors in database 13. Develop a simple Hibernate application using any Database. 14. Develop Simple MVC Spring application.
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Semester-VII

Course code: MGM21RML401	Course name: Research Methodology	Course category: RM
Credits: 4	Teaching scheme: L- 4 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Theory Exam Duration: 2 Hrs		
Pre-requisites: Knowledge of Mathematics and Statistics, Analytical and Logical Thinking		
Course Objectives:		
1. To explain the nature and role of research in engineering practice		
2. To formulate research problems and objectives from engineering contexts		
3. To design appropriate research and experimental strategies		
4. To interpret engineering data and justify conclusions logically		
5. To apply ethical principles and IPR concepts in research work		
6. To prepare structured technical reports and research presentations		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Apply fundamental research concepts to engineering problems		
CO2: Analyze real-world problems to frame researchable questions		
CO3: Develop logically sound research designs		
CO4: Analyze and interpret data to support engineering decisions		
CO5: Evaluate ethical, legal, and societal implications of research		
CO6: Create clear and structured research documents and presentations		

Contents –

Unit	Content	Teaching hours
1	Foundations of Research in Engineering - Meaning and objectives of research; Engineering research vs. scientific research; Types of research: exploratory, descriptive, analytical, experimental, design-oriented; Basic research, applied research, translational research; Role of research in innovation, patents, and societal impact; Interdisciplinary and multidisciplinary research.	10
2	Problem Identification and research design - Identifying real-world engineering problems; Research gaps: literature-driven vs. practice-driven; Formulating research questions, objectives, and hypotheses; Variables, assumptions, and constraints; Research design types: experimental, quasi- experimental, observational, design-based; Validity and reliability (conceptual level).	10
3	Data, Measurement and Experimental Planning - Types of data: qualitative and quantitative; Scales of measurement; Sampling concepts and sample size logic; Design of experiments (introductory, non-mathematical); Error, uncertainty, and bias in engineering data; Ethical data collection practices.	10

4	Data analysis and interpretation - Descriptive statistics for engineers; Conceptual understanding of inferential statistics; Trend analysis and correlation; Model validation and interpretation of results; Logical reasoning from data to conclusions; Common pitfalls in analysis and interpretation	10
5	Research ethics, IPR and academic integrity - Ethics in engineering research; Plagiarism, fabrication, falsification; Authorship and publication ethics; Intellectual Property Rights: patents, copyrights, trade secrets; Introduction to standards, codes, and compliance; Responsible research and innovation.	10
6	Technical writing and research communication- Structure of technical papers and theses; Writing research objectives, methodology, and conclusions; Use of figures, tables, and citations; Referencing styles and literature management; Peer review process and responding to reviewers; Oral presentation of research	10

Text Books:

- Booth, W.C., Colomb, G.G., & Williams, J.M. (2016), The Craft of Research, 4th Edition, University of Chicago Press
- Creswell, J.W. (2014), Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 4th Edition, SAGE Publications
- Kothari, C.R. (2019), Research Methodology: Methods and Techniques, 4th Edition, New Age International Publishers
- Deb, D., Dey, R., & Balas, V.E. (2018), Engineering Research Methodology: A Practical Insight, Springer.
- David Thiel (2014), Research Methods for Engineers, Cambridge University Press
- P. Pandey & S.C. Pandey (2015), Research

Reference Books:

- Ranjit Kumar (2019), Research Methodology: A Step-by-Step Guide for Beginners, 4th Edition, SAGE Publications
- Uwe Flick (2018), Introducing Research Methodology: A Beginner's Guide, 2nd Edition, SAGE Publications
- Saunders, M., Lewis, P., & Thornhill, A. (2019), Research Methods for Business Students, 7th Edition, Pearson
- Dipak Bhattacharya (2018), Research Methodology: Principles and Practices, 5th Edition, Excel Books
- Herman Tang (2023), Engineering Research: Design, Methods, and Publication, Wiley.
- R.A. Fisher (1935), The Design of Experiments, Oliver & Boyd Ltd.

Semester-VII

Course code: ITY23RPJ401	Course name: Research Project	Course category: RP
Credits: 4	Teaching scheme: P- 8 Hrs/Week	Evaluation scheme: TW-60, PR-40
Pre-requisites: Knowledge of Mathematics and Statistics, Analytical and Logical Thinking		
Lab Objectives:		
1. To identify and analyze a real-world engineering problem		
2. To design and develop a systematic solution or prototype		
3. To implement and validate the proposed methodology through experimentation, simulation, or real-time data analysis.		
4. To evaluate the performance of the proposed system using suitable metrics and compare it with baseline or existing approaches.		
Lab Outcomes: At the end of the course, the students will be able to -		
LO1: Apply engineering knowledge and problem-solving skills to develop an effective and feasible technical solution.		
LO2: Demonstrate research aptitude, including literature review, methodology formulation, experimentation, and result interpretation..		
LO3: Hands-on experience with modern engineering tools and technologies relevant to the chosen domain		
LO4: Enhance professional skills, including technical documentation, teamwork, presentation, and ethical responsibility.		

PROJECT GUIDELINES

1. Project Group size should be of maximum 4 students.
2. The project is to be taken up at the start of semester I and the project must be completed by the end of semester II.
3. While submitting project proposal care is to be taken that the project will be completed within the available time of two terms.
4. Project title should be precise and clear. Selection and approval of topic: Topic should be related to real life or commercial application in the field of Information Technology.

OR

Investigation of the latest development in a specific field of Information Technology.

OR

Commercial and Interdisciplinary projects should be encouraged. The examination will be conducted independently in respective departments.

5. The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by guide. This data should be used for finding the total man hours and estimating the cost of the project.
6. The group is expected to complete details Literature Survey, system/problem definition, analysis, design, etc. in (B.E. first Term) seventh term, as a part of term work in the form of a joint report.
Project report must be submitted in the prescribed format only. No variation in the format will be accepted.
7. The guides should regularly monitor the progress of the project work.
8. Assessment of the project for award of term work marks shall be done by the guide and a departmental committee as per the guidelines given in the following table.
9. The suggestive format of the report is as follows:

(Only one report should be submitted per group as a part of term work submission.)

Title of the Project:

Names & Roll Numbers of the students:

Name of the guide:

Chapter 1: Introduction

Chapter 2: Literature Survey

Chapter 3: System Development

A) Assessment of project –I Term Work B. Tech. First Term

Name of the Project: _____

Name of the Guide: _____

Sr. No.	Exam Seat No.	Name of the Student	Assessment by Guide (70%)					Assessment by Departmental Committee (30%)			Grand Total
			Literature Survey	Topic Selection	Documentation	Attendance	Total	Evaluation	Presentation	Total	
		Marks	05	2.5	7.5	2.5	17.5	2.5	5	7.5	25

Semester-VIII

Course code: ITY23PEL451	Course name: Blockchain Platforms	Course category: PEC
Credits: 4	Teaching scheme: L- 4 Hrs/week	Evaluation scheme: CA-40, MSE-20, ESE-40
Theory Exam Duration: 2 Hrs		
Pre-requisites: Knowledge of Programming languages like Javascript, Python, Basic Knowledge of Computer Security, Cryptography and Networking		
Course Objectives:		
1. To Introduce to other blockchain platforms		
2. To study two decentralized application use case		
3. To study challenges such as privacy and scalability		
4. To study Various decentralized application platforms		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Classify which blockchain platform to choose for a project		
CO2: Install & run programs using Corda, Multichain		
CO3: Install & run programs using Hyper Ledger		
CO4: Gain comprehensive knowledge of the Stellar blockchain platform		

Contents –

Unit	Content	Teaching hours
1	Decentralized Application Platforms - Permissioned Blockchains, Hyperledger, Fabric Services, Fabric Model & Functions, Composer, Intro: Decentralized Application Platforms, Augur & Grid +, Challenges & Solutions, Alternative Decentralized Solutions, Interplanetary File System, Hashgraph, Blockchain: Social Imperative.	9
2	Hyperledger Insights- Hyperledger Technologies-Framework, Libraries, Sawtooth, Burrow, Fabric, Indy and case studies change healthcare, kiva, DLT labs, Walmart	8
3	Exploring Multichain - Open Source blockchain platform- Introduction to Multichain, Framework basics, Set up the Environment, Install and run sample applications	9
4	Introduction to Corda - What is Corda? Corda Ledger, Introduction to Corda States, Setting up Corda Development environment, Introduction to state unit tests, Introduction to Corda Contracts, Contract Unit Test Introduction, Introduction to Corda Transactions, Commands, Attachments & Timestamps	9
5	Stellar: Decentralized Exchange - Stellar Blockchain platform, Stellar consensus protocol, Accounts, Distributed Exchange, Ledger, Operations, Smart Contracts	8
6	Polkadot & Cross-Chain Interoperability Platforms - Introduction to Interoperability, Limitations of single-chain blockchains, Need for cross-chain communication, Blockchain trilemma revisited, Polkadot Architecture, Relay Chain, Parachains, Parathreads, Bridges, Consensus Mechanism: Nominated Proof of Stake (NPoS), Cross-Chain Communication, XCMP (Cross-Chain Message Passing), Asset transfer across chains, Security model	9

Text Books: 1. 1. Petr Novotny, Venkatraman Ramakrishna, Nitin Gaur, Anthony O'Dowd, Luc Desrosiers, "Hands-On Blockchain with Hyperledger: Building decentralized applications with Hyperledger Fabric and Composer", ISBN-13: 978-1788994521

2. R3 Corda for Architects and Developers, with case studies in Finance, Insurance, Healthcare, Travel, Telecomm, and Agriculture, Debajani Mohanty, APress publications

Reference Books:

1. Nitin Gaur, Anthony O'Dowd, Petr Novotny, Venkatraman Ramakrishna, Luc Desrosiers Salman A. Baset "Blockchain with Hyperledger Fabric: Build decentralized applications using Hyperledger Fabric", Packt Publishing Limited; 2nd edition.
2. Josh Thompson, "Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming", Create Space Independent Publishing Platform, 2017.

E-sources:

1. <https://www.hyperledger.org/use/hyperledger-burrow>
2. <https://www.udemy.com/course/stellar-blockchain-tutorial-complete-beginner-training/>
3. <https://www.ibm.com/blockchain/resources/>
4. <https://www.corda.net/blockchain-bootcamp/>
5. <https://www.multichain.com/>

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Semester-VIII

Course code: ITY23PEL452	Course name: IoT Cloud	Course category: PEC
Credits: 4	Teaching scheme: L-4 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Theory Exam Duration: 2 Hrs		
Pre-requisites: Basics of IoT architecture and protocols, Fundamentals of Cloud Computing, Introductory Data Analytics and Machine Learning, Digital logic circuits, Networking, wireless transmission		
Course Objectives:		
1. To understand the fundamentals of IoT devices, networking, and communication protocols.		
2. To learn cloud-based architectures and platforms for scalable IoT analytics.		
3. To apply data science and machine learning techniques to IoT data.		
4. To design efficient data storage, processing, and management strategies for IoT systems.		
5. To deploy, visualize, and optimize IoT analytics solutions using modern cloud platforms.		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Explain IoT networking concepts, protocols, and data messaging mechanisms.		
CO2: Design cloud-based IoT analytics architectures using elastic and scalable services.		
CO3: Apply machine learning and data science techniques to analyze IoT data.		
CO4: Organize and manage large-scale IoT datasets using data lakes and retention strategies.		
CO5: Deploy and visualize IoT analytics solutions using platforms such as AWS, Azure, and ThingSpeak		

Contents –

Unit	Content	Teaching hours
1	IoT Networking Foundations: IoT devices, Networking basics, IoT networking connectivity protocols, IoT networking data messaging protocols, Analyzing data to infer protocol and device characteristics	9
2	IoT Analytics for the Cloud - Introduction to elastic analytics, Decouple key components, Cloud security and analytics, Designing data processing for analytics, Applying big data technology to storage.	8
3	Cloud-Based IoT Architecture and Data Processing: Cloud-based IoT reference architectures-IoT data ingestion and integration mechanisms-Stream processing vs batch processing of IoT data-Designing scalable and fault-tolerant IoT data pipelines- Cloud security challenges in IoT data processing- -Interoperability and integration of heterogeneous IoT devices.	9
4	Data Science for IoT Analytics - Data Science for IoT Analytics: Introduction to Machine Learning, Feature engineering with IoT data, Validation methods, Understanding the bias-variance tradeoff, Use cases for deep learning with IoT data.	9
5	Strategies to Organize Data for Analytics - Linked Analytical Datasets, Managing data lakes, data retention strategy- Data modeling approaches for analytical workloads- Managing data lakes for large-scale IoT data- Data governance, privacy, and compliance considerations	5

6	<p>Deployment, Visualization, and Future Trends in IoT Cloud Analytics: Deployment of IoT analytics models on the cloud- Real-time dashboards and data visualization tools- Monitoring, logging, and performance optimization- Edge–Cloud integration for IoT analytics- Emerging trends: AIoT, serverless IoT analytics, digital twins, and autonomous IoT systems- AWS IoT Analytics, AWS Lambda, and Amazon S3 for IoT data processing- Microsoft Azure IoT Hub, Azure Stream Analytics, Azure Data Lake- ThingSpeak for IoT data collection and visualization.</p>	10
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Text Books: 1. Arshdeep Bahga and Vijay Madiseti, “Internet of Things – A Hands on Approach”, Universities Press, 2015.

2. Kevin, Townsend, Carles, Cufí, Akiba and Robert Davidson, "Getting Started with Bluetooth Low Energy" O'Reilly.

2. Min Chen, Shiwen Mao, and Yunhao Liu, “Big Data: Related Technologies, Challenges and Future Prospects”, Springer, 2014.

3. Rajkumar Buyya et al., “Cloud Computing: Principles and Paradigms”, Wiley, 2011

Reference Books:

1. David Hanes et al., “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases”, Cisco Press, 2017.
2. Foster Provost & Tom Fawcett, “Data Science for Business”, O’Reilly Media, 2013.
3. AWS Whitepapers, AWS IoT and Analytics Documentation.
4. Microsoft Documentation, Azure IoT Hub and Azure Stream Analytics.
5. MathWorks Documentation, ThingSpeak for IoT Analytics.

Semester-VIII

Course code: ITY23PEL453	Course name: Machine Learning With Big Data	Course category: PEC
Credits: 4	Teaching scheme: L-4 Hrs/Week	Evaluation scheme: CA-40, MSE-20, ESE-40
Theory Exam Duration: 2 Hrs		
Pre-requisites: 1. Foundational Data Science Knowledge		
2. Data Analysis and Visualization Tools		
3. Machine Learning Fundamentals		
Course Objectives:		
1. To understanding Data Visualization Principles		
2. To learn human-Computer Interaction and User-Centric Design.		
3. To explore techniques for visualizing and interpreting predictions made by time series and sequence models.		
4. To learn how to create compelling visual narratives to convey findings to diverse audiences		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Apply Exploratory Data Analysis (EDA) Skills		
CO2: Apply Dimensionality Reduction Methods		
CO3: Apply Human-Computer Interaction Principles		
CO4: Apply Knowledge in Practical Projects		
CO5: Collaborate on Interpretability Challenges		

Contents –

Unit	Content	Teaching hours
1	Foundations of Machine Learning and Big Data - Introduction to machine learning and big data, covering foundational concepts. Distinguishing between supervised and unsupervised learning. overview of big data characteristics, challenges, and distributed computing Difference between machine learning and Big data, 5Vs in Big data	9
2	Big Data Technologies and Data Preprocessing - Intricacies of distributed computing frameworks such as Hadoop and Spark. Hadoop's architecture, components, and the Hadoop Distributed File System (HDFS). data preprocessing techniques, missing data, feature scaling, and categorical data encoding	9
3	Supervised Learning Algorithms -Linear regression, logistic regression, and decision trees. fundamentals of predictive modeling and classification, developing a foundational understanding of algorithms crucial for handling large datasets	9
4	Unsupervised Learning Algorithms - clustering algorithm- K-means and hierarchical clustering. Dimensionality reduction techniques-Principal Component Analysis (PCA) and t-Distributed Stochastic Neighbor Embedding (t-SNE).	9
5	Big data application - Overview of Big Data Machine Learning, Mahout, Big Data Machine learning Algorithms in Mahoutkmeans, Naive Bayes etc. Machine learning with Spark, Machine Learning Algorithms in Spark, Spark MLlib, Deep Learning for Big Data, Graph Processing: Pregel, Giraph, Spark GraphX.	9
6	Big data ML Case studies - Real-World Big Data ML Case Studies, Recommendation Systems, Anomaly and Fraud Detection, Predictive Analytics, Model Deployment and	9

	Monitoring, Ethical Issues in Big Data and ML, Data Privacy and Security, Future Trends in Big Data Machine Learning	
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Text Books: 1. "Data Science for Business" by Foster Provost and Tom Fawcett, Oreilly Publications
2. "Interactive Data Visualization for the Web" by Scott Murray, Oreilly Publications
3. "Visualization Analysis and Design" by Tamara Munzner, CRC Press, Taylor and Francis Publications
Reference Books: <ol style="list-style-type: none"> 1. "The Visual Display of Quantitative Information" by Edward R. Tufte 2. "Information Visualization: Perception for Design" by Colin Ware 3. "Interactive Data Visualization: Foundations, Techniques, and Applications" by Matthew O. Ward, Georges Grinstein, and Daniel Keim 4. "Applied Plotting, Charting & Data Representation in Python" by Benjamin Root 5. "Big Data Visualization" by James D. Miller

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Semester-VIII

Course code: ITY23PEL454 Course name: Blockchain Security and Applications Course category: PEC
Credits: 4 Teaching scheme: L-4 Hrs/week Evaluation scheme: CA-40, MSE-20, ESE-40
Theory Exam Duration: 2 Hrs
Pre-requisites: Basics of blockchain and cybersecurity
Course Objectives:
1. To understand the security and performance-related issues of blockchain.
2. To learn techniques and tools to tackle the security related issues of blockchain.
3. To learn new approaches required for enhancing blockchain performance.
Course Outcomes: At the end of the course, the students will be able to -
CO1: Understand the security and performance perspective of blockchain technology.
CO2: Learn and apply security analysis and performance-enhancing techniques related to blockchain.
CO3: Understand the real-life applications of blockchain technology and apply it to provide solutions to some real-life problems

Contents –

Unit	Content	Teaching hours
1	Security Issues - Blockchain Related Issues, Higher-Level Language (Solidity) Related Issues, EVM Bytecode Related Issues, Real-Life Attacks on Blockchain Applications/ Smart Contracts, Trusted Execution Environments.	9
2	Security Tools for Smart Contracts - Working, Advantages, And Disadvantages of Tools- Oyente, Securify, Maian, Manticore, Mythril, SmartCheck, Verx. Secure Key Management, Quantum Resilience Keys.	8
3	Performance Related Issues - Transaction Speed, Transaction Fees, Network Size, Complexity, Interoperability Problems, Lack of Standardization. Lack of Supportive Regulations Related to Blockchain Applications.	9
4	Performance Improvements - Off-Chain State Channels, Sidechains, Parallels Chains, Concurrent Smart Contract Transactions, Sharding Technique and Its Benefits, Atomic Swaps Between Smart Contracts. User code, CloudSim, GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud	9
5	Financial Blockchain - Blockchain in Financial services: Financial services, Global Trade and Commerce, Insurance Industry, Consumer goods and Retail Industry. Improving record management, Improving Business efficiency, Real world examples.	8
6	Industrial Blockchain - Blockchain in Manufacturing and Industrial applications: Digital supply chain management, Logistics, Blockchain solution for Food management, Real-World use cases	8

Text Books: 1. Mastering Ethereum: Building Smart Contracts and Dapps Book by Andreas Antonopoulos and Gavin Wood, Shroff Publisher/O'Reilly Publisher.

2. Applications of Blockchain Technology in Business; Challenges and Opportunities, Mohesen taran and Angappa Gunsekaran

3. Blockchain for dummies, Manav Gupta, IBM Limited Edition

Reference Books:

1. Blockchain Applications: A Hands On Approach, Arshdeep Bagha, Vijay Madiseti

E-Resources:

1. <https://www.edx.org/course/blockchain-and-fintech-basics-applications-and-limitations>
2. <https://www.youtube.com/watch?app=desktop&v=EWKhD29tSNU>

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Semester-VIII

Course code: ITY23PEL455 Course name: Cybersecurity in IoT Course category: PEC
Credits: 4 Teaching scheme: L-4 Hrs/Week Evaluation scheme: CA-40, MSE-20, ESE-40
Duration of Theory Exam: 2 Hrs
Pre-requisites: Basic knowledge of Computer Networks, Fundamentals of Internet of Things (IoT), Introduction to Cloud Computing
Course Objectives:
1. To learn about the security issues in IoT and cloud computing.
2. To learn about the cryptography solutions and issues in IoT.
3. To learn about the security measures taken in IoT and Cloud systems to improve security.
Course Outcomes: At the end of the course, the students will be able to -
CO1: Understand the fundamental security issues in Internet of things.
CO2: Demonstrate different Frameworks and Hardware Architecture of IoT Device.
CO3: Analyze different IoT Protocols and Layer Functioning.
CO4: Protect and secure the network connecting IoT devices to back-end systems on the internet.
CO5: Demonstrate different authentication mechanism such as digital certificates, biometrics, etc.

Contents –

Unit	Content	Teaching hours
1	FUNDAMENTALS OF IoT ECOSYSTEM: IoT security issues, how to design an IoT system, Hardware, software and network security related to IoT systems - Basics of cryptographic solutions to IoT systems.	5
2	OVERVIEW OF CLOUD COMPUTING AND ITS SERVICES Cloud Computing Fundamental: Cloud computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS, block chain as a service with cyber security	8
3	CHALLENGES IN CLOUD COMPUTING: Benefits and challenges of cloud computing - Public vs. Private clouds, Role of virtualization in enabling the cloud	9
4	SECURITY CONCEPTS IN CONTEXT TO IoT DEVICES 9 Hrs. Security Concepts: Confidentiality, privacy, integrity, authentication, non-repudiation, Virtualization	10

5	IoT SECURITY THREATS AND COUNTERMEASURES: System-Specific Attacks: Guest hopping, attacks on the VM (delete the VM, attack on the control of the VM, code or file injection into the virtualized file structure), VM migration attack, hyper jacking.	10
6	ADVANCED CYBERSECURITY IN INTERNET OF THINGS SYSTEMS: Advanced security threats and attack surfaces in large-scale IoT environments; zero-trust security architecture for IoT systems; secure device provisioning, secure boot, firmware integrity-hardware root of trust in IoT devices; cybersecurity architectures for Industrial IoT (IIoT) and Smart City applications; blockchain-based identity management and access control for IoT; lightweight and post-quantum cryptographic techniques for resource-constrained IoT devices; machine learning and deep learning-based intrusion detection and anomaly detection in IoT networks; trust and reputation management models for IoT device collaboration; privacy-preserving data security techniques for IoT, including differential privacy and secure data aggregation; IoT security standards, compliance frameworks	10

Text Books: 1. David Etter, “IoT Security: Practical guide book “ Create Space, 1st Edition, 2016.

2. Drew Van Duren, Brian Russell, “Practical Internet of Things Security”, Packt, 1st Edition, 2016

Reference Books:

1. Internet of Things Security: Attacks, Tools, Techniques and Challenges – Mishra et al., Elsevier (2025).

2. IoT Security: Fundamentals and Key Enabling Technologies – Islam et al., Elsevier (2025).

3. Cloud Security: Concepts, Applications and Practices – Murthy et al., Routledge (2025).

4. Cybersecurity of Industrial Internet of Things (IIoT) – Buja, CRC Press (2026).

Semester-VIII

Course code: ITY23PEL456 **Course name:** Graph Analytics for Big Data **Course category:** PEC
Credits: 4 **Teaching scheme:** L-4 Hrs/Week **Evaluation scheme:** CA-40, MSE-20, ESE-40
Theory Exam Duration: 2 Hrs

Pre-requisites: Programming Fundamentals, Data Structures and Algorithms, Computer Networks

Course Objectives:

1. To understand Scalability Concepts
2. To explore Performance Optimization Techniques
3. To learn distributed Systems Scalability
4. To study database and Network Scalability
5. To explore the Graph application tools

Course Outcomes: At the end of the course, the students will be able to -

CO1: Design and Implement Distributed Systems for Scalability

CO2: Utilize Cloud Scalability

CO3: Optimize Code and Algorithms

CO4: Apply Memory Management Optimization

CO5: Conduct Performance Testing and Analysis

Contents –

Unit	Content	Teaching hours
1	Graph Algorithms - Traversal Algorithms, Centrality Algorithms, Community Detection Algorithms, PageRank and variants, Shortest Path Algorithms, Graph Database Technologies, Apache Giraph, Amazon Neptune, Microsoft Azure Cosmos DB, Graph Representation, Adjacency Matrix, Directed and Undirected Graphs, Graph Storage Model, Traversal and Path Finding, ACID Compliance	9
2	Big Data Platforms and Tools - Apache Spark Graph X, Apache Flink, Hadoop Map Reduce, Graph Processing in Distributed Systems, Parallel and Distributed Graph Processing, Graph Partitioning, Fault Tolerance, Hadoop Ecosystem, Apache Spark, NoSQL Databases, Distributed Storage Systems, Distributed Graph Processing Frameworks, Parallel Graph Algorithms, Communication and Message Passing	9
3	Graph Analytics in Social Networks - Friendship and Connection Analysis, Influence Propagation, Community Structure Analysis, Fraud Detection and Anomaly Detection, Graph-based Fraud Detection, Anomaly Detection in Graphs, Centrality Analysis, Community Detection, Graph-Based Anomaly Detection, Cross-Network Analysis, Supervised Learning Approaches, Unsupervised Learning Approaches, Semi-Supervised Learning, Blockchain -Based Fraud Detection	9
4	Biological and Chemical Applications - Bioinformatics, Cheminformatics, Temporal and Dynamic Graphs, Temporal Graph Analysis, Dynamic Network Analysis, Chemical Education and Visualization, Systems Biology, Structural Bioinformatics, Dynamic Graph Evolution Models, Dynamic Graph Algorithms, Real-World Applications of Temporal and Dynamic Graphs	9

5	Scalability and Performance Optimization - Optimizing Graph Algorithms for Scalability, Hardware Acceleration, Graph-based Machine Learning, Graph Neural Networks (GNNs), Graph Embeddings, Visualization and Interpretability, Graph Visualization Techniques, Interpretable Graph Analytics, Database Performance Optimization, Memory Management Optimization, Machine Learning Model Optimization	9
6	Graph Analytics Applications & Case studies - Navigating Complex Fraud Schemes, Identifying Money Laundering Circles, Recommendation Engines, Supply Chain Optimization, Mapping Digital Threat, Optimizing Cloud Costs. Neo4j, Oracle Graph, Amazon Neptune, ArangoDB	9

Text Books: 1. "Scalability Rules: 50 Principles for Scaling Web Sites" by Martin L. Abbott and Michael T. Fisher	
2. "Systems Performance: Enterprise and the Cloud" by Brendan Gregg, Prentice Hall	
3. "Cloud Native Patterns: Designing Change-Tolerant Software" by Cornelia Davis, Manning Publications	
Reference Books:	
1. "The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation, and Modeling" by Raj Jain, Publisher: Wiley, ISBN: 0471503361	
2. "Scalability Rules: Principles for Scaling Web Sites" by Martin L. Abbott and Michael T. Fisher	
3. "Scalability Rules: 50 Principles for Scaling Web Applications" by Martin L. Abbott and Michael T. Fisher	
4. "The Performance of Open Source Applications" edited by Tavish Armstrong and Brendan Gregg	

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