AISSMS
INSTITUTE OF INFORMATION TECHNOLOGY
(IOIT)

ADDING VALUE TO ENGINEERING

An Autonomous Institute Affiliated to Savitribai Phule Pune University
Approved by AICTE, New Delhi and Recognised by Govt. of Maharashtra
Accredited by NAAC with "A+" Grade | NBA - 5 UG Programmes

ACADEMIC COURSE STRUCTURE

AND

DETAILED SYLLABUS OF

SECOND YEAR

INFORMATION TECHNOLOGY

B.TECH 4 YEAR UG COURSE
(Applicable for the batches admitted from 2023-2024)

AISSMS INSTITUTE OF INFORMATION TECHNOLOGY
Kennedy Road, Near RTO,
Pune – 411 001, Maharashtra State, India
Email: principal@aissmsioit.org, Website: https://www.aissmsioit.org

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BOS-INFORMATION TECHNOLOGY
AISSMS IOIT (AUTONOMOUS),
PUNE-1.

Institute Vision & Mission

Vision

To be recognized amongst top 10 private engineering colleges in Maharashtra by the year 2026 by rendering value added education through academic excellence, research, entrepreneurial attitude, and global exposure.

Mission

- To enable placement of 150 plus students in the 7 lacs plus category & ensure 100% placement of all final year students.
- To connect with 10 plus international universities, professional bodies, and organizations to provide global exposure students.
- To create conducive environment for career growth, prosperity, and happiness of 100% staff.
- To be amongst top 5 private colleges in Pune in terms of admission cut off.

Quality Policy

We commit ourselves to provide quality education & enhance our students quality through continuous improvement in our teaching and learning processes.

Department Vision & Mission

Vision

To be a leader in preparing technically competent and skilful IT Graduates to address the needs of industry and society.

Mission

- To prepare students for employment/entrepreneurship/higher studies through curricular, extracurricular and extension activities.
- To promote research and professional activities through industry involvement and professional bodies
- To instil professional ethics and lifelong learning skills with concern for the society.

Program Educational Objectives (PEOs)

Graduates will

- Excel in diverse career paths with core professional skills.
- Engage in multi domain research/professional activities.
- Cater to the needs of society with IT solutions/applications.

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Program Outcomes(POs)

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. [Engineering knowledge]
2. Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. [Problem analysis]
3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. [Design/development of solutions]
4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. [Conduct investigations of complex problems]
5. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations. [Modern tool usage]
6. Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. [The engineer and society]
7. Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. [Environment and sustainability]
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. [Ethics]
9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. [Individual and teamwork]
10. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. [Communication]
11. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. [Project management and finance]
12. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. [Life-long learning]

Program Specific Outcomes (PSOs)

Graduates will be able to

1. Use database, networking and programming technologies for solving real life problems.
2. Develop applications in the field of computing, networking, security and analytics.

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A. Definition of Credit:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week 2 Hours Practical (Lab)/week	**0.5** credits 1 credit

B. Range of credits –

A range of credits from 160 to 176 for a student to be eligible to get Undergraduate degree in Engineering.

A student will be eligible to get Undergraduate degree with Honors or additional Minor Engineering if he/she completes an additional 20 credits.

C. Credit for Undergraduate Degree in Information Technology

Sr. No.	Year	Semester	Credits
1	First Year	I	19
2		II	21
3	Second Year	III	22
4		IV	24
5	Third Year	V	23
6		VI	25
7	Final Year	VII	12
8		VIII	14
Total Credits			**160**

D. Structure of Undergraduate Engineering program

Sr. no.	Domains	Code	Credits	NEP Suggested
1	Basic Science courses	BSC	**16**	14-18
2	Engineering Science courses	ESC	**16**	12-16
3	Programme Core Courses	PCC	**58**	44-56
4	Programme Elective courses	PEC	**18**	20
5	Open Elective other than particular Programme	OEC	**06**	08
6	Vocational and Skill Enhancement Course	VSE	**08**	08
7	Humanities Social Science and Management	HSM	**12**	14
8	Experiential Learning Courses	ELC	**22**	22
9	Liberal Learning Courses	LLC	**04**	04
Total			**160**	**160-176**

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E.Semester wise credit details for Undergraduate Engineering program

Sr. no.	Code	Credits									
		Semesters								Total	NEP suggested
		I	II	III	IV	V	VI	VII	VIII		
1	BSC	8	8	-	-	-	-	-	-	16	14-18
2	ESC	10	6	-	-	-	-	-	-	16	16-12
3	PCC	-	-	16	16	12	12	2	-	58	44-56
4	PEC	-	-	-	-	5	5	8	-	18	20
5	OEC	-	-	3	-	3	-	-	-	06	08
6	VSE	-	2	-	3	-	3	-	-	08	08
7	HSM	-	-	3	3	3	3	-	-	12	14
8	ELC	3	3	-	-	-	-	2	14	22	22
9	LLC	-	-	-	2	-	2	-	-	04	04
Total Credits		**21**	**19**	**22**	**24**	**23**	**25**	**12**	**14**	**160**	**160-176**
Minor (Th+PR)		**-**	**-**	**4**	**4**	**4**	**4**	**-**	**-**	**-**	**16**
Total Credit including Minor		**21**	**19**	**26**	**28**	**27**	**29**	**12**	**14**	**176**	**176**
Exam Total		**650**	**650**	**825**	**875**	**825**	**875**	**600**	**600**	**5900**	
Total Working Hours per Week				**31**	**33**	**32**	**35**	**16**	**28**		**-**

F. Honors Degree : Cyber Security

Sr. No.	Course Code	Courses Name	Sem.	Hours per week			Credit	Examination Scheme					Total
				L	T	P		ISE	ESE	TW	PR	OR	
1	ITHDT501	Information Security and Audit Monitoring	V	3	-	-	3	40#	60*	-	-	-	100
2	ITHDT502	Information Security and Audit Monitoring Lab@@	V	-	-	4	2	-	-	25	-	25	50
3	ITHDT601	Database Security	VI	3	-	-	3	40#	60*	-	-	-	100
4	ITHDT602	Database Security Lab	VI	-	-	2	1	-	-	-	25	-	25
5	ITHDT701	Cloud Security	VII	3	-	-	3	40#	60*	-	-	-	100
6	ITHDT702	Cloud Security Lab	VII	-	-	2	1	-	-	-	25	-	25
7	ITHDT801	Cyber Crime Investigation and Digital Forensics	VIII	3	-	-	3	40#	60*	-	-	-	100

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8	ITHDT802	Cyber Crime Investigation and Digital Forensics Lab@@	VIII	-	-	4	2	-	-	25	-	25	50
Total				**12**	**-**	**12**	**18**	**160**	**240**	**50**	**50**	**50**	**550**

G. Honors Degree- with Research

B.Tech (Honors with Research)													
Sr. No.	**Course Code**	**Courses Name**	**Sem.**	**Hours per week**			**Credit**	**Examination Scheme**					**Total**
				L	**T**	**P**		**ISE**	**ESE**	**TW**	**PR**	**OR**	
1	ITHDR7R1	Research Methodology	VII	3	-	-	3	40#	60*	-	-	-	100
2	ITHDR7R2	Mathematical Modeling	VII	3	-	-	3	40#	60*	-	-	-	100
3	ITHDR7R3	Dissertation Phase I@@	VII	-	-	4	2	-	-	25	-	25	50
4	ITHDR8R4	Research Publication and Ethics	VIII	2	-	-	2	20#	30#	-	-	-	50
5	ITHDR8R5	Paper Publication	VIII	-	-	4	2	-	-	50	-	-	50
6	ITHDR8R6	Dissertation Phase II@@	VIII	-	-	12	6	-	-	100	-	50	150
Total				**8**	**-**	**20**	**18**	**100**	**150**	**175**	**-**	**75**	**500**

H. Major Courses : Information Technology

Sr. No.	**Course Code**	**Courses Name**	**Sem.**	**Hours per week**			**Credit**	**Examination Scheme**					**Total**
				L	**T**	**P**		**ISE**	**ESE**	**TW**	**PR**	**OR**	
1	ITPCC302	Discrete Mathematics	III	3	-	-	3	40#	60*	-	-	-	100
2	ITPCC303	Digital Electronics & Computer Organization	III	3	-	-	3	40#	60*	-	-	-	100
3	ITPCC304	Data Structure and Algorithms	III	3	-	-	3	40#	60**	-	-	-	100
4	ITPCC305	Data Base Management System	III	3	-	-	3	40#	60*	-	-	-	100
6	ITPCC307	Digital Electronics & Computer Organization Lab@@	III	-	-	2	1	-	-	25	25	-	50
7	ITPCC308	Data Structure and Algorithms Lab@@	III	-	-	4	2	-	-	25	-	25	50
8	ITPCC309	Data Base Management System Lab@@	III	-	-	2	1	-	-	25	25	-	50
9	ITPCC402	Probability and Statistics	IV	3	-	-	3	40#	60*	-	-	-	100

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10	ITPCC403	Object Oriented Programming	IV	3	-	-	3	40#	60**	-	-	-	100
11	ITPCC404	Processor Architecture and Interfacing	IV	3	-	-	3	40#	60*	-	-	-	100
12	ITPCC405	Computer Graphics and Animation	IV	3	-	-	3	40#	60*	-	-	-	100
14	ITPCC407	Object Oriented Programming Lab@@	IV	-	-	4	2	-	-	25	-	25	50
15	ITPCC408	Processor Architecture and Interfacing Lab@@	IV	-	-	2	1	-	-	25	25		50
16	ITPCC409	Computer Graphics and Animation Lab@@	IV	-	-	2	1	-	-	25	25	-	50
17	ITPCC502	Data Communication and Computer Network	V	3	-	-	3	40#	60*	-	-	-	100
18	ITPCC503	Theory of Computation	V	3	1	-	4	40#	60*	-	-	-	100
19	ITPCC504	Software Engineering & Project Management	V	3	-	-	3	40#	60*	-	-	-	100
20	ITPEC505	Elective-I	V	3	-	-	3	40#	60**	-	-	-	100
21	ITPCC507	Data Communication and Computer Network Lab@@	V	-	-	2	1	-	-	25	-	25	50
22	ITPCC508	Software Engineering & Project Management Lab@@	V	-	-	2	1	-	-	25	25	-	50
23	ITPEC509	Software Lab-I@@	V	-	-	4	2	-	-	25	-	25	50
24	ITPCC602	Machine Learning	VI	3	1	-	4	40#	60*	-	-	-	100
25	ITPCC603	Operating System	VI	3	-	-	3	40#	60*	-	-	-	100
26	ITPCC604	Cloud Computing	VI	3	-	-	3	40#	60*	-	-	-	100
27	ITPEC605	Elective-II	VI	3	-	-	3	40#	60**	-	-	-	100
29	ITPCC607	Operating System Lab@@	VI	-	-	2	1	-	-	25	25	-	50
30	ITPCC608	Cloud Computing Lab@@	VI	-	-	2	1	-	-	25	25		50
31	ITPEC609	Software Lab-II@@	VI	-	-	4	2	-	-	25	-	25	50
32	ITPCC701	Distributed Computing	VII	2	-	-	2	40#	60*	-	-	-	100
33	ITPEC702	Elective - III	VII	3	-	-	3	40#	60*	-	-	-	100
34	ITPEC703	Elective - IV	VII	3	-	-	3	40#	60*	-	-	-	100
35	ITPEC704	Software Lab-III@@	VII	-	-	2	1	-	-	25	50	-	75

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36	ITPEC705	Software Lab-IV@@	VII	-	-	2	1	-	-	25	50	-	75
37	IOELC7P1	Project Stage I@@	VII	-	-	4	2	-	-	100	-	50	150
38	IOELC801	Internship/ 2MOOCs/ Entrepreneurship/ Research Project/ Foreign University Certification Course@@	VIII	-	-	24	12	-	-	200	-	100	300
39	IOELC8P2	Project stage II@@	VIII	-	-	4	2	-	-	200	-	100	300
			Total	**56**	**2**	**69**	**92**	**760**	**1140**	**850**	**275**	**375**	**3400**

I. Minor Degree: Software Development Technologies

Sr. No.	Course Code	Courses Name	Sem.	Hours per week			Credit	Examination Scheme		
				L	T	P		ESE	TW	Total
1	ITMNR301	Data Structure and Algorithms	III	3	-	-	3	75	-	75
2	ITMNR302	Data Structure and Algorithms Lab	III	-	-	2	1	-	25	25
3	ITMNR401	Object Oriented Programming	IV	3	-	-	3	75	-	75
4	ITMNR402	Object Oriented Programming Lab	IV	-	-	2	1	-	25	25
5	ITMNR501	Software Engineering & Project Management	V	3	-	-	3	75	-	75
6	ITMNR502	Software Engineering & Project Management Lab	V	-	-	2	1	-	25	25
7	ITMNR601	Operating System	VI	3	-	-	3	75		75
8	ITMNR602	Operating System Lab	VI	-	-	2	1	-	25	25
			Total	**12**	**-**	**8**	**16**	**300**	**100**	**400**

J. Open Elective Courses

Sr. No.	Course code	Courses Name	Sem.	Hours per week			Credit	Examination Scheme					Total
				L	T	P		ISE	ESE	TW	PR	OR	
1	ITOEC306	**MOOC**-Human Computer Interaction	III	3	-	-	3	40$	60$$	-	-	-	100
2	ITOEC506	**MOOC** -Ethical Hacking	V	3	-	-	3	40$	60$$	-	-	-	100
			Total	**6**	**-**	**-**	**6**	**80**	**120**	**-**		**-**	**200**

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K. Vocational and Skill Enhancement Courses

Sr. No.	Course Code	Courses Name	Sem.	Hours per week			Credit	Examination Scheme					Total
				L	T	P		ISE	ESE	TW	PR	OR	
1	ITVSC406	Web Development @@	IV	1	-	4	3	-	-	50	50	-	100
2	ITVSC606	Software Quality Assurance and Testing@@	VI	1	-	4	3	-	-	50	50	-	100
		Total		**2**	**-**	**8**	**6**	**-**	**-**	**100**	**100**	**-**	**200**

L. Humanities Social Science and Management Courses

Sr. No.	Course code	Courses Name	Sem.	Hours per week			Credit	Examination Scheme					Total
				L	T	P		ISE	ESE	TW	PR	OR	
1	IOHSM301	Democracy, Election and Governance@@	III	2	-	-	2	-	-	25	-	25	50
2	IOHSM3AC	Audit course - Vedic Mathematics	III	1	-	-	1	-	-	25	-	-	25
3	ITHSM401	Management Information System@@	IV	1	1	-	2	-	-	25	-	25	50
4	IOHSM4AC	Audit course- Sustainable Development goals	IV	1	-	-	1	-	-	25	-	-	25
5	IOHSM501	Intellectual Property Rights@@	V	2	-	-	2	-	-	25	-	25	50
6	IOHSM5AC	Audit course- Foreign Language Level-I (A. German/ B. Japanese)	V	1	-	-	1	-	-	25	-	-	25
7	IOHSM601	Seminar and Technical Paper Writing	VI	1	-	2	2	-	-	50	-	-	50
8	IOHSM6AC	Audit course- Foreign Language Level-II (A. German/ B. Japanese)	VI	1	-	-	1	-	-	25	-	-	25
		Total		**10**	**1**	**2**	**12**	**-**	**-**	**225**	**-**	**75**	**300**

M. Experiential Learning Courses

Sr. No.	Course Code	Courses Name	Sem.	Hours per week			Credit	Examination Scheme					Total
				L	T	P		ISE	ESE	TW	PR	OR	
1	IOELC7P1	Project Stage I@@	VII	-	-	4	2	-	-	100	-	50	150
2	IOELC801	Internship/ 2MOOCs/ Entrepreneurship/	VIII	-	-	24	12	-	-	200	-	100	300

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		Research Project/ Foreign University Certification Course@@											
3	IOELC8P2	Project Stage II@@	VIII	-	-	4	2	-	-	200	-	100	300
Total				**-**	**-**	**32**	**16**	**-**	**-**	**500**	**-**	**250**	**750**

N. Liberal Learning Courses

Sr. No.	Course Code	Courses Name	Sem.	Hours per week			Credit	Examination Scheme					Total
				L	T	P		ISE	ESE	TW	PR	OR	
1	IOLLC4L1	Lifelong Learning Skills -I	IV	-	-	-	1	-	-	25	-	-	25
2	IOLLC4L2	Lifelong Learning Skills - II	IV	-	-	-	1	-	-	25	-	-	25
3	IOLLC6L3	Lifelong Learning Skills - III	VI	-	-	-	1	-	-	25	-	-	25
4	IOLLC6L4	Lifelong Learning Skills - IV	VI	-	-	-	1	-	-	25	-	-	25
		Total		**-**	-	-	**4**	-	-	100	-	-	100

Lifelong Learning Skills courses I, II, III, IV courses introduced in 4th and 6th sem. whereall the students are required to acquire 2 credits in each semester, one each from **Extracurricular Activities** and **Co-curricular Activities** respectively which will have grades as below. Activity Certificate obtained during SY and TY B- Tech will be considered in 4th and 6th semester respectively.

A. Extracurricular Activities:

Sr. No.	Activity	Level	Achievement	Grade	Achievement	Grade
1.	Sports	Inter collegiate	Participation	P	Prize winner	C
		University	Participation	C	Prize winner	B
		Zonal	Participation	B	Prize winner	B+
		State	Participation	B+	Prize winner	A
		National	Participation	A	Prize winner	A+
		International	Participation	A+	Prize winner	O
2.	NSS/NCC	Camp	Attended	B		
		Camp + 5 Activities	Attended	B+		
		Camp + 10 Activities	Attended	A		
		Camp + 15 Activities	Attended	A+		
		Camp + 20 Activities	Attended	O		
3.	Cultural	Inter collegiate	Participation	B	Prize winner	B+
		State	Participation	B+	Prize winner	A
		National	Participation	A	Prize winner	A+
		International	Participation	A+	Prize winner	O
4.	Community Engagement	Certified by NGO/Authorities with report and geo-tagged photograph	1 Activity of 15 hrs.	B		
			2 Activities of 30 hrs.	B+		
			3 Activities of 45 hrs	A		
			4 Activities of 60 hrs.	A+		
			5 Activities of 75 hrs.	O		

B. Co-curricular Activities:

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Sr. No	Activity	Level	Achievement	Grade	Achievement	Grade
1.	Conference	National	Participation	B	Prize winner	A
		International	Participation	B+	Prize winner	A+
		International (Scopus indexing)	Participation	A+	Prize winner	O
2.	Journal Publication	Non-refereed but recognized and reputed journal/ periodical, having ISSN number.	Publication	B		
		Refereed Journal - As listed by UGC	Publication	A		
		Refereed Journals- As listed by Scopus	Publication	A+		
		Refereed Journals - As listed by SCI/ SCIE	Publication	O		
3.	Hackathon		Participation	A+	Prize winner	O
4.	Professional Body	National	Membership	P	3rd Prize	A
			Activities/participation	B	2nd Prize	A+
			5 participations	B+	1st Prize	O
5.	Internship	1 week	Completed	C		
		2 week	Completed	B		
		3 week	Completed	B+	Sponsored Project	A+
		4 week	Completed	A	Job through internship	O
6.	Entrepreneurship	Awareness camp	Attended	A	Product Developed	A+
					Own Startup	O
7.	Project/Technical events	Inter collegiate	Participation	P	Prize winner	C
		University	Participation	C	Prize winner	B
		Zonal	Participation	B	Prize winner	B+
		State	Participation	B+	Prize winner	A
		National	Participation	A	Prize winner	A+
		International	Participation	A+	Prize winner	O

Any activity other than listed above but having equal weightage should be considered for getting additional credit. The marks with respect to grades are as follows:

Sr. No.	Grade	Marks
1	O	25
2	A+	22
3	A	20
4	B+	18
5	B	16
6	C	13
7	P	10
8	F	0-5

O. Exit Course Structure

Sr. No.	Code	Courses Name	Hours per week			Credit	Examination Scheme					Total
			L	T	P		ISE	ESE	TW	PR	OR	
Exit course after F.Y :One year UG Certificate in Technology												

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1	ITEXC 101	Data Base Management SystemLab	-	-	4	1	-	-	25	-	-	25
						1	-	-	-	25	-	25
	ITEXC 102	Software Engineering & Project Management Lab	-	-	4	1	-	-	25	-	-	25
						1	-	-	-	25	-	25
	ITEXC 103	Internship	-	-	8	4	-	-	100	-	-	100
		Total	**-**	**-**	**16**	**8**	**-**	**-**	**150**	**50**	**-**	**200**
Two years UG diploma in Technology												
2	ITEXC 201	Data Communication and Computer NetworkLab	-	-	4	1	-	-	25	-	-	25
						1	-	-	-	-	25	25
	ITEXC 202	Software Engineering & Project Management Lab	-	-	4	1	-	-	25	-	-	25
						1	-	-	-	25	-	25
	ITEXC 203	Internship	-	-	8	4	-	-	100	-	-	100
		Total	**-**	**-**	**16**	**8**	**-**	**-**	**150**	**25**	**25**	**200**
Three years Bachelor's Degree in Vocation (B.Voc.)or B.Sc. in Technology												
3	ITEXC 301	Software Lab III	-	-	4	1	-	-	25	-	-	25
						1	-	-	-	25	-	25
	ITEXC 302	Software Lab IV	-	-	4	1	-	-	25	-	-	25
						1	-	-	-	25	-	25
	ITEXC 303	Internship	-	-	8	4	-	-	100	-	-	100
		Total	**-**	**-**	**16**	**8**	**-**	**-**	**150**	**50**	**-**	**200**

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Information Technology - Second Year (Semester –III)												
Sr. No.	Code	Course Title	Hours per week			Credits	Examination scheme					
			Lecture	Tutorial	Practical		ISE	ESE	TW	PR	OR	Total
1	IOHSM301	Democracy, Election and Governance@@	2	-	-	2	-	-	25	-	25	50
2	ITPCC302	Discrete Mathematics	3	-	-	3	40#	60*	-	-	-	100
3	ITPCC303	Digital Electronics & Computer Organization	3	-	-	3	40#	60*	-	-	-	100
4	ITPCC304	Data Structure and Algorithms	3	-	-	3	40#	60**	-	-	-	100
5	ITPCC305	Database Management System	3	-	-	3	40#	60*	-	-	-	100
6	ITOEC306	**MOOC** -Human Computer Interaction	3		-	3	40$	60$$	-	-	-	100
7	ITPCC307	Digital Electronics & Computer Organization Lab @@	-	-	2	1	-	-	25	25	-	50
8	ITPCC308	Data Structure and Algorithms Lab@@	-	-	4	2	-	-	25		25	50
9	ITPCC309	Database Management System Lab@@	-	-	2	1	-	-	25	25		50
10	IOHSM3AC	Audit course - Vedic Mathematics	1	-	-	1	-	-	25	-	-	25
11	ITMNR301	Minor Course (TH)	3	-	-	3	-	75	-	-	-	75
12	ITMNR302	Minor Course (PR)	-	-	2	1	-	-	25	-	-	25
Grand Total			**21**	**00**	**10**	**26**	**200**	**375**	**150**	**50**	**50**	**825**

*	**End Semester Examination (ESE)** based on subjective questions.
**	**Practical or Activity based Evaluation.**
#	**In Semester Evaluation I** based on Subjective Examination
	In Semester Evaluation II based on Presentation/Group Discussion/Laboratory Work/Course Project/Home Assignment/Comprehensive Viva Voce/Blog Writing/Case Study/Survey/GATE based Multiple-Choice Question (MCQ)/ Numerical based Subjective Examination
$	**For MOOCs:** Assignments marks will be converted on the scale of 40 marks.
$$	**For MOOCs:** Score of examination conducted by the respective authority of MOOC or Score of ESE Conducted by Institute will be converted on the scale of 60 marks.
@@	Passing is mandatory in both the examination heads to gain the respective credits.

MOOC: Design & Implementation of Human-Computer Interfaces: (12 weeks)

https://onlinecourses.nptel.ac.in/noc22_cs125/preview

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Information Technology - Second Year (Semester –IV)												
Sr. No.	Code	Course Title	Hours per week			Credits	Examination scheme					
			Lecture	Tutorial	Practical		ISE	ESE	TW	PR	OR	Total
1	ITHSM401	Management Information System@@	1	1	-	2	-	-	25	-	25	50
2	ITPCC402	Probability and Statistics	3	-	-	3	40#	60*	-	-	-	100
3	ITPCC403	Object Oriented Programming	3	-	-	3	40#	60**	-	-	-	100
4	ITPCC404	Processor Architecture and Interfacing	3	-	-	3	40#	60*	-	-	-	100
5	ITPCC405	Computer Graphics and Animation	3	-	-	3	40#	60*	-	-	-	100
6	ITVSE406	Web Development@@	1	-	4	3	-	-	50	50		100
7	ITPCC407	Object Oriented Programming Lab@@	-	-	4	2	-	-	25	-	25	50
8	ITPCC408	Processor Architecture and Interfacing Lab@@	-	-	2	1	-	-	25	25		50
9	ITPCC409	Computer Graphics and Animation Lab@@	-	-	2	1	-	-	25	25	-	50
10	IOHSM4AC	Audit course-Sustainable Development Goals	1	-	-	1	-	-	25	-	-	25
11	IOLLC4L1	Lifelong Learning Skills -I	-	-	-	1	-	-	25	-	-	25
12	IOLLC4L2	Lifelong Learning Skills -II	-	-	-	1	-	-	25	-	-	25
13	ITMNR401	Minor Course (TH)	3	-	-	3	-	75	-	-	-	75
14	ITMNR402	Minor Course (PR)	-	-	2	1	-	-	25	-	-	25
Grand Total			**18**	**01**	**14**	**28**	**160**	**315**	**250**	**100**	**50**	**875**

*	**End Semester Examination (ESE)** based on subjective questions.
**	**Practical or Activity based Evaluation.**
#	**In Semester Evaluation I** based on Subjective Examination
	In Semester Evaluation II based on Presentation/Group Discussion/Laboratory Work/Course Project/Home Assignment/Comprehensive Viva Voce/Blog Writing/Case Study/Survey/GATE based Multiple-Choice Question (MCQ)/ Numerical based Subjective Examination
@@	Passing is mandatory in both the examination heads to gain the respective credits.

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Second Year Information Technology (2023 Course) Democracy, Election and Governance			
Course Code:	**IOHSM301**	**Credit**	**2**
Contact Hours:	2 Hrs/week (L)	**Type of Course:**	Lecture
Examination Scheme	Term-work 25 marks	Oral 25 marks	

Pre-requisites:

-

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term-work	Internal	25
2.	Oral	External	25

Course Objectives	
1	To introduce the students meaning of democracy and the role of the governance.
2	To help the understand the various approaches to the study of democracy and governance

Course Outcomes : Students will be able to	
301.1	Know the meaning of democracy and the role of the governance in life.
301.2	Understand the various approaches to the democracy and governance

Topics covered:

UNIT-I: DEMOCRACY-FOUNDATIONANDDIMENSIONS (5 hrs.)

a. Constitution of India
b. Evolution of Democracy- different Models
c. Dimensions of Democracy-Social, Economic, and Political

UNIT-II: DECENTRALIZATION (5 hrs.)

a. Indian tradition of decentralization
b. History of panchayat Raj institution in the lost independence period
c. 73rdand74thamendments
d. Challenges of caste, gender, class, democracy, and ethnicity

UNIT-III: GOVERNANCE (5 hrs.)

a. Meaning and concepts
b. Government and governance
c. Inclusion and exclusion

Text books:

1. Banerjee-Dube, I. (2014). A history of modern India. Cambridge University Press.
2. Basu, D. D. (1982). Introduction to the Constitution of India. Prentice Hall of India.
3. Bhargava, R. (2008). Political theory: An introduction. Pearson Education India.
4. Bhargava, R., Vanaik, A. (2010) Understanding Contemporary India: Critical Perspective. New Delhi: Orient Blackswan.
5. Chandhoke, N., Proyadardhi.P, (ed) (2009), 'Contemporary India: Economy, Society, Politics', Pearson India Education Services Pvt. Ltd, ISBN 978-81- 317-1929-9.

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6. Chandra, B. (1999). Essays on contemporary India. Har-Anand Publications.
7. Chaterjee, P. (1997). State and Politics in India.
8. Dasgupta. S., (ed) (2011), 'Political Sociology', Dorling Kindersley (India) Pvt. Ltd., Licensees of Pearson Education in south Asia. ISBN: 978-317-6027- 7.
9. Deshpande, S. (2003). Contemporary India: A Sociological View, New Delhi:Viking Publication.
10. Guha, R. (2007). India After Gandhi: The History of the World's Largest. Democracy, HarperCollins Publishers, New York.
11. Guha, R. (2013). Gandhi before India. Penguin UK.
12. Jayal. N.G. (2001). Democracy in India.New Delhi: Oxford University Press.
13. Kohli, A. (1990). Democracy and discontent: India's growing crisis of governability. Cambridge University Press.
14. Kohli, A., Breman, J., & Hawthorn, G. P. (Eds.). (2001). The success of India's democracy (Vol. 6). Cambridge University Press.
15. Kothari, R. (1989). State against democracy: In search of humane governance. Apex Pr.
16. Kothari, R. (1970). Politics in India. New Delhi: Orient Blackswan.
17. Kothari, R. (1995). Caste in Indian politics. Orient Blackswan.
18. Sarkar, S. (2001). Indian democracy: the historical inheritance. the Success of India's Democracy, 23-46.

मराठी संदर्भ ग्रंथ:

१. राही श्रुती गणेश., आवटे श्रीरंजन, (२०१९), *'आपलं आयकार्ड'*, सुहास पळशीकर द युनिक अकॅडमी पब्लिकेशनप्रा.लि.,.

२. व्होरा राजेंद्र., पळशीकर, सुहास.(२०१४). *भारतीय लोकशाही अर्थ आणि व्यवहार.* पुणे : डायमंड प्रकाशन.

३. सुमंत, यशवंत.(२०१८). *प्रा. यशवंत सुमंत यांची तीन भाषणे.* पुणे : युनिक अॅकॅडमी पब्लिकेशन्स प्रा.लि

४. भोळे. भा.ल. (२०१५). *भारतीय गणराज्याचे शासन आणि राजकारण.* नागपूर: पिंपळापुरे बुक प्रकाशन

५. कसबे. राबसाहेब. (२०१०)डॉ. आंबेडकर आणि भारतीय राज्यघटना. पुणे: सुगावा प्रकाशन

Note: The assessment for the subject shall be based on presentation and report submission.

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Second Year Information Technology (2023 Course)
Discrete Mathematics

Course Code:	**ITPCC302**	**Credit**	3
Contact Hours:	3 Hrs/week (L)	**Type of Course:**	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Pre-requisites:

- Engineering Mathematics-I
- Engineering Mathematics-II

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-Sem. Evaluation	Internal	40
2.	End Semester Examination	External	60

Course Objectives

1	To gain sound knowledge to formulate and solve problems with sets and Sequences.
2	To solve counting problems by applying elementary counting techniques to solve problems of discrete probability.
3	To apply Graph and Tree terminologies in real life problems.
4	To recognize types of relation, formulate and solve problems with relations and functions.
5	To describe basics of number theory and its applications.
6	To describe the various types' algebraic structures and its applications.

Course Outcomes: Students will be able to

302.1	Use set theory to solve mathematical problems.
302.2	Apply the probability theory to solve combinatorial problems.
302.3	Apply tree and graph theory to devise mathematical models.
302.4	Apply relations and functions to provide solution to computational problems.
302.5	Use techniques of number theory and its application.
302.6	Explain algebraic structure.

Topics covered:

UNIT I: SET THEORY (6 hrs.)

Sets, Types of Sets: Finite set, Infinite set, Empty set, Singleton set, Equal set, Equivalent set, Power set, Universal set, Subset, Cardinality of sets, Cartesian Product, Properties of Sets, Venn diagram, Set Operations, Vector Implementations of Sets, Applications of Set Theory.

UNIT II: COMBINATORICS AND DISCRETE PROBABILITY (6 hrs.)

Combinatorics: Rules of Sum and Product, Permutations, Combinations.

Discrete Probability: Probability, Discrete Probability, Conditional Probability, Bayes Theorem, Applications of Combinatorics and Discrete Probability.

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UNIT III: TREES AND GRAPH THEORY(6 hrs.) **Tree:**-Introduction to Trees,Tree Terminology, Types of Trees, Minimum Spanning Tree, MST using Kruskal and Prims approach. **Graph:**Introduction to Graphs, Graph Terminology, Types of Graphs, Representing graphs, Graph Isomorphism, Connectivity, Eulers and Hamilton paths, Planar Graph, Graph Coloring.
UNIT IV: RELATION AND FUNCTION (6 hrs.) **Relations:** Binary Relations, Representation of Binary Relations,Properties of Relations,Operations on Relations,Composition of Relations,Closures of Relations,Equivalence Relations,partial order relation, total order **Function:** Functions as relation, Injection, Surjection, Bijection, Inverse function, composition of Functions, counting function, Pigeonhole Principle
UNIT V-INTRODUCTION TO NUMBER THEORY (6 hrs.) Properties of Divisibility, Division Algorithm, Greatest Common Divisor,GCD and its Properties, Euclidean Algorithm, Extended Euclidean Algorithm, Prime Factorization Theorem, Modular Arithmetic, Congruence Relation, Chinese Remainder Theorem., Fermat's Little Theorem
UNIT VI-ALGEBRAIC STRUCTURES (6 hrs.) Algebraic Structure, Groups, Semigroups, Monoids. Rings, and Fields.
Syllabus contents required for competitive exams (GATE, UPSC, MPSC etc.)(*if complete unit is applicable then write only "unit 1/2/.." or write the contents from that unit):* GATE: All units

Text Books:

1. C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics", 4th Edition, McGraw-Hill.
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications", & 7th edition, McGraw-Hill.

Reference Books:

1. Bernard Kolman, Robert C. Busby, Sharon Cutler Ross, "Discrete mathematical structures", 6th edition, Prentice Hall of India.
2. Edgar G. Goodaire, Michael M. Parmenter, "Discrete Mathematics with Graph Theory", 3rd Edition, Pearson Education.
3. Tremblay J. S., "Discrete mathematical structures with application", 3rdEdition, Tata McGraw Hill.

E- Books / E- Learning References:

1. https://discrete.openmathbooks.org/pdfs/dmoi3-tablet.pdf
2. https://home.iitk.ac.in/~arlal/book/mth202.pdf
3. https://mathworld.wolfram.com/topics/CalculusandAnalysis.html
4. https://www.javatpoint.com/discrete-mathematics-tutorial
5. https://www.tutorialspoint.com/discrete_mathematics/index.htm

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Second Year Information Technology (2023 Course)
Digital Electronics & Computer Organization

Course Code:	**ITPCC303**	**Credit**	**3**
Contact Hours:	3 Hrs./week (L)	**Type of Course:**	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Pre-requisites:

- Basic Electronics Engineering

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-Sem. Evaluation	Internal	40
2.	End Semester Examination	External	60

Course Objectives	
1	To explain the basics of digital circuits.
2	To provide the design of a combinational circuit.
3	To explain the design of a sequential circuit.
4	To describe the basic structure of a computer.
5	To explain the central processing unit and instruction set.
6	To make students understand the register transfer process and micro operations.

Course Outcomes: Students will be able to	
303.1	Draw the kmap to reduce the logical function
303.2	Draw logical diagram for given combinational circuit.
303.3	Draw logical diagram for given sequential circuit.
303.4	Compare Von Neumann and Harvard architecture and draw different bus structures.
303.5	Describe the instruction format and its addressing mode
303.6	Explain the micro-operations using the bus and memory transfer concepts

Topics covered:

UNIT-I: INTRODUCTION TO DIGITAL ELECTRONICS (6 hrs.)

Introduction, Number System, Boolean Algebra, Universal gates, Standard Representation of logic function, K-map reduction technique upto 4-variable, Quine Mc-Clusky minimization technique.

UNIT-II: COMBINATIONAL CIRCUITS (6 hrs.)

Introduction, Multiplexer, Demultiplexer, Decoder, Adder circuits: Half adder, Full adder, BCD adder, Half subtractor, Full subtractor, Code converters, Parity generator and checker, Comparator.

UNIT-III: SEQUENTIAL CIRCUITS (6 hrs.)

Introduction, Flip flops: Types and conversion of flip flops, Application of Flip flops: Registers-Types, Ring counter, Twisted ring counter, Counters-Ripple counters, Synchronous counters, MOD N counter.

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UNIT-IV: BASIC STRUCTURE OF COMPUTERS (6 hrs.) History of the development of the digital computer, Recent trends computers with processing & memory capacities, Von Neumann Architecture, Harvard Architecture, Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement.
UNIT-V: CENTRAL PROCESSING UNIT(6 hrs.) Introduction, General Register Organization, Stack Organization, Instruction format. Addressing Modes, Data transfer and manipulation, Program Control, Reduced Instruction Set Computer (RISC).
UNIT-VI: REGISTER TRANSFER AND MICRO-OPERATIONS (6hrs.) Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations, Arithmetic logic shift unit.
Syllabus contents required for competitive exams (GATE, UPSC, MPSC etc.)(*if complete unit is applicable then write only "unit 1/2/.." or write the contents from that unit):* GATE: All units

Text Books:

1. Modern Digital Electronics by R.P.Jain, Fourth Edition, Tata McGraw-Hill Education.
2. Computer Organization: By Stallings.

Reference Books:

1. M. Moris Mano (2006), Computer System Architecture, 3rd edition, Pearson/PHI, India
2. Digital Fundamentals by Morris and Mano, PHI Publication
3. Fundamental of digital circuits by A.Anandkumar,PHI Publication
4. Fundamentals of Logic Design by Charles H. Roth Thomson
5. Structured Computer Organization: By Tanenbaum.

E- Books / E- Learning References:

1. https://de-iitr.vlabs.ac.in/
2. https://nptel.ac.in/courses/108105132
3. http://vlabs.iitkgp.ernet.in/coa/
4. https://nptel.ac.in/courses/106105163

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Second Year Information Technology (2023 Course)
Data Structure and Algorithms

Course Code:	**ITPCC304**	**Credit**	**3**
Contact Hours:	3 Hrs/week(L)	**Type of Course:**	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	Practical/Activity based Evaluation 60 Marks	

Pre-requisites:

- Programming and Problem Solving I
- Programming and Problem Solving II

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-sem. Evaluation	Internal	40
2.	Practical or Activity Based Evaluation	External	60

Course Objectives

1	To explain basics of data structures and algorithms
2	To explain basic data structures like 1-D arrays ,2-D arrays and Strings
3	To describe Linked lists and its types
4	To explain different searching and sorting techniques.
5	To explain Stack data structure and its application
6	To describe Queue Data structures and it's applications

Course Outcomes: Students will be able to

304.1	Describe the types and complexity analysis of data structures
304.2	Use arrays and strings to perform various operations
304.3	Apply searching and sorting algorithm on given data
304.4	Solve problems using linked lists data structure
304.5	Solve interconversion of expressions usingstack data structure
304.6	Describe the queue data structure and perform its operations for given problem

Topics covered:

UNIT-I: INTRODUCTION TO DATA STRUCTURES AND ALGORITHMS (6 Hrs.)

Introduction to Data Structures: Concept of data, Data object, Data structure, Concept of Primitive and non-primitive, linear and Nonlinear, static and dynamic, persistent and ephemeral data structures, Definition of ADT

Analysis of algorithm: Frequency count and its importance in analysis of an algorithm, Time complexity & Space complexity of an algorithm Big 'O', 'Ω' and 'Θ' notations,

Modular programming: Function definition, Function call and Function prototype, Data access using pointers(addresses/reference), Recursive functions (Demonstrate at least 3-4 examples, like factorial, summation of integers etc)

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UNIT-II: BASIC DATA STRUCTURS (6 Hrs.) Single, multidimensional array, address calculation. Operations on arrays Representation of polynomials using arrays, Dynamic Array, Use of arrays to represent/store strings and their manipulation (string comparison, finding a substring and reversing strings)
UNIT-III: SEARCHING AND SORTING(6Hrs.) Need of searching and sorting, Concept of internal and external sorting, sort stability, Searching methods: Linear and binary search algorithms, Fibonacci Series. **Sorting methods:** Bubble, insertion, Quick, Merge, shell and comparison of all sorting methods. Analyse Best, Worst and Average case for searching and sorting algorithms
UNIT-IV: LINKED LISTS (6 Hrs.) Concept of linked organization, Singly Linked List, Doubly Linked List, Circular Linked List (Operations: Create, Display, Search, Insert, Delete).
UNIT-V: STACK DATA STRUCTURE AND IT'S APPLICATIONS (6Hrs.) Concept of stack, Concept of implicit and explicit stack, stack as an ADT using sequential and linked organization, Applications of stack: Use of stack for recursive calls, converting expressions from infix to postfix or prefix form, evaluating postfix or prefix form.
UNIT VI: QUEUE DATA STRUCTURE AND IT'S APPLICATIONS (6Hrs.) Concept of queues as ADT, Implementation of queue using array and linked organization, Concept of circular queue, double ended queue, priority queue. Applications of queue:
Syllabus contents required for competitive exams (GATE, UPSC, MPSC etc.)(*if complete unit is applicable then write only "unit 1/2/.." or write the contents from that unit):* **GATE:Unit-I to Unit-VI(All)**
PRACTICAL OR ACTIVITY BASED EVALUATION 1. Based on unit III toVI practical oriented problems will be assigned by teacher during End Sem Examination. 2. Three hours will be given to students for End Sem Examination. 3. From each unit two problems will be allotted to students and student will provide solution for any one problem per unit. Within 3 hrs. student will solve 4 problems. 4. Evaluation of each problem carries 15 marks where 10 marks is for successful execution and 5 marks is for QA.

Text Books

1. E. Horowitz, S. Sahni, D. Mehta, "Fundamentals of Data Structures in C++", Galgotia Book Source, New Delhi, 1995, ISBN 16782928
2. Y. Langsam, M. Augenstin, A. Tannenbaum, "Data Structures using C and C++", 2nd Edition, Prentice Hall of India, 2002, ISBN-81-203-1177-9.

Reference Books

1. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach using C++", Cengage Learning, 5th Edition, ISBN 978-8131504925
2. Mark Allen Weiss, "Data structures and Algorithm Analysis in C++ ", Pearson Education India, 3 edition (2007), ISBN 978-8131714744
3. Hemant Jain, "Problem Solving in Data Structures & Algorithms using C++", CreateSpace Independent Publishing Platform (2017), ISBN 978-1542396479
4. G A V Pai, "Data Structures and Algorithms Concepts, Techniques and Applications", McGraw Hill (2017), ISBN 978-0070667266
5. E Balagurusamy, "Object-Oriented Programming with C++", McGraw Hill Education; Seventh edition (2017), ISBN 978-9352607990

E- Books / E- Learning References:

1. https://www.geeksforgeeks.org/
2. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
3. https://www.codechef.com/certification/data-structures-and-algorithms/prepare

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Second Year Information Technology (2023 Course)
Database Management System

Course Code:	ITPCC305	Credit	3
Contact Hours:	3 Hrs/week(L)	Type of Course:	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Pre-requisites:

- Data Structure and Algorithms
- Discrete Mathematics

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-Sem. Evaluation	Internal	40
2.	End Semester Examination	External	60

Course Objectives

1	To discuss database management system concepts
2	To explain relational model and its uses.
3	To describe the use of SQL and PL-SQL.
4	To discuss transaction management and concurrency control in databases.
5	To explain parallel and distributed database architectures
6	To describe the concept of data warehouse and mining.

Course Outcomes: Students will be able to

305.1	Draw E-R diagram for enterprise database
305.2	Write relational algebraic queries
305.3	Solve the queries using SQL and PL/SQL on enterprise database
305.4	Illustrate the concept of transaction and concurrency control mechanism in databases
305.5	Categories different types of parallel and distributed databases
305.6	Explain the concept of dataware house and datamining

Topics covered:

UNIT-I: INTRODUCTION TO DBMS (6 hrs.)

Basic concept of database, Advantages of DBMS over file systems, Data abstraction, Database languages, Data independence, Components of a DBMS, Overall architecture of DBMS, Multi-user DBMS architecture, ER Model: Basic concepts, Entity, attributes, relationships, constraints, keys.ER and EER diagrams: Components of ER model, Conventions, Converting ER diagrams into tables

UNIT-II: RELATIONAL MODEL (6 Hrs.)

Basic concepts, Attributes and Domains, Codd's rules. Relational Integrity: Nulls, Entity, Referential integrities. Relational Algebra: Basic Operations, Selection, projection, joining. Functional Dependency, Normalization: 1NF, 2NF, 3NF, BCNF.

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UNIT-III: SQL –PL/SQL (6Hrs.)

Introduction to SQL: Characteristics and advantages SQL Data Types, Literals, DDL, DML, SQL Operators Tables: Creating, Modifying, Deleting, Views: Creating, Dropping, Updation using Views, Indexes, Nulls.

SQL DML Queries: SELECT query and clauses, set operations, Tuple Variables, set comparison, Ordering of Tuples, Aggregate Functions, Nested Queries, Database Modification using SQL Insert, Update, Delete Queries, Stored Procedure, Triggers.

UNIT-IV: TRANSACTIONS and CONCURRENCY CONTROL (6Hrs.)

Transaction: Basic concept of a Transaction, Transaction Management, Properties of Transactions, Concept of Schedule, Serial Schedule, Cascaded Aborts.

Concurrency Control: Need, Locking Methods, Deadlocks, Time-stamping Methods. Recovery Methods: Shadow-Paging and Checkpoints.

UNIT-V: DATABASE ARCHITECTURES (6Hrs.)

Database Architectures: Centralized and Client-Server Architectures, 2 Tier and 3 Tier Architecture, Introduction to Parallel Databases, Key elements of Parallel Database Processing, Architecture of Parallel Databases, Introduction to Distributed Databases, Architecture of Distributed Databases, Distributed Database Design.

UNIT-VI: ADVANCE DATABASE CONCEPTS(6Hrs.)

Data Warehousing: Introduction, Characteristics and Limitations of Data Warehousing, Architecture of Data Warehouse, Data Mart, OLAP.

Data Mining: Process, Knowledge Discovery, Goals of Data Mining, Data Mining Tasks, Association, Classification.

Syllabus contents required for competitive exams (GATE, UPSC, MPSC etc.)(*if complete unit is applicable then write only "unit 1/2/.." or write the contents from that unit):*

GATE: All units

Text Books

1. Silberschatz A., Korth H., Sudarshan S, Database System Concepts, McGraw Hill Publication, ISBN-0-07-120413-X, Sixth Edition.
2. G. K. Gupta "Database Management Systems" , Tata McGraw Hill.

Reference Books

1. Kristina Chodorow, Michael Dirolf, MongoDB: The Definitive Guide, O'Reilly Publications.
2. Jiawei Han, MichelineKamber, Jian Pei, Data Mining: Concepts and Techniques, Elsevier.
3. Bill Schmarzo, Big Data: Understanding How Data Powers Big Business, Wiley, 978-81-265-4545-2.
4. Helen Morris, Introduction to Database Systems, PEARSON INDIA, 1st Edition.
5. Raghu Ramakrishnan, Johannes , Database Management Systems, McGraw Hill, Indian 3rd Edition.
6. AtulKahate, Introduction to Database Management System, PEARSON INDIA, 5th Edition.

E- Books / E- Learning References:

1. https://www.pdfdrive.com/dbms-korthpdf-e46256085.html
2. https://www.db-book.com/db6/slide-dir/
3. https://www.octawian.ro/fisiere/situri/asor/build/html/_downloads/1fcab53a6d916e39c715fc20a9a9c2a8/Silberschatz_A_databases_6th_ed.pdf
4. https://www.bmc.com/blogs/dbms-database-management-systems/
5. https://www.techtarget.com/searchdatamanagement/definition/database-management-system
6. https://www.geeksforgeeks.org/dbms/

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BOS–INFORMATION TECHNOLOGY
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Second Year Information Technology (2023 Course) MOOC-Human Computer Interaction			
Course Code:	**ITOEC306**	**Credit**	**3**
Contact Hrs.:	3 Hrs/week (L)	**Type of Course:**	Lecture
Examination Scheme	40$	60$$	

Pre-requisites:

-

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	MOOCs Assignments	External	40
2.	MOOCs Examination	External	60

Course Objectives	
1	To introduce the human-computer interfaces,
2	To explain the concept of usability and its engineering
3	To identify of usability requirements.
5	To convert the design to an information system
6	To evaluate the system for system usability.

Course Outcomes: Students will be able to	
306.1	Describe the human-computer interfaces
306.2	Identify usability requirements for given problem
306.3	Convert design to information system
306.4	Evaluate the system for system usability

Topics covered:

Students must register for below mentioned NPTEL MOOC:

Course Name: Design & Implementation of Human-Computer Interfaces:
Duration: (12 weeks)
Link:https://onlinecourses.nptel.ac.in/noc22_cs125/preview

$ For MOOCs: Assignments marks will be converted on the scale of 40 marks.
$$ For MOOCs: Score of examination conducted by the respective authority of MOOC or Score of ESE Conducted by Institute will be converted on the scale of 60 marks.

E- Books / E- Learning References:

1. https://www.interaction-design.org/literature/topics/user-centered-design
2. http://www.glenbrook.k12.il.us/GBSSCI/PHYS/Class/sound/u11l2d.html
3. http://www.individual-differences.com/

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Second Year Information Technology (2023 Course) Digital Electronics & Computer Organization Lab			
Course Code:	**ITPCC307**	**Credit**	**1**
Contact Hours:	2 Hrs./week(P)	**Type of Course:**	Practical
Examination Scheme	Term-work 25 Marks	Practical 25 Marks	

Pre-requisites:

- Basic Electronics Engineering

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term Work	Internal	25
2.	Practical	External	25

Course Objectives	
1	To explain the implementation of digital circuits.
2	To explain the implementation of sequential circuits.
3	To demonstrate computer organization related operations using simulation tool

Course Outcomes: Students will be able to	
307.1	Draw and implement combination circuits
307.2	Draw and implement sequential circuits
307.3	Perform computer organization related operations using simulation tool

List of Experiments:

1. Implementation of the given Boolean function using logic gates in both SOP and POS forms.Realize
   (a) 4:1 multiplexer using gates.
   (b) 3-variable function using IC 74151(8:1MUX).
2. Implementation and verification of decoder/de-multiplexer and encoder using logic gates.
3. Design and implement half adder, full adder using basic gates.
4. To design a 4 bit Binary to Gray code Converter, 4-bit Gray to Binary code Converter.
5. Design and implement 4-bit binary adder using IC 7483.
6. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
7. Design and implement MOD-N Counter using IC7490.
8. Virtual Lab Experiments
   (a) Design of Ripple carry adders on Virtual Lab.
   http://vlabs.iitkgp.ac.in/coa/exp1/index.html

   (b) Design and simulate single bit ALU with 4 functions(AND,OR,XOR,ADD)
   http://vlabs.iitkgp.ac.in/coa/exp8/index.html

   (c) Design and simulate single bit RAM cell or 4 address * 2 bit memory using 8single bit RAM cell.

http://vlabs.iitkgp.ac.in/coa/exp9/index.html

9. Design and develop a mini project using Sequential and combinational logic circuits.

Text Books:

1. Modern Digital Electronics by R.P.Jain, Fourth Edition, Tata McGraw-Hill Education.
2. Computer Organization: By Stallings.

Reference Books:

1. M. Moris Mano (2006), Computer System Architecture, 3rd edition, Pearson/PHI, India
2. Digital Fundamentals by Morris and Mano, PHI Publication
3. Fundamental of digital circuits by A.Anandkumar,PHI Publication
4. Digital Fundamentals by FLOYD & JAIN, Pearsons Pub
5. Fundamentals of Logic Design by Charles H. Roth Thomson
6. Structured Computer Organization: By Tanenbaum.

E- Books / E- Learning References:

1. https://de-iitr.vlabs.ac.in/
2. https://nptel.ac.in/courses/108105132
3. https://vlabs.iitkgp.ernet.in/coa/
4. https://nptel.ac.in/courses/106105163

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Second Year Information Technology (2023 Course) Data Structure and Algorithms Lab				
Course Code:	**ITPCC308**	**Credit:**	**2**	
Contact Hours:	4 Hrs/week(P)	**Type of Course:**	Practical	
Examination Scheme	Term-work 25 Marks	Oral 25 Marks		

Pre-requisites:

- Programming and Problem Solving I
- Programming and Problem Solving II

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term Work	Internal	25
2.	Oral	External	25

Course Objectives	
1	To demonstrate the use of arrays and linked list
2	To make use of array and linklist for implementation of applications.
3	To explain interconversion of expressions using array and linked list
4	To explain different types of queues and demonstrate its operations.

Course Outcomes: Students will be able to	
308.1	Write programs to store data and perform operations using arrays.
308.2	Write programs to store data and perform operations using link list.
308.3	Perform interconversion of expressions using array and linked list
308.4	Implement different types of queues and demonstrate its operations.

List of Experiments:

1. Create an array to store N integers and find min and max using function
2. Create a Dynamic array to store N integers and write a menu driven C++ program to perform following operations.
   a) Quick Sort
   b) Merge Sort

   (Note: Analyze and provide comparative study of both the algorithms)
3. Create a 2-D array to store names of N students and write a menu driven C++ program to perform following operations.
   a) Linear search
   b) Insertion Sort(Alphabetical order)
   c) Binary search

   (Note: Analyze and provide comparative study of both the search algorithms)
4. Create Singly linked list to store details of company , like Name, location and number of employees . Write a menu driven C++ program to perform following operations.
   a) Create a list of N companies
   b) Append a new company to the list
   c) Add a company to the beginning of list
   d) Find no. of Employees, if company name is specified

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e) Find Location if company name is specified

(Note: Define a C++ class to represent a List and define member functions for the listed operations)

5. Create doubly linked list to store details of Doctor , like Name, specialization and phone number . Write a menu driven C++ program to perform following operations.
   a) Create a list by appending a node
   b) List all the Doctors with phone numbers for given specialization.
   c) Reverse the List , such that the last Doctor, should be first in the List.

   (Note: Define a C++ class to represent a List and define member functions for the listed operations)
6. Create Circular List to represent a polynomial for two variables. Write a menu driven C++ program to perform following operations on polynomials.
   a) Create polynomial
   b) Display a polynomial
   c) Add two polynomials
   d) Evaluate a given polynomial

   (Note: The polynomial can be evaluated by providing values for x and y variables)
7. Design and develop a Stack using sequential representation and write a menu driven C++ program to perform following operations.
   a) Input a valid infix expression and convert it to postfix expression.
   b) Input a valid infix expression and convert it to prefix expression.

   (Note: Define a C++ class to represent a Stack and define member functions for the Overflow, underflow, push and pop operations, define non-member functions for conversions)
8. Design and develop a Stack using Linked representation and write a menu driven C++ program to perform following operations.
   a) Input a valid postfix expression and evaluate it
   b) Input a valid prefix expression and evaluate

   (Note: Define a C++ class to represent a Stack and define member functions for the Overflow, underflow, push and pop operations, define non-member functions for evaluations)
9. Design and Develop a Linear queue using sequential representation having max size of 50 numbers with operations as insert/delete items to/from it. Write a menu driven C program to perform following operations.
   a) Issue a token number to customer(insert)
   b) Serve a Customer(delete)
   c) Display token numbers of Customers
10. Design and Develop a Circular queue using sequential representation having max size of 50 numbers with operations as insert/delete items to/from it. Write a menu driven C program to perform following operations.
    a) Issue a token number to customer(insert)
    b) Serve a Customer(delete)
    c) Display token numbers of Customers

    (Note: Define a C++ class to represent a Circular Queue and define member Functions insert, delete and display).
11. Design and Develop Priority queue using linked representation and demonstrate its use.
12. Virtual Lab Experiments:
    a. Quick Sort;https://ds1-iiith.vlabs.ac.in/exp/quick-sort/index.html
    b. Linked List;https://ds1-iiith.vlabs.ac.in/exp/linked-list/index.html
13. Design and Develop mini project using data structure concepts.

Oral Evaluation

1. Student will design and develop a mini project using data structure concepts and present the same during OR exam.

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Text Books

1. E. Horowitz, S. Sahni, D. Mehta, "Fundamentals of Data Structures in C++", Galgotia Book Source, New Delhi, 1995, ISBN 16782928
2. Y. Langsam, M. Augenstin, A. Tannenbaum, "Data Structures using C and C++", 2nd Edition, Prentice Hall of India, 2002, ISBN-81-203-1177-9.

Reference Books

1. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach using C++", Cengage Learning, 5th Edition, ISBN 978-8131504925
2. Mark Allen Weiss, "Data structures and Algorithm Analysis in C++ ", Pearson Education India, 3 edition (2007), ISBN 978-8131714744
3. Hemant Jain, "Problem Solving in Data Structures & Algorithms using C++", CreateSpace Independent Publishing Platform (2017), ISBN 978-1542396479
4. G A V PAI, "DATA STRUCTURES and Algorithms Concepts, Techniques and Applications", McGraw Hill (2017), ISBN 978-0070667266
5. E Balagurusamy, "Object-Oriented Programming with C++", McGraw Hill Education; Seventh edition (2017), ISBN 978-9352607990

E- Books / E- Learning References:

1. https://www.geeksforgeeks.org/
2. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
3. https://www.codechef.com/certification/data-structures-and-algorithms/prepare
4. https://www.codespaces.com/best-data-structures-and-algorithms-courses-classes.html#1-data-structures-and-algorithms-specialization-program-coursera
5. https://www.codespaces.com/best-data-structures-and-algorithms-courses-classes.html#6-javascript-algorithms-and-data-structures-masterclass-udemy

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Second Year Information Technology (2023 Course) Database Management System Lab			
Course Code:	**ITPCC309**	**Credit**	**1**
Contact Hours:	2 Hrs/week (P)	**Type of Course:**	Practical
Examination Scheme	Term-work 25 Marks	Practical 25 Marks	

Pre-requisites:

- Discrete Mathematics
- Data Structure and Algorithms

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term-work	Internal	25
2.	Practical	External	25

Course Objectives	
1	To discuss the properties and installation procedure of MySQL/Oracle and SQLite
2	To explain SQL DDL/DML queries with various operators and clauses
3	To explain procedures and triggers to execute a given task
4	To provide the insight to design and draw E-R diagram for any enterprise

Course Outcomes: Students will be able to	
309.1	Study and Installation of MySQL/Oracle and SQLite tools
309.2	Solve SQL DDL/DML queries using various operators and clauses
309.3	Write procedures and triggers to execute a given task
309.4	Draw the design of enterprise database with suitable E-R diagram

List of Experiments:

1. Study of MySQL Open-source software. Discuss the characteristics like efficiency, scalability, performance and transactional properties.
2. Install and configure client and server of MySQL(Show all commands and necessary steps for installation and configuration)
3. Study of SQLite: What is SQLite? Uses of SQLite. Building and installing SQLite.
4. Design any database with at least 3 entities and relationships between them. Draw suitable ER/EER diagram for the system.
5. Design and implement a database (for assignment no 4) using DDL with primary key and foreign key constraints.
6. Perform following SQL queries on the database created in assignment 5. Implementation of relational operators in SQL
    1. Boolean operators and pattern matching
    2. Arithmetic operations and built in functions
    3. Group functions
    4. Processing Date and Time functions

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5. Complex queries and set operator

7. Execute DDL/DML statements which demonstrate the use of views. Update the base table using its corresponding view. Also consider restrictions on updatable views and perform view creation from multiple tables.
8. Write and execute PL/SQL stored procedure and function to perform a suitable task on the database using all types of cursors.
9. Write and execute suitable database triggers. Consider row level and statement level triggers.
10. Perform case study of any organization (back end only), draw ER diagram and Database design.
11. Design a mini project to demonstrate the database for any organization using open-source tools/framework.

Text Books

1. Silberschatz A., Korth H., Sudarshan S, Database System Concepts, McGraw Hill Publication, ISBN-0-07-120413-X, Sixth Edition.
2. G. K. Gupta "Database Management Systems" , Tata McGraw Hill.

Reference Books

1. Kristina Chodorow, Michael Dirolf, MongoDB: The Definitive Guide, O'Reilly Publications.
2. Jiawei Han, Micheline Kamber, Jian Pei, Data Mining: Concepts and Techniques, Elsevier.
3. Bill Schmarzo, Big Data: Understanding How Data Powers Big Business, Wiley, 978-81-265-4545-2.
4. Helen Morris, Introduction to Database Systems, PEARSON INDIA, 1st Edition.
5. Raghu Ramakrishnan, Johannes, Database Management Systems, McGraw Hill, Indian 3rd Edition.
6. Atul Kahate, Introduction to Database Management System, PEARSON INDIA, 5th Edition.

E- Books / E- Learning References:

1. https://www.javatpoint.com/mysql-queries
2. https://dev.mysql.com/doc/mysql-tutorial-excerpt/8.0/en/examples.html
3. https://dev.mysql.com/doc/refman/8.0/en/entering-queries.html
4. https://www.w3schools.com/mysql/mysql_sql.asp
5. https://www.geeksforgeeks.org/mysql-common-mysql-queries/
6. https://www.databasejournal.com/mysql/the-10-most-common-mysql-queries/
7. https://www.educba.com/mysql-query-commands/
8. https://www.oreilly.com/library/view/mysql-reference-manual/0596002653/ch03s05.html

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Second Year Information Technology (2023 Course) Audit course- Vedic Mathematics			
Course Code:	**IOHSM3AC**	**Credit**	**1**
Contact Hours:	1 Hrs/week	**Type of Course:**	Lecture
Examination Scheme	Term-work 25 Marks		

Pre-requisites:
Nil

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term-work	Internal	25

Course Objectives	
1	To develop the understanding of Techniques/Sutras to solve mathematical arithmetic's in easy and faster way and use these techniques to varies Competitive Examinations.
2	To Improve speed and efficiency to solve even the most complex Mathematical problems.
3	To remove the phobia about mathematics in the minds of Students.
4	To help students to have better command over mathematical concepts and boost up their self- confidence level towards the subject.

Course Outcomes: Students will be able to	
3AC.1	Apply Vedic Mathematics techniques to Perform quickly and accurately mathematical calculations like multiplication, division, squares, cubes, LCM, HCF.
3AC.2	Apply Vedic Mathematics techniques to solve Linear Equations, Quadratic Equations, Factorization of a Cubic Polynomial.
3AC.3	Apply Vedic Mathematics techniques to Perform calculations in Coordinate Geometry, Differentiation, Integration and Trigonometry without relying heavily on calculators or written methods.

UNIT I:- BASIC LEVEL(4Hrs)
Introduction of Vedic Mathematics, Multiplication, Square, Cube, Divisibility Test , Highest Common Factor of Polynomials, Multiplication of Polynomials, Division of Polynomials

UNIT II: INTERMEDIATE LEVEL(4Hrs)
Linear Equations, Quadratic Equations, Factorization of a Cubic Polynomial, Magic squares, Dates and Calendar.

UNIT III:ADVANCE LEVEL(4Hrs)
Determinant, Coordinate Geometry, Differentiation, Integration, Trigonometry.

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Textbooks

1. Advanced Vedic Mathematics, Rajesh Kumar Thakur.
2. Vedic Mathematics Made Easy , DhavalBathia
3. VEDIC MATHEMATICS ForStudents: LEVEL – 1 OF 5 SERIES, by Nava Vision

Reference Books

1. Sri Bharatikrishna Tirthaji,"Vedic Mathematics",Published by MotilalBanarsidass, 1965.ISBN 81-208-0163-6.
2.Williams K.R. "Discover Vedic Mathematics" Vedic Mathematics Research Group, 1984.ISBN 1-869932-01-3.
3. Wiliams K.R. and M.Gaskell "The Cosmic Calculator". otilalBanarsidass,2002.ISBN 81-208-1871-7.
4. Nicholas A.P., Williams,J. Pickles."Vertically and Crosswise". Inspiration books, 1984.ISBN 1-902517-03-2

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Second Year Information Technology (2023 Course) Management Information System			
Course Code:	**ITHSM401**	**Credit:**	**2**
Contact Hrs.:	1Hr./week (L) 1 Hr./week(T)	**Type of Course:**	Lecture/Tutorial
Examination Scheme	Term Work 25 Marks	Oral 25 Marks	

Pre-requisites:

-

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term Work	Internal	25
2.	Oral	External	25

Course Objectives	
1	To explain the foundations of management information system.
2	To classify and explain the various M-commerce facilities.
3	To introduce the enterprise management system.
4	To develop a management information system for society

Course Outcomes : Students will be able to	
401.1	Describe the basics of management information system
401.2	Explain various M-commerce strategies.
401.3	Discuss benefits of enterprise management system
401.4	Develop a management information system for society

Topics covered:

UNIT-I: INTRODUCTION TO INFORMATION SYSTEM (4Hrs)

Foundations of Information Systems: Need and objective of Information systems. Components and resources of information systems, Types of information systems: Operations support systems and Management support systems.

Management Information Systems: Definition, role and impact of MIS, Functions of the managers: planning, organizing, staffing, coordinating and directing, MIS as a support to the management

Applications in Manufacturing Sector: HR Management, Marketing Management, Finance Management, Materials Management and Marketing Management,

Applications in service: Banking, Insurance, Airline, Hotel, Hospital, Education

UNIT-II: E-COMMERCE (2 Hrs.)

Electronic Commerce Systems (E-Commerce): Introduction, scope, B2C, B2B and C2C, C2G, G2G, Essential e-Commerce processes, Electronic Payment Processes, m commerce.

Customer Relationship Management (CRM): Introduction, What is CRM? Three phases of CRM, Benefits, challenges and trends in CRM, E-ERM

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UNIT-III: ENTERPRISE MANAGEMENT SYSTEMS(2Hrs.)

Introduction, Enterprise Resource Planning (ERP) systems: Basic features, benefits, selection, implementation, EMS and MIS

ITES: Objectives of ITES, ITES Services and applications like Medical Transcription, Document Processing

PROJECT BASED ACTIVITY: (16 hrs.)

In a group student has to develop a management information system for a societal need

Guidelines:

1. There should be a team of 3 to 6 students who will work cohesively.
2. The project scope/topic can be from any field/area, but selection related to IT technical aspect is desirous.
3. The project/problem done in first year engineering could be extended further, based on its potential and significance analysis.
4. Project/problem requiring solutions through conceptual model development and use of software tools should be preferred.
5. Different alternate approaches such as theoretical, practical, working model, demonstration or software analysis should be used in solving/implementing of project/problem.
6. The project/problem requiring multi-disciplinary approach to solve it, should be preferred.
7. Problem may require in depth study of specific practical, scientific or technical domain.
8. Hands-on activities, organizational and field visits, interacting with research institutes and expert consultation should be included in the approach to make students aware of latest technologies.
9. Progress of Project will be monitored regularly on weekly basis. Weekly review of the work is necessary.
10. During process of monitoring and continuous assessment and evaluation the individual and team performance is to be measured by mentor.
11. Students must maintain an institutional culture of authentic collaboration, self-motivation, pee rlearning and personal responsiveness. The institution/department should support students in this regard through guidance/orientation programs and the provision of appropriate resources and services.
12. Supervisor/mentor and students must actively participate in assessment and evaluation processes. Group may demonstrate their knowledge and skills by developing a public product and/orreport and/or presentation.

Recommended parameters for assessment, evaluation and weightage:

1. Idea Inception (5%)
2. Outcomes of Project/Problem Solving Skills/Solution provided/Final product(40%) (Individual assessment and team assessment)
3. Documentation (Gathering requirements, design &modeling, implementation/execution, use of technology and final report, other documents (25 %)
4. Potential for the patent(10%)
5. Demonstration (Presentation, User Interface, Usability etc.) (10%)
6. Contest Participation/ publication (5%)
7. Awareness /Consideration of Environment/ Social /Ethics/ Safety measures/Legal aspects (5%).

Note: teacher will Design the rubrics based on the above parameters for evaluation of student performance

Text Books:

1. O'Brien James , "Management Information Systems" , 7th Edition, Tata McGravv-Hill Publishing Company Limited, ISBN 0 - 07 –0622003-2
2. Rober Schulthesis, Mary Sumner, "Management information system" , Tata McGraw-Hill Publishing Company Limited, 0.07.463879-3

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3. ArpitaGopal, Chandrani Singh, "E-world Emerging trends in Information Technology", Excel Books, 978-81-7446-732-4

Reference Books:

1. KC Laudon, JP Laudon, "*MIS Managing digital firm, Person Education*" , 978-81317-1413-7
2. Jawadekar W., *"Management Information Systems*", 2nd Edition, Tata McGraw-HillPublishing Company Limited, 2002, ISBN 0 -07 - 044575 - 3
3. Lucas Henry C., "*Information Technology for Management*" Edition, Tata McGraw-Hill Publishing Company Limited, 2004, ISBN 0 - 07- 047242- 4
4. Post J, Anderson D., "*Management Information Systems*" 3rd Edition, Tata McGraw-Hill Publications, ISBN 0 - 07 - 049940 -3
5. Gupta L., "*Management Information Systems: A Managerial Perspective*", Galgotia,ISBN 81-7515-085-8
6. Brendan Read :*Designing the Best Call Center for Your Business*, 2nd Edition , CMPBook, ISBN 1578203139, 9781578203130

E- Books / E- Learning References:

1. https://repository.dinus.ac.id/docs/ajar/Kenneth_C.Laudon,Jane_P_.Laudon_-_Management_Information_Sysrem_13th_Edition_.pdf
2. https://d3bxy9euw4e147.cloudfront.net/oscms-prodcms/media/documents/PrinciplesofManagement-OP.pdf
3. https://ebooks.lpude.in/management/mba/term_4/DMGT505_MANAGEMENT_INFORMATION_SYSTEM.pdf

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Second Year Information Technology (2023 Course) Probability and Statistics			
Course Code:	**ITPCC402**	**Credit:**	3
Contact Hrs.:	3 Hrs/week (L)	**Type of Course:**	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Pre-requisites:

- Discrete Mathematics

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-Sem. Evaluation	Internal	40
2.	End Semester Examination	External	60

Course Objectives	
1	To understand the basic concepts in probability
2	To understand data distribution using probability
3	To Relate probability function to the distribution of a random variable.
4	To Apply statistical measures on data..
5	To compute regression and correlation between two variables.
6	To test hypothesis.

Course Outcomes: Students will be able to	
402.1	Use probability and its concepts with real worlds problems.
402.2	Corelate data distribution using probability.
402.3	Relate probability function to the distribution of a random variable.
402.4	Apply statistical measures on data.
402.5	Compute regression and correlation between two variables.
402.6	Test the hypothesis using statistical testing

Topics covered:

UNIT-I: PROBABILITY (6 hrs.)

Introduction, random experiments, sample space, events and algebra of events.
Definitions of Probability – classical, statistical, and axiomatic. Conditional Probability, laws of addition and multiplication, independent events, theorem of total probability, Bayes' theorem and its applications.

UNIT-II: PROBABILITY DISTRIBUTION (6 hrs.)

Probability distributions: Binomial, Poisson, Normal and Hyper geometric, Sampling distributions

UNIT-III:RANDOM VARIABLES (6 hrs.)

Discrete and continuous random variables, p.m.f., p.d.f. and c.d.f.,illustrations and properties of random variables, univariate transformations with illustrations.
Two dimensional random variables: discrete and continuous type, joint, marginal and conditional p.m.f, p.d.f., and c.d.f., independence of variables.

UNIT-IV: STATISTICS (6 hrs.)

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Sample variable, statistical sampling, population, frequency distribution Collection, Mean, median, mode, Measures of dispersion: range, variation, standard deviation, skewness and kurtosis
UNIT-V: REGRESSION AND CORRELATION ANALYSIS (6 hrs.) Regression -Linear Regression · Logistic Regression, Ridge Regression, Lasso Regression, Polynomial Regression, Regression model evaluation metrics Covariance, Correlation, Difference Between Covariance and Correlation, Correlation methods- Pearson correlation, Kendall rank correlation, Spearman correlation, Analysis of variance- ANOVA
UNIT-VI: HYPOTHESIS TESTING (6 hrs.) Hypothesis, hypothesis testing – Null- and alternative hypothesis , Type-I and type-II errors , Significance levels and powers of the tests. p-values. Tests for the expected value and variance of random variables- One-tailed and two-tailed tests, T-test, F-test, Z-test and Chi-Square test, Relationship between confidence intervals and hypothesis testing.
Syllabus contents required for competitive exams (GATE, UPSC, MPSC etc.)(*if complete unit is applicable then write only "unit 1/2/.." or write the contents from that unit):* GATE: All units

Text Books:

1. Montgomery, Douglas C., and George C. Runger. Applied Statistics and Probability for Engineers. John Wiley & Sons, 2010
2. Probability and Random variable, David Stirzaker, University of oxford.
3. Text Book of correlation and regression ,A.K.Sharma, Discovery Publishing House,2005

Reference:

1. Introduction to Hypothesis Testing (Easy Statistics),Anusha IlluKumbura, Easy Statistic Series.
2. Probability and Statistics, Michael J. Evans and Je§rey S. Rosenthal, University of Toronto
3. Random Variable and Probability Distribution. Cramer, Cambridge University Press.

E- Books / E- Learning References:

1. https://www.spps.org/cms/lib/MN01910242/Centricity/Domain/859/Statistics%20Textbook.pdf
2. https://www.fireblazeaischool.in/blogs/covariance-and-correlation-in-machine-learning/
3. https://www.probabilitycourse.com/chapter4/4_0_0_intro.php
4. https://www.geeksforgeeks.org/types-of-regression-techniques/

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Second Year Information Technology (2023 Course) Object Oriented Programming				
Course Code:	**ITPCC403**	**Credit:**	**3**	
Contact Hrs.:	3 Hrs/week (L)	**Type of Course:**	Lecture	
Examination Scheme	In-sem. Evaluation 40 Marks	Practical/Activity based Evaluation 60 Marks		

Pre-requisites:

- Programming and Problem solving -I
- Programming and Problem solving -II

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-Sem. Evaluation	Internal	40
2.	Practical/Activity based Evaluation	External	60

Course Objectives	
1	To explain object-orientedprogramming concepts
2	To create classes and objects for real world problems
3	To use inheritance and polymorphism
4	To create abstract class and Interface
5	To handle exceptions using exception handling
6	To make use of collections for implementing generics

Course Outcomes: Students will be able to	
403.1	Describe the object-oriented programming paradigm
403.2	Define classes and objects for real world problems
403.3	Implement inheritance and polymorphism for given problems
403.4	Implement abstract class and interface
403.5	Handle exceptions using exception handling mechanism
403.6	Make use of collections for implementing generics programming

Topics covered:

UNIT-I: CONCEPTS OF OBJECT-ORIENTED PROGRAMMING (6 Hrs.)

Introduction to Procedural-Oriented and Object-Oriented Paradigms, Limitations of Procedural Programming, Need of Object-Oriented Programming, Fundamentals of the Object-Oriented Programming (OOP): Objects, Classes, Data abstraction, Encapsulation, Inheritance, Polymorphism, Dynamic Binding and Message Passing, Data types, Control structures, Array , String,Case study

UNIT-II: DEFINING CLASSES AND METHODS (6 Hrs.)

Define a Class, Creating an Objects, Access specifiers, Introducing Methods, adding a Method-with parameters, without parameters, with return type, without return types, Static data, Static methods, Constructors, types of Constructors, Overloading Methods/Constructors, this keyword Using Object as a Parameters, Returning Objects, the finalize () Method, Recursion, Command Line Argument, Inner classes, Case study

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UNIT-III: INHERITANCE AND POLYMORPHISM (6 Hrs.) Introduction, Need of Inheritance, Types of Inheritance, using super keyword, Creating Polymorphism, Method Overriding, Dynamic Method Dispatch, Using final with Inheritance, Case study
UNIT-IV: ABSTRACT CLASSES AND INTERFACE(6 Hrs.) Using Abstract methods and Class, Defining an Interface, Implementing Interfaces, Nested Interfaces, Applying Interfaces, variables in Interfaces, Interfaces can be extended, Case study
UNIT-V: EXCEPTION HANDLING (6 Hrs.) Errors, Types of errors, Exception, Exception Handling, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, Creating Your Own Exception Subclasses, Case study.
UNIT-VI: GENERIC PROGRAMMING AND COLLECTIONS FRAMEWORK(6 Hrs.) Collections Overview, The Collection Interface: The List Interface, The Set Interface, The Map Interface and The Queue Interface, The Collection Classes: The ArrayList Class, The LinkedList Class, The HashSet Class, the Hash map Class, TheTreeSetClass, Case study
Syllabus contents required for competitive exams (GATE, UPSC, MPSC etc.)(*if complete unit is applicable then write only "unit 1/2/.." or write the contents from that unit):* **GATE:Unit 1**
PRACTICAL OR ACTIVITY BASED EVALUATION 1. Based on unit III toVI practical oriented problems will be assigned by teacher during End Sem Examination. 2. Three hours will be given to students for End Sem Examination. 3. From each unit two problems will be allotted to students and student will provide solution for any one problem per unit. Within 3 hrs. student will solve 4 problems. 4. Evaluation of each problem carries 15 marks where 10 marks is for successful execution and 5 marks is for QA. The weightage of four problems solved by students is 60.

Text Books:

1. Object Oriented Programming Using Java, E. Balaguruswamy,Tata McGraw Hill
2. Programming with Java, E. Balaguruswamy , Tata McGraw Hill

Reference Books:

1. Timothy A. Budd , An Introduction to Object Oriented Programming, Addison-Wesley
2. The Complete Reference, Java 2 (Fourth Edition), Herbert Schild, TMH.
3. Object-Oriented Programming and Java by Danny Poo (Author), Derek Kiong (Author), Swarnalatha Ashok (Author)Springer; 2nd ed. 2008 edition (12 October 2007), ISBN-10: 1846289629, ISBN-13: 978-1846289620,2007
4. Object-Oriented Design Using Java, Dale Skrien, McGraw-Hill Publishing, 2008, ISBN - 0077423097, 9780077423094.
5. UML for Java Programmers by Robert C. Martin, Prentice Hall, ISBN 0131428489,2003.

E- Books / E- Learning References:

1. https://www.w3schools.com/java/java_oop.asp
2. https://www.geeksforgeeks.org/object-oriented-programming-oops-concept-in-java/
3. https://www.freecodecamp.org/news/object-oriented-programming-concepts-java/
4. https://www.guru99.com/java-oops-concept.html

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Second Year Information Technology (2023 Course) Processor Architecture and Interfacing			
Course Code:	**ITPCC404**	**Credit:**	**3**
Contact Hrs.:	3Hrs/week (L)	**Type of Course:**	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Pre-requisites:

- Digital Electronics and Computer Organisation

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-Sem. Evaluation	Internal	40
2.	End Semester Examination	External	60

Course Objectives	
1	To explain the architecture of the ESP 32 controller.
2	To describe Instruction set and I/O Port Programming.
3	To apply programming concepts for Delay, Arithmetic and Logic Operations, and Memory Access.
4	To describe concepts of Timer, Serial Port, and Interrupt programming.
5	To apply knowledge of programming for interfacing of LCD, Keyboard, ADC, and DAC.
6	To analyze current trends in microcontrollers.

Course Outcomes: Students will be able to	
404.1	Describe the architecture of the ESP 32 controller.
404.2	Describe Instruction set and I/O Port Programming.
404.3	Describe concepts of different networking protocol programming.
404.4	Explain RTOS concepts to perform real world project.
404.5	Explain the different model and application of the Raspberry Pi.
404.6	Use python programming concepts to interface I/O using Raspberry Pi.

Topics covered:

UNIT-I: INTRODUCTION TO MICROCONTROLLERS AND THE ESP32 (6 hrs.)
Microcontroller Architectures (Harvard vs. Von Neumann), Microcontroller Peripherals (GPIO, Timers, ADC, DAC, Serial Communication), Embedded C Programming: Data types, operators, control structures, Development Environments and Tool chains, The ESP32 Arduino Core, Setting up the Arduino IDE for ESP32, Basic ESP32 programming in Arduino (GPIO, Serial).

UNIT-II: ESP32 PROGRAMMING WITH ESP-IDF (6 hrs.)
Introduction to ESP-IDF (Espressif IoT Development Framework), ESP-IDF Project Structure and Build System (Make, CMake), In-depth ESP32 GPIO Programming and Interrupts with ESP-IDF, ESP32 Timers, PWM, ADC using ESP-IDF.

UNIT-III: ESP32 NETWORKING AND APPLICATIONS (ESP-IDF) (6 hrs.)
ESP32 Wi-Fi and Bluetooth with ESP-IDF, Networking with ESP-IDF: TCP/IP Sockets, Web Servers, Basic IoT Protocols with ESP-IDF (MQTT, HTTP),Real-world Project: Smart Home Sensor Node (ESP32, Sensors, ESP-IDF, web interface/MQTT),

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UNIT-IV: ADVANCED ESP32 TOPICS (ESP-IDF) (6 hrs.) Real-Time Operating Systems (RTOS) with Free RTOS on ESP32, Low-power operation of the ESP32 with ESP-IDF, Over-The-Air (OTA) Updates with ESP-IDF, Real-world Project: Wireless Data Logger (ESP32, Sensors, Data Storage, ESP-IDF),
UNIT-V: INTRODUCTION to RASPBERRY Pi (4 hrs.) Different Models of Raspberry Pi, Why Raspberry Pi, Peripherals of Raspberry Pi, Applications of Raspberry Pi, The Linux Operating System and Raspbian, GPIO programming with Python.
UNIT-VI: INTERFACING USING RASPBERRY Pi (8 hrs.) Interfacing Peripherals with the Raspberry Pi (I2C, SPI), Interfacing Various Sensors (temperature, humidity, light, etc.), Implementing IoT Protocols (MQTT, HTTP), Real-world Project: Environmental Monitoring Station (Raspberry Pi, Sensors,Cloud connectivity),
Syllabus contents required for competitive exams (GATE, UPSC, MPSC etc.)(*if complete unit is applicable then write only "unit 1/2/.." or write the contents from that unit):* NA

Text Books:

1. Developing IoT Projects with ESP32Automate Your Home Or Business with Inexpensive Wi-Fi Devices by Vedat Ozan Oner
2. Learning Raspberry Pi Unlock Your Creative Programming Potential by Creating Web Technologies, Image Processing, Electronics- and Robotics-Based Projects Using the Raspberry Pi By Samarth Shah

Reference Books:

1. Hands-on ESP32 with Arduino IDE by Asim Zulfiqar
2. Programming the Raspberry Pi, Third Edition: Getting Started with Python by Simon Monk
3. Developing IoT Projects with ESP32: Unlock the full Potential of ESP32 in IoT development to create production-grade smart devices, Second Edition by Vedat Ozan Oner

E- Books / E- Learning References:

1. **https://youtube.com/playlist?list=PLLSegLrePWgLzBgQqDJvgZ4ewbpCnuare&feature=shared**
2. **https://youtube.com/playlist?list=PLoAx5AQlvczXOJcyb9wC11DGYfTyGnX1u&feature=shared**
4. **https://youtube.com/playlist?list=PLfPtpZzK2Z_QO8snrdnRTTNtQvLw35Zfc&feature=shared**
5. **https://www.udemy.com/course/learn-esp32-with-this-30-days-challenge/**
6. **https://www.udemy.com/course/advanced-esp32/?couponCode=LEADERSALE24B**
7. **https://www.udemy.com/course/raspberry-pi-for-beginners-step-by-step/?couponCode=LEADERSALE24B**
8. **https://www.udemy.com/course/raspberry-pi-and arduino/?couponCode=LEADERSALE24B**
9. **https://www.espressif.com/sites/default/files/documentation/esp32_technical_reference_manual_en.pdf**

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Second Year Information Technology (2023 Course) Computer Graphics and Animation				
Course Code:	**ITPCC405**	**Credit:**	**3**	
Contact Hrs.:	3 Hrs/week (L)	**Type of Course:**	Lecture	
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks		

Pre-requisites:

- Data Structure and Algorithms

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In Sem Evaluation	Internal	40
2.	End Semester Examination	External	60

Course Objectives	
1	To explain graphics, graphics drawing algorithm to solve problems
2	To explain Polygon filling & 2D Transformation.
3	To explain 3D Transformation, windowing and clipping concepts
4	To explain the types of projections.
5	To explain basics & principle of animation
6	To explain the workflow of animation.

Course Outcomes: Students will be able to	
405.1	Use line drawing and circle drawing algorithms to solve problems
405.2	Apply Polygon filling & 2D Transformation methods.
405.3	Solve 3D Transformation, windowing and clipping concepts.
405.4	Solve the types of projections.
405.5	Explain animation basics & principle of animation
405.6	Explain the process of making animation.

Topics covered:

Unit-I: INTRODUCTION AND OVERVIEW OF GRAPHICS SYSTEM(6Hrs.)
Introduction to Computer Graphics, Raster scan and Random scan display,
Line Drawing: DDA Line Mathematical Treatment algorithm, Bresenhem Line Mathematical Treatment & algorithm
Circle Drawing: Bresenhem's circle drawing Mathematical Treatment &algorithm.
OpenGL – Introduction, Open GL libraries, Primitive operations

UNIT-II: POLYGON FILLING AND 2D TRANSFORMATION(6Hrs.)
Polygons: Polygons and its types, Inside test method,
Polygon filling methods: SeedFill/Floodfill, BoundaryFill, Scan-line Fill algorithms,
2D Transformations: Translation, Scaling, Rotation, Shearing , Reflection

UNIT-III: WINDOWING, CLIPPING AND 3D TRANSFORMATION(6Hrs.)
Windowing: Concept of window and viewport, viewing transformations
Line Clipping: Cohen Sutherland Method
Polygon Clipping: Sutherland Hodgman Method
3D Transformation: Translation, scaling, rotation about X, Y, Z, Shearing , Reflection

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UNIT-IV: PROJECTIONS (6 Hrs.)

Planner Geographics Projections:
1) Parallel Projection:
a) Oblique Projection: Cavalier, Cabinet
b) Orthographic Projection: -i) Axonometric -Isometric, Dimetric, Trimetric, ii) Multiview Projection: Top View, Front View, Side View
2)Perspective Projection: - One point, Two Point, Three Point

UNIT-V: INTRODUCTION TO ANIMATION & PRINCIPLES OF ANIMATION (6 Hrs.)

What is animation? History of animation, Early animation devices, pros and cons of animation, Animation Vocabulary-Timeline, Framerate, Working on one's & two's, Shots & Scenes, Keyframes , Breakdowns , Inbetweens, Timing ,Spacing , Easing.
Principles of animation – Squash and stretch, Anticipation, Staging, Straight ahead action and pose to pose, Follow through and overlapping action, Slow in and slow out, Arc, Secondary action, Timing, Exaggeration, Solid drawing, Appeal.

UNIT-V: TYPES AND PROCESS OF ANIMATION (6 Hrs.)

Type of animation – Traditional animation, 2D animation, 3D animation, Typography Animation, Clay animation, Sand Animation, Flip book Animation, Stop-motion animation How animation works? Workflow of creating animation. Steps of making an animated film Animation Software, Animation Hardware, Demonstration of animation concepts using tools

Syllabus contents required for competitive exams (GATE, UPSC, MPSC etc.)(*if complete unit is applicable then write only "unit 1/2/.." or write the contents from that unit):*

NA

Text Books:

1. D. Hearn, M. Baker, "Computer Graphics – C Version", 2nd Edition, Pearson Education, 2002, ISBN81 – 7808 – 794 – 4
2. S. Harrington, "Computer Graphics", 2nd Edition, McGraw-Hill Publications, 1987, ISBN 0 – 07 –100472 – 6.
3. D. Rogers, "Mathematical Elements for Computer Graohics",2nd Edition, McGraw-Hill Publication, 2002, ISBN 10: 0-07 – 048677-8.
4. Rajesh Kumar Maurya, "Computer Graphics with Virtual Reality Systems" Edition: 2nd Edition Publisher: Wiley, ISBN: 9788126550883
5. The complete animation course by Chris Patmore Pub.-Baron's Educational Series. (New York)
6. Animation Unleashed by Ellen Bessen, Michael Weise Productions,2008(U.S.A)

Reference Books:

1. D. Rogers, "Procedural Elements for Computer Graphics", 2nd Edition, Tata McGraw-HillPublication, 2001, ISBN 0 – 07 – 047371 – 4.
2. J. Foley, V. Dam, S. Feiner, J. Hughes, "Computer Graphics Principles and Practice", 2nd Edition, Pearson Education, 2003, ISBN 81 – 7808 – 038 – 9.
3. F.S. Hill JR, "Computer Graphics Using Open GL", Pearson Education
4. The Encyclopedia of Animation Techniques, Richard Taylor, 1996 (India)
5. Experimental Animation: An Illustrated Anthology by Robert Russet and Cecile Starr Pub.- Van Nostrand Reinhold Compa Pub.1976 (U.S.A)

E- Books / E- Learning References:

1. https://www.bloopanimation.com/animation-for-beginners/
2. https://www.digitalartsonline.co.uk/features/motion-graphics/best-websites-online-tools-for-learning-animation/

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Second Year Information Technology (2023 Course) Web Development				
Course Code:	**ITVSE406**	**Credit:**	3	
Contact Hrs.:	1 Hr/week (L) 4 Hrs/week(P)	**Type of Course:**	Lecture/Practical	
Examination Scheme	Term-work 50 Marks	Practical 50 Marks		

Pre-requisites:
NA

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term Work	Internal	50
2.	Practical	External	50

Course Objectives	
1	To explain static and dynamic website using technologies like html, css, bootstrap.
2	To use of web scripting languages for web development
3	To use front end & back end technologies
4	To develop web application using Node.js
5	To develop web application usingExpress.js
Course Outcomes: Students will be able to	
406.1	Develop Static and Dynamic website using technologies like HTML, CSS, Bootstrap.
406.2	Demonstrate the use of web scripting languages.
406.3	Develop web application with Front End & Back End Technologies
406.4	Develop web application using Node.js
406.5	Develop web application usingExpress.js

Topics Covered

Unit I. INTRODUCTION TO WEB DEVELOPMENT (2 hrs.)
HTML: Getting started with HTML, Why HTML, Tags and Elements, Attributes, Properties, Headings list, Links, Tables, Images, HTML Form, Media (Audio, Video), Semantic HTML5 Elements.
CSS: Why CSS, Types of CSS, How to use CSS, Properties, Classes, Child-Class (Nested CSS), Colors, Text, Background, Border, Margin, Padding, Positioning (flex, grid, inline, block), Animation, Transition.

Unit II: BOOTSTRAP (2 hrs.) Why Bootstrap, CSS over Bootstrap, How to Use Bootstrap, Bootstrap Grid System, Bootstrap Responsive, Bootstrap Classes, Bootstrap Components (i.e., Button, Table, List, etc.), Bootstrap as a Cross Platform.

Unit-III: JAVA SCRIPT (2 Hrs.)
Introduction to Scripting languages, Introduction to JavaScript (JS), Variables, data types, and operators, Control flow and conditional statements, Functions, Array, Object, Events, DOM model, Accessing and modifying elements with JavaScript, Dynamic content creation and manipulation

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Unit IV: FORM AND USER INPUT (2 Hrs.)
Forms and User Input, Form validation with JavaScript, Sending form data to the server

Unit V: INTRODUCTION TO REACT (2 Hrs.)
Introduction to React, Understanding component-based architecture, Introduction to Creating components with React. Managing state and props, Routing, Redux-architecture

Hooks: Basic hooks, useState() hook, useEffect() hook, useContest() hook

Unit VI: INTRODUCTION TO NODE.JS AND EXPRESS (2 Hrs.)
Introduction to server-side JavaScript with Node.js, Building a simple web server with Express.js, Handling HTTP requests and responses.

MongoDB: MongoDB basics, MongoDB NodeJS communication, CRUD operations using NodeJS.

<table>
<tr><th>Ass. No.</th><th>Assignment Title</th></tr>
<tr><td>1.</td><td>Perform the case study by visiting various websites for the different client projects and prepare the report for these websites, in following format:
<table>
<tr><th>Sr. No.</th><th>Website URL</th><th>Scope of website</th><th>Features liked</th><th>Features disliked</th><th>Overall Evaluation</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>2.</td><td>Install and configure VSCode software(show all steps of installation and necessary packages for web development).</td></tr>
<tr><td>3.</td><td>Design a personal portfolio webpage using HTML and CSS</td></tr>
<tr><td>4.</td><td>Create a blog layout that adapts to different screen sizes using HTML and CSS.</td></tr>
<tr><td>5.</td><td>Create a horizontal navigation bar in DIV with a nested dropdown menus and create a layout using CSS and display it in html file</td></tr>
<tr><td>6.</td><td>Design and develop a landing page using Bootstrap predefined components like navbar, jumbotron, and cards to create a professional-looking landing page</td></tr>
<tr><td>7.</td><td>Design the following static web pages required for online book store web site'
i. HOME PAGE: The static home page must contain three frames.
ii. LOGIN PAGE
iii. CATOLOGUE PAGE: The catalogue page should contain the details of all the books available in the web site in a table.
iv. REGISTRATION PAGE</td></tr>
<tr><td>8.</td><td>Write JavaScript to validate the following fields of the above registration page
i. Name (Name should contains alphabets and the length should not be less than 6 characters).
ii. Password (Password should not be less than 6 characters length).
iii. E-mail id (should not contain any invalid and must follow the standard pattern (nams@domain.com)
iv. Phone number (Phone number should contain 10 digits only).</td></tr>
<tr><td>9.</td><td>Create an application using JavaScript to take food order from a customer and generate its bill and a feedback form (At least one web page to accept order and one for billing and feedback form)</td></tr>
<tr><td>10.</td><td>Create a Node.JS Application which serves a static website.</td></tr>
</table>

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11.	Create a simple Task application using Node.js and Express.js. and MongoDB for CRUD operations
12.	Create version control account on GitHub and using Git commands to create repository and push your code to GitHub.
13.	Create a responsive, interactive website using HTML, CSS and JavaScript and publish the app using GitHub / GitHub Pages or Free hosting platforms like Netlify
14.	Design a mini project for any real time scenario such as online library, Milk dairy, Hotel online booking etc.

Text Books:

1. Kogent Learning Solutions Inc, Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, XML and AJAX, Blackbook, Dreamtech Press, Second Edition, ISBN: 9788177228496.
2. Raymond Camden, Andy Matthews, jQuery Mobile Web Development Essentials, Packt Publishing, Second Edition, 9781782167891.
3. Steven M. Schafer, "HTML, XHTML and CSS", Wiley India Edition, Fourth Edition, 978-81-265- 1635-3
4. Dr.HirenJoshi, Web Technology and Application Development, DreamTech, First,ISBN:978-93- 5004-088-1

Reference Books:

1. Steven M. Schafer, "HTML, XHTML and CSS", Wiley India Edition, Fourth Edition, 978-81-265- 1635-3
2. Ivan Bayross,"Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP,BPB Publications,4th Edition,ISBN:978-8183330084.
3. Brain Fling, Mobile Design and Development, O'REILLY, First Edition, ISBN: 13:978-81- 8404-817-
4. Adam Bretz & Colin J Ihrig, Full Stack Javascript Development with MEAN, SPD, First Edition,
ISBN:978-0992461256.

Books / E- Learning References

1. https://www.meanacademy.in/web-technologies
2. https://www.meanacademy.in/angular
3. https://www.meanacademy.in/mongodb
4. https://www.meanacademy.in/nodejs
5. https://www.meanacademy.in/aws

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Second Year Information Technology (2023 Course) Object Oriented Programming Lab			
Course Code:	**ITPCC407**	**Credit:**	**2**
Contact Hrs.:	4 Hrs/week (P)	**Type of Course:**	Practical
Examination Scheme	Term-work 25 Marks	Oral 25 Marks	

Pre-requisites:

- Programming and Problem Solving -I
- Programming and Problem Solving -II

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term Work	Internal	25
2.	Oral	External	25

Course Objectives	
1	To implement object-oriented programming concepts
2	To handle exceptions using exception handling
3	To make use of collections for implementing generics
4	To use file handling for given problem

Course Outcomes: Students will be able to	
407.1	Study and installation of Tools for development and execution of java Programs
407.2	Write program for a given problems using OOP Concepts.
407.3	Use exception handling mechanism to manage exceptions
407.4	Make use of generic framework for given problems
407.5	Solve a database-oriented problem using file handling
407.6	Demonstrate and Present solution for given problems

List of Experiments

1. Study of different modern tools and Installation of JDK and Java IDE like Netbeans or Eclipse
2. Design a class for student entity and consider relevant abstract data. Accept and display the data for 5 objects using array of objects.
3. Design a class 'Complex 'with data members for real and imaginary part. Provide default and Parameterized constructors. Write a program to perform arithmetic operations of two complex numbers.
4. Identify commonalities and differences between Publication, Book and Magazine classes. Title, Price, Copies are common instance variables and saleCopy is common method. The differences are, Bookclass has author and order Copies(). Magazine Class has orderQty, Currentissue, receiveissue().Write a program to find how many copies of the given books are ordered and display total sale of publication
5. Design and develop inheritance for a given case study, identify objects and relationships and implement inheritance wherever applicable. Employee class with Emp_name, Emp_id, Address, Mail_id, and Mobile_no as members. Inherit the classes, Programmer,

Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary

6. Design a base class shape with two double type values and member functions to input the data and compute_area() for calculating area of figure. Derive two classes' triangle and rectangle. Make compute_area() as abstract function and redefine this function in the derived class to suit their requirements. Write a program that accepts dimensions of triangle/rectangle and display calculated area. Implement dynamic binding for given case study.
7. Design and develop a context for given case study and implement an interface for Vehicles Consider the example of vehicles like bicycle, car, and bike. All Vehicles have common functionalities such as Gear Change, Speed up and apply breaks .Make an interface and put all these common functionalities. Bicycle, Bike, Car classes should be implemented for all these functionalities in their own class in their own way.
8. Implement a program to handle Arithmetic exception, Array Index Out OfBounds.The user enters two numbers Num1 and Num2. The division of Num1 and Num2 is displayed. If Num1 and Num2 were not integers, the program would throw a Number Format Exception. If Num2 were zero, the program would throw an Arithmetic Exception. Display the exception.
9. Implement a generic program using any collection class to count the number of elements in a collection that have a specific property such as even numbers, odd number, prime number and palindromes.
10. Implement a program for maintaining a student records database using File Handling.Student has Student_id,name,Roll_no, Class, marks and address. Display the data for five students.
    a) Create Database
    b) Display Database
    c) Clear Records
    d) Modify record
    e) Search Record
11. Using all concepts of Object-Oriented programming develop a solution for any application contains following operations such as
    a) Creation of database
    b) Addition of data
    c) Deletion of Data
    d) Updation of Data
    e) Display of Data
12. **Virtual Lab experiments:**
    - Using constructors for creating Objects : https://java-iitd.vlabs.ac.in/exp/constructors/
    - Understanding Inheritance in Java, https://java-iitd.vlabs.ac.in/exp/inheritance/

Oral Evaluation

1. Student will design and develop a mini project using object oriented concepts and present the same during OR exam.

Text Books:

1. Programming with Java, E Balagurusamy,Tata McGraw Hill

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Reference Books:

1. Introduction to Java Programming (Comprehensive Version), Daniel Liang, Seventh Edition, Pearson.
2. Programming in Java, Sachin Malhotra & Saurabh Chaudhary, Oxford University Press.
3. Murach's Beginning Java 2, Doug Lowe, Joel Murach and Andrea Steelman, SPD.
4. Core Java Volume-I Fundamentals, Eight Edition, Horstmann& Cornell, Pearson Education.
5. The Complete Reference, Java 2 (Fourth Edition), Herbert Schild, TMH.
6. Java Programming, D. S. Malik, Cengage Learning.

E- Books / E- Learning References

1. https://www.w3schools.com/java/java_oop.asp
2. https://www.geeksforgeeks.org/object-oriented-programming-oops-concept-in-java/
3. https://www.freecodecamp.org/news/object-oriented-programming-concepts-java/
4. https://www.guru99.com/java-oops-concept.html

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Second Year Information Technology (2023 Course) Processor Architecture and Interfacing Lab				
Course Code:	**ITPCC408**	**Credit:**	1	
Contact Hrs.:	2Hrs/week (P)	**Type of Course:**	Practical	
Examination Scheme	Term-work 25 Marks	Practical 25 Marks		

Pre-requisites:

- Digital Electronics and Computer Organisation

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term Work	Internal	25
2.	Practical	External	25

Course Objectives	
1	To explain embedded C programming concepts to interface different I/O
2	To apply knowledge of programming for interfacing of different I/O
3	To make use of Python Programming to interface I/O using Raspberry Pi.

Course Outcomes : Students will be able to	
408.1	Write embedded C Program to interface different I/O
408.2	Write embedded C Program using serial communication protocols
408.3	Use python programming concepts to interface I/O using Raspberry Pi.

List of Experiments:

1. Arduino IDE - ESP32 GPIO programming, LED blinking and button input and Print on serial terminal (UART)
2. Arduino IDE - ESP32 OLED display interfacing (I2C interface)
3. Arduino IDE - ESP32 generate PWM signal and operate servo motor.
4. ESP-IDF - ESP32 UART , read, write / print data (RTOS)
5. ESP-IDF - ESP32 4x4 keypad, display key pressed on OLED display. (RTOS, seperate tasks)
6. ESP-IDF - using NIMBLE send data to mobile / PC Bluetooth terminal (RTOS)
7. ESP-IDF - using Wifi send data to AWS IOT core via MQTT (RTOS)
8. Raspberry Pi- flashing Raspberry Pi OS and setting up raspberry Pi
9. Raspberry Pi - write a basic python script to blink an LED and print data.
10. Raspberry Pi- MQTT server data posting and subscribing (in python script)
11. Raspberry Pi - interfacing DHT sensor with RaspberryPi
12. Miniproject using ESP32, Raspberry Pi or any other microcontroller

Text Books:

1. Developing IoT Projects with ESP32Automate Your Home Or Business with Inexpensive Wi-Fi Devices by Vedat Ozan Oner
2. Learning Raspberry Pi Unlock Your Creative Programming Potential by Creating Web Technologies, Image Processing, Electronics- and Robotics-Based Projects Using the Raspberry Pi By Samarth Shah

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Reference Books:

1. Hands-on ESP32 with Arduino IDE by Asim Zulfiqar
2. Programming the Raspberry Pi, Third Edition: Getting Started with Python by Simon Monk
3. Developing IoT Projects with ESP32: Unlock the full Potential of ESP32 in IoT development to create production-grade smart devices, Second Edition by Vedat Ozan Oner

E- Books / E- Learning References:

1. **https://youtube.com/playlist?list=PLLSegLrePWgLzBgQqDJvgZ4ewbpCnuare&feature=shared**
2. **https://youtube.com/playlist?list=PLoAx5AQlvczXOJcvb9wC11DGYfTyGnX1u&feature=shared**
4. **https://youtube.com/playlist?list=PLfPtpZzK2Z_QO8snrdnRTTNtQvLw35Zfc&feature=shared**
5. **https://www.udemy.com/course/learn-esp32-with-this-30-days-challenge/**
6. **https://www.udemy.com/course/advanced-esp32/?couponCode=LEADERSALE24B**
7. **https://www.udemy.com/course/raspberry-pi-for-beginners-step-by-step/?couponCode=LEADERSALE24B**
8. **https://www.udemy.com/course/raspberry-pi-and arduino/?couponCode=LEADERSALE24B**
9. **https://www.espressif.com/sites/default/files/documentation/esp32_technical_reference_manual_en.pdf**

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Second Year Information Technology (2023 Course) Computer Graphics and Animation Lab				
Course Code:	**ITPCC409**	**Credit:**	**1**	
Contact Hrs.:	2 Hrs/week (L)	**Type of Course:**	Practical	
Examination Scheme	Term-work 25 Marks	Practical 25 Marks		

Pre-requisites:

- Data Structure and Algorithms

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term Work	Internal	25
2.	Practical	External	25

Course Objectives	
1	To demonstrate the installation of Open GL.
2	To make use of line drawing and circle drawing algorithm concepts
3	To explain different transformation and polygon filling methods.
4	To implement computer graphics animation using software.

Course Outcomes: Students will be able to	
409.1	Study and installation of OpenGL
409.2	Write a program for a given problem using line drawing and circle drawing algorithm
409.3	Demonstrate different transformation and filling methods on polygon
409.4	Create the animation using software

List of Experiments

1. Install and explore the OpenGL.
2. Draw any line or shape using any Line drawing algorithms using following line patterns.
   i) Simple line ii) Dotted line iii) Dashed line iv) Solid line
   using mouse interface. Divide the screen in four quadrants with center as (0, 0). The line should work for all the slopes +ve, -ve, >1,<1.
3. Implement Bresenham's circle drawing algorithm to draw any object. The object should be displayed in all the quadrants with respect to center and radius.
4. Implement translation, rotation, scaling and shear transformation on Polygon
5. Implement the following polygon filling methods
   I. Floodfill or seed fill II.boundary fill
6. Create bouncing square within canvas using HTML and JavaScript.
7. Moving car animation using CSS.

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8. Create a coffee machine animation using HTML, JavaScript and CSS.
9. Use graphics animation tools like Maya/Blender/3D Studio for creation of theme based animation.
10. Design and develop a mini project using computer graphics algorithms.

Text Books:

1. D. Hearn, M. Baker, "Computer Graphics – C Version", 2nd Edition, Pearson Education, 2002, ISBN81 – 7808 – 794 – 4
2. S. Harrington, "Computer Graphics", 2nd Edition, McGraw-Hill Publications, 1987, ISBN 0 – 07 –100472 – 6.

Reference Books:

1. D. Rogers, "Procedural Elements for Computer Graphics", 2nd Edition, Tata McGraw-HillPublication, 2001, ISBN 0 – 07 – 047371 – 4.
2. J. Foley, V. Dam, S. Feiner, J. Hughes, "Computer Graphics Principles and Practice", 2nd Edition, Pearson Education, 2003, ISBN 81 – 7808 – 038 – 9.
3. Foley,"Computer Graphics: Principles & Practice in C", 2e, ISBN 9788131705056, Pearson Edu.
4. F.S. Hill JR, "Computer Graphics Using Open GL", Pearson Education
5. Beginning Adobe Animate CC: Learn to Efficiently Create and Deploy Animated and Interactive Content - by Tom Green & Joseph L
6. Adobe Animate CC Classroom in a Book - by Russell Chun

E- Books / E- Learning References

1. https://www.bloopanimation.com/animation-for-beginners/
2. https://www.glprogramming.com/red/chapter01.html
3. https://www.w3schools.com/css/css_intro.asp
4. https://www.w3schools.com/html/html_intro.asp

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Second Year Information Technology (2023 Course)
Audit course- Sustainable Development Goals

Course Code:	**IOHSM4AC**	**Credit**	**1**
Contact Hours:	1 Hrs/week (P)	**Type of Course:**	Lecture
Examination Scheme	Term-work 25 Marks		

Pre-requisites:
Nil

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term-work	Internal	25

Course Objectives	
1	To discuss the sustainable development goals.
2	To explain framework of Seventeen Sustainable Development Goals.
3	To discuss structure and order of Sustainable Development Goals.
4	To study cases of Sustainable Development Goals.

Course Outcomes: Students will be able to	
4AC.1	Explain sustainable development goals.
4AC2	Describe framework of Seventeen Sustainable Development Goals.
4AC3	Discuss structure and order of Sustainable Development Goals.
4AC.4	Report case studies of Sustainable Development Goals.

Topics Covered

Unit 1: Introduction to SDGs(3 hrs)
Sustainability, Sustainable development, Role of UN and the Need for SDGs, Scope and Inclusion and Agenda 2030, Our Common Future and Philosophy behind SDGs, Distinction between Development and Sustainable Development

Unit 2: Sustainable Development Goals (5 hrs)
Framework and Structuring of Seventeen SDGs
SDG 1: No Poverty
SDG 2: Zero Hunger
SDG 3: Good Health and Well-being
SDG 4: Quality Education
SDG 5: Gender Equality
SDG 6: Clean Water and Sanitation
SDG 7: Affordable and Clean Energy
SDG 8: Decent Work and Economic Growth
SDG 9: Industry, Innovation and Infrastructure
SDG 10: Reduced Inequality
SDG 11: Sustainable Cities and Communities
SDG 12: Responsible Consumption and Production

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SDG 13: Climate Action SDG 14: Life Below Water SDG 15: Life on Land SDG 16: Peace and Justice Strong Institutions SDG 17: Partnerships to achieve the Goal
Unit 3:SDG Structure and Order(3 hrs) Interrelationships and Connections between Seventeen SDGs, SDG Structure and Order at Levels of People, Ecological and Spiritual , SDGs and Socio Ecological Systems: Economy; Society; Biosphere.
Unit 4:Sustainable Development Goals- Case Studies (2 hrs) Case Studies from around the World, Case studies from India

Text Books

1. Hazra, Somnath., Bhukta, Anindya (2020) Sustainable Development Goals An Indian Perspective, Springer International Publishing, Switzerland
2. Ziai, Aram (2016) Development Discourse and Global History from colonialism to the sustainable development goals. Routledge, London & New York
3. OECD (2019), Sustainable Results in Development: Using the SDGs for Shared Results and Impact, OECD Publishing, Paris, https://doi.org/10.1787/368cf8b4-en.
4. Sachs, J., Schmidt-Traub, G., Kroll, C., Lafortune, G., Fuller, G., Woelm, F. 2020. The Sustainable Development Goals and COVID-19. Sustainable Development Report 2020.Cambridge: Cambridge University Press.

Relevant websites, movies, and documentaries

https://www.un.org/sustainabledevelopment/

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Second Year Information Technology (2023 Course) Lifelong Learning Skill-I			
Course Code:	**IOLLC4L1**	**Credit:**	1
Examination Scheme	Term-work 25 Marks		

Lifelong Learning Skills courses introduced for holistic development of students where all the students are required to acquire 1 credit in 4th semester from **Extracurricular Activities** which will have grades as below. Activity Certificate obtained either in 3rd sem or 4th semfrom below mentioned activities will be considered for grading in 4th sem.

Extracurricular Activities:

Sr. No.	Activity	Level	Achievement	Grade	Achievement	Grade
1.	Sports	Inter collegiate	Participation	P	Prize winner	C
		University	Participation	C	Prize winner	B
		Zonal	Participation	B	Prize winner	B+
		State	Participation	B+	Prize winner	A
		National	Participation	A	Prize winner	A+
		International	Participation	A+	Prize winner	O
2.	NSS/NCC	Camp	Attended	B		
		Camp + 5 Activities	Attended	B+		
		Camp + 10 Activities	Attended	A		
		Camp + 15 Activities	Attended	A+		
		Camp + 20 Activities	Attended	O		
3.	Cultural	Inter collegiate	Participation	B	Prize winner	B+
		State	Participation	B+	Prize winner	A
		National	Participation	A	Prize winner	A+
		International	Participation	A+	Prize winner	O
4.	Community Engagement	Certified by NGO/Authorities with report and geo-tagged photograph	1 Activity	B		
			2 Activities	B+		
			3 Activities	A		
			4 Activities	A+		
			5 Activities	O		

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Second Year Information Technology (2023 Course)
Lifelong Learning Skill -II

Course Code:	IOLLC4L2	Credit:	1
Examination Scheme	Term-work 25 Marks		

Lifelong Learning Skills courses introduced for holistic development of students where all the students are required to acquire 1 credit in 4th semester from **Co-curricular Activities** which will have grades as below. Activity Certificate obtained either in 3rdsem or 4thsem from below mentioned activities will be considered for grading in 4th sem.

Co-curricular Activities:

Sr. No	Activity	Level	Achievement	Grade	Achievement	Grade
1.	Conference	National	Participation	B	Prize winner	A
		International	Participation	B+	Prize winner	A+
		International (Scopus indexing)	Participation	A+	Prize winner	O
2.	Journal Publication	Non-refereed but recognized and reputed journal/ periodical, having ISSN number.	Publication	B		
		Refereed Journal - As listed by UGC	Publication	A		
		Refereed Journals- As listed by Scopus	Publication	A+		
		Refereed Journals - As listed by SCI/ SCIE	Publication	O		
3.	Hackathon		Participation	A+	Prize winner	O
4.	Professiona l Body	National	Membership	P	3rd Prize	A
			Activities/participation	B	2nd Prize	A+
			5 participations	B+	1st Prize	O
5.	Internship	1 week	Completed	C		
		2 week	Completed	B		
		3 week	Completed	B+	Sponsored Project	A+
		4 week	Completed	A	Job through internship	O
6.	Entreprene urship	Awareness camp	Attended	A	Product Developed	A+
					Own Startup	O
7.	Project/Tec hnical events	Inter collegiate	Participation	P	Prize winner	C
		University	Participation	C	Prize winner	B
		Zonal	Participation	B	Prize winner	B+
		State	Participation	B+	Prize winner	A
		National	Participation	A	Prize winner	A+
		International	Participation	A+	Prize winner	O

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