MGMUNIVERSITY
Established by Maharastra Act.
2(f) status of UGC.

MGM University
Dr. G. Y. Pathrikar College of Computer Science
And Information Technology, Chhatrapati Sambhajinagar

Dr. G. Y. Pathrikar College of Computer Science and Information Technology
Chhatrapati Sambhajinagar

B.Sc. (Hons. /Hons. with Research) Information Technology: First, Second and Third Year (Syllabus) With Effect From: ACADEMIC YEAR: 2024-25

MGM University

Vision

- To ensure sustainable human development which encourages self-reliant and self-content society.

- To promote activities related to community services, social welfare and also Indian heritage and culture.

- To inculcate the culture of non-violence and truthfulness through Vipassana meditation and Gandhian Philosophy.

- To develop the culture of simple living and high thinking

Mission

- To impart state of art education and technical expertise to students and give necessary training to teachers to create self-reliant society for future.

- To encourage students to participate in Indian and International activities in sports, literature, etc. so that future generation becomes base for free and liberal society

- To educate students in areas like Management, Finance, Human relations to inculcate philosophy of simple living and high thinking value of simple economic society.

- To inculcate culture of non-violence and truthfulness through Vipassana.

  To sustain activities of Indian culture (viz. classical dance, music and fine arts) through establishing institutes like Mahagami, Naturopathy, etc.

विद्यापीठ गीत

अत्त दिप भव भव प्रदिप भव,

स्वरूप रूप भव हो

ज्ञान सब्ब दवज्ञान सब्ब भव ,

सब्ब दिप भव हो अत्तादह

अत्त नो नाथो , अत्तादह अत्त नो

गदि

अत्त मागगपर अप्रमािसे है झुिझे

चलना सब्ब   का कल्याण हो ,

वो कार्गकुशल करना

सब्ब   का उत्तम मंगल , पथप्रिशगक हो

अत्त दिप भव भव प्रदिप भव , स्वरूप

रूप भव हो

ज्ञान सब्ब दवज्ञान सब्ब भव ,

सब्ब दिप भव हो बुद्धमं

शरनं गच्छादम : धम्मं

शरनं गच्छादम :

संघं   शरनं गच्छादम :

Dr. G. Y. Pathrikar College of Computer Science & Information Technology

MGM college of Computer Science and Information Technology was established in 2001 offering undergraduate and postgraduate degree program in Computer Science and Information Technology. College was renamed as Dr.G.Y.Pathrikar College of Computer Science and Information Technology in 2003 in memory of great educationalist, one of the founder member and Ex-Secretary MGM, Dr. G. Y .Pathrikar Sir.

It is first self-financed ISO certified institution offering program dedicated to Computer science and Information technology in Maharashtra and has achieved status of 2f/12b. Ours was the only and first college to be re-accredited as A+ grade with NAAC in the year 2017. Experienced and qualified faculty with Ph.D. is strength of our college. Starting with 77 student's College has crossed total students strength of 10,000 passing out. Student are doing well in various MNCs like Infosys, Tech-Mahindra, Wipro, Capgemini, Cognizant etc. Many have their own Startups. Some of the students have completed their Masters and Ph.D. program from foreign countries like US, UK, Australia. Now we are constituent college of MGM University, Chhatrapati Sambhajinagar.

Vision

> To be an academic institution in dynamic equilibrium in social, ecological and economical environment striving continuously for excellence in total quality education, research and technological service to the nation.

Mission

- To create and sustain a community of learning in which students acquire knowledge and learn to apply it professionally with due consideration for ethical, and economical issues.
- To upgrade our students in all respect with the help of latest infrastructure in the area of Computer Science and Information Technology in order to build the National Capabilities.
- To understand the culture of Non-violence, truth, peace through Gandhian Philosophy.

Programs offered at Dr. G. Y. Pathrikar College of Computer Science & Information Technology

Undergraduate Programmes	Postgraduate Programmes	PhD Programmes
B.Sc.(Computer Science) Honours / Honours with Research	M.Sc.(Computer Science)	Ph.D. in Computer Science and Information Technology
B.Sc.(Information Technology) Honours/ Honours with Research	M.Sc.(Information Technology)	
BCA(Science) Honours / Honours with Research	M.Sc.(Data Science)	
B.Sc.(Animation) Honours / Honours with Research	M.Sc.(Animation)	
Integrated B.Sc.-M.Sc. (Data Science)		
BCA(Digital Marketing) Honours		
B.Sc.(Robotics) Honours		

MGMUNIVERSITY

Name of Program – B.Sc. (Information Technology) Honours / Honours with Research Duration

– Four Years

Eligibility -

● He / She Must have passed the Higher Secondary (Multipurpose) Examination conducted by H.S.C. Board Government of Maharashtra with Science / Technical Subjects or an Examination of any statutory University and Board recognized as equivalent thereto.

<div align="center">**OR**</div>

● Candidates having offered prescribed vocational courses, (MCVC) with Computer Techniques / Information Technology / Electronics.

<div align="center">**OR**</div>

● Three Years Course in Diploma Engineering conducted by the Board of Technical Education, Maharashtra State. He / She must have passed at qualifying examination.

Name of the College/Institute/Department/School: Dr. G.Y Pathrikar College of CS & IT MGMU **Name of the Programme**: **B.Sc. (Information Technology) Honours / Honours with Research Programme**
Type (UG/PG): **UG**
Duration: 04 Years (08 Semesters)

List of Options to select from Bucket of Courses provided in various categories:

Major	
Information Technology	
Core Major	**Core Elective**

	GYP	IBT	UDBAS
Minor options for basic and applied science Faculty	Cyber Security	Food Technology and Processing	Chemistry
	Robotics	Microbiology	Geo-Informatics
	Data Analytics	Biotechnology	Mathematics
	Block-Chain Technologies	Bioinformatics	Statistics
		Food Nutrition and Dietetics	Material Science

	Faculty of Engineering and Technology	Faculty of Social Sciences & Humanities	Faculty of Design	Faculty of Management and Commerce	Interdisciplinary Faculty	Performing Arts
Minor options from Other Faculty	Data Science	Filmmaking	Product Design	Financial Management	Cosmetic Technology	Theatre Arts
	IoT	Photography	Interior Design	E-Commerce	Education	Dance
	Geo-informatics and Applications	Mass Communication and Journalism	Contemporary Arts	International Business Management	Yog Sciences	Music
	EV Technology	Psychology	Visual Communication	Hospitality Mgmt.	Physical Education	Folk Art
	Drone Technology	Economics	Fashion Technology	Travel and Tourism	Home Science	
	Robotics Technology	English		Art of Leadership		
	Chemical Technology	Social Work		Art of Business		
	AI&ML					
	Universal Human Values					
	Energy management					

First Year - Semester I

Course Category	Course Code	Course Title	Nature of Course	No. of Credits	Teaching (Contact hrs/ week)		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
MM	ITH41MML101	Introduction to Information and Communication Technology	Lecture	2	2		30	20	50	-	08	20
MM	ITH41MML102	Computer Architecture	Lecture	2	2		30	20	50	-	08	20
MM	ITH41MMP101	Practical based on Information and Communication Technology	Practical	1		2	30	20	50	-	08	20
MM	ITH41MMP102	Practical based on Computer Architecture	Practical	1		2	30	20	50	-	08	20
IKS	ITH41IKT101	Indian Psychology and yoga	Lecture	2	2	-	30	20	50	-	08	20
AEC		Basket of AEC From University	Lecture	2	2	-	30	20	50	-	08	20
OE		Basket of OE From University	Lecture	2	2	-	30	20	50	-	08	20
OE		Basket of OE From University	Lecture	2	2	-	30	20	50	-	08	20
VSC	ITH41VSP101	C Programming	Practical	2		4	30	20	50	-	08	20
SEC	ITH41SEL101	Programing Logic and Design	Lecture	2	2	-	30	20	50	-	08	20
VEC		Basket of VEC From University	Lecture	2	2	-	30	20	50	-	08	20
CC		Basket of CC From University	Practical	2	-	4	50	-	50	20	-	20
Total				**22**	**16**	**12**	**380**	**220**	**600**			

Note:
Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation, **Course Category:** MM-Major Mandatory, ME-Major Elective, MI-Minor, OE-Generic / Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project

Course Category	Course Code	Course Title	Nature of Course	No. of Credits	Teaching (Contact hrs/ week)		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
MM	ITH41MML103	Database Management System	Lecture	2	2		30	20	50		08	20
MM	ITH41MM L104	Data Structure	Lecture	2	2		30	20	50		08	20
MM	ITH41MM P103	Practical based on DBMS	Practical	1		2	30	20	50		08	20
MM	ITH41MMP104	Practical based on Data Structure	Practical	1		2	30	20	50		08	20
MI		Basket of MI From University	Lecture	2	2	-	30	20	50		08	20
AEC		Basket of AEC From University	Lecture	2	2	-	30	20	50		08	20
OE		Basket of OE From University	Lecture	2	2	-	30	20	50		08	20
OE		Basket of OE From University	Lecture	2	2	-	30	20	50		08	20
VSC	ITH41VSP102	Web Fundamental	Practical	2		4	30	20	50		08	20
SEC	ITH41SEL102	Operating System	Lecture	2	2	-	30	20	50		08	20
VEC		Basket of VEC From University	Lecture	2	2	-	30	20	50		08	20
CC		Basket of CC From University	Practical	2	-	4	50	-	50	20	-	20
Total				**22**	**16**	**12**	**380**	**220**	**600**			

First Year - Semester II

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation, **Course Category:** MM-Major Mandatory, ME-Major Elective, MI-Minor, OE-Generic / Open electives, VSC-Vocational skill course, SEC- Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project

Level 4.5 Award of UG certificate with 40 credits and an additional 4-credits core NSQF course / internship OR continue with major and minor

Second Year - Semester III													
Course Category	Course Code	Course Title	Nature of Course	No. of Credits	Teaching (Contact hrs/ week)		Evaluation Scheme (Marks)			Minimum Passing (Marks)			
					L	P	Internal	External	Total	Internal	External	Total	
MM	ITH41MML201	Data Warehousing	Lecture	2	2	-	30	20	50	-	08	20	
MM	ITH41MML202	Object Oriented Programing Using C++	Lecture	2	2	-	30	20	50	-	08	20	
MM	ITH41MML203	Statistical Method	Lecture	2	2	-	30	20	50	-	08	20	
MM	ITH41MMP201	Practical Based on Data warehousing	Practical	1	-	2	30	20	50	-	08	20	
MM	ITH41MMP202	Practical Based on Object Oriented Programing Using C++	Practical	1	-	2	30	20	50	-	08	20	
OE		Basket of OE From University	Lecture	2	2	-	30	20	50	-	08	20	
MI		Basket of MI From University	Lecture	3	3	-	60	40	100	-	16	40	
MI		Basket of MI From University	Practical	1	-	2	30	20	50	-	08	20	
AEC		Basket of AEC From University	Practical	2	2	-	30	20	50	-	08	20	
VSC	ITH41VSP201	Advance Excel	Practical	2	-	4	30	20	50	-	08	20	
FP	ITH41FPJ201	Field Project	Practical	2	-	4	50	-	50	20	-	20	
CC		Basket of CC From University	Practical	2	-	4	50	-	50	20	-	20	
Total				**22**	**13**	**18**	**430**	**220**	**650**				

Note:
Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation, **Course Category:**
MM-Major Mandatory, ME-Major Elective, MI-Minor, OE-Generic / Open electives, VSC-Vocational skill course,
SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value
Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement
and service, CC-Co – curricular course, RM-Research methodology, RP-Research project

Second Year - Semester IV

Course Category	Course Code	Course Title	Nature of Course	No. of Credits	Teaching (Contact hrs/ week)		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal		Total
MM	ITH41MML204	Data Mining	Lecture	2	2	-	30	20	50	-	08	20
MM	ITH41MML205	Core Java	Lecture	2	2	-	30	20	50	-		20
MM	ITH41MML206	Software Engineering	Lecture	2	2	-	30	20	50	-	08	20
MM	ITH41MMP203	Practical Based on Data Mining	Practical	1	-	2	30	20	50	-	08	20
MM	ITH41MMP204	Practical Based on Core Java	Practical	1	-	2	30	20	50	-	08	20
OE		Basket of OE From University	Lecture	2	2	-	30	20	50	-	08	20
MI		Basket of MI From University	Lecture	3	3	-	60	40	100	-	16	40
MI		Basket of MI From University	Practical	1	-	2	30	20	50	-	08	20
AEC		Basket of AEC From University	Lecture	2	2	-	30	20	50	-		20
SEC	ITH41SEP 201	Bootstrap	Practical	2	-	4	30	20	50	-	08	20
CEP	ITH41CEP 201	Community Engagement Program	Practial	2	-	4	50	-	50	20	-	20
CC		Basket of CC From University	Practical	2	-	4	50	-	50	20	-	20
Total				**22**	**13**	**18**	**430**	**220**	**650**			

Note:

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation, **Course Category: M**M-Major Mandatory, ME-Major Elective, MI-Minor, OE-Generic / Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project

Third Year - Semester V												
Course Category	Course Code	Course Title	Nature of Course	No. of Credits	Teaching (Contact hrs/ week)		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
MM	ITH41MML301	Introduction to Data Science	Lecture	2	2	-	30	20	50		08	20
MM	ITH41MML302	Python Programming	Lecture	2	2	-	30	20	50		08	20
MM	ITH41MML303	Computer Networks	Lecture	2	2		30	20	50		08	
MM	ITH41MMP301	Practical Based on Introduction to Data Science	Practical	1	-	2	30	20	50		08	20
MM	ITH41MMP302	Practical Based on Python Programming	Practical	1	-	2	30	20	50		08	20
ME	ITH41MEL301	Java Script	Lecture	3	3	-	60	40	100		16	40
	ITH41MEL302	Agile software development										
ME	ITH41MEP301	Practical based on Java Script	Practical	1	-	2	30	20	50		08	20
	ITH41MEP302	Agile software development										
MI		Basket of MI From University	Lecture	3	3	-	60	40	100		16	40
MI		Basket of MI From University	Practical	1	-	2	30	20	50		08	20
VSC	ITH41VS P301	Mobile App Development	Practical	2	-	4	30	20	50		08	20
FP	ITH41FPJ 301	Field Project	Project	2	-	4	50	-	50	20	-	20
Total				**20**	**12**	**16**	**410**	**240**	**650**			

Note:
Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation, **Course Category:** MM-Major Mandatory, ME-Major Elective, MI-Minor, OE-Generic / Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project

Third Year - Semester VI

Course Category	Course Code	Course Title	Nature of Course	No. of Credits	Teaching (Contact hrs/ week)		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
MM	ITH41MML304	Data Analytics	Lecture	2	2	-	30	20	50		08	20
MM	ITH41MML305	Cloud Computing	Lecture	2	2	-	30	20	50		08	20
MM	ITH41MML306	Drone Technology	Lecture	2	2	-	30	20	50		08	20
MM	ITH41M MP303	Practical Based Data Analytic	Practical	1	-	2	30	20	50		08	20
MM	ITH41M MP304	Practical Based on Cloud Computing	Practical	1	-	2	30	20	50		08	20
ME	ITH41MEL303	PHP	Lecture	3	3	-	60	40	100		16	40
	ITH41MEL304	UI/UX										
ME	ITH41MEP303	Practical based on PHP	Practical	1	-	2	30	20	50		08	20
	ITH41MEP304	Practical based on UI/UX										
MI		Basket of MI From University	Lecture	3	3	-	60	40	100		16	40
MI		Basket of MI From University	Practical	1	-	2	30	20	50		08	20
OJT	ITH41JTP 301	On Job Training	Practical	4		8	30	20	50		08	20
Total				**20**	**12**	**16**	**390**	**260**	**650**			

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation, **Course Category:** MM-Major Mandatory, ME-Major Elective, MI-Minor, OE-Generic / Open electives, VSC-Vocational skill course, SEC- Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project.

					Teaching (Contact hrs/week)		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
Fourth Year - Semester VII												
Course Category	Course Code	Course Title	Nature of Course	No. of Credits								
					L	P	Internal	External	Total	Internal	External	Total
MM	ITH41MML401	Artificial Intelligence	Lecture	3	3		60	40	100		16	40
MM	ITH41MML402	Internet of Things	Lecture	3	3		60	40	100		16	40
MM	ITH41MML403	Network Security	Lecture	3	3		60	40	100		16	40
MM	ITH41MMP401	Practical Based Artificial Intelligence	Practical	2		2	30	20	50		08	20
MM	ITH41MMP402	Practical Based on Internet of Things	Practical	2		2	30	20	50		08	20
MM	ITH41MMP403	Practical Based on Network Security	Practical	2		2	30	20	50		08	20
ME	ITH41MEL401	Cloud Web Services	Lecture	3			60	40	100		16	40
	ITH41MEL402	Basics of Power BI										
ME	ITH41MEP401	Practical Based on Cloud Web Services	Practical	2		2	30	20	50		08	20
	ITH41MEP402	Practical Based on Power BI										
RM	ITH41RML401	Research Methodology	Lecture	3		-	60	40	100		16	40
RM	ITH41RMP401	Practical based on Research Methodology	Practical	2		2	30	20	50		08	20
Total				**20**	15	10	**450**	**300**	**750**			

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation, **Course Category:** MM-Major Mandatory, ME-Major Elective, MI-Minor, OE-Generic / Open electives, VSC-Vocational skill course, SEC- Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project.

Course Category	Course Code	Course Title	Nature of Course	No. of Credits	Teaching (Contact hrs/week)		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
MM	ITR41MML404	Introduction to DevOps	Lecture	3	3	-	60	40	100		16	40
MM	ITR 41MML405	Business Intelligence	Lecture	3	3	-	60	40	100		16	40
MM	ITR 41MML406	Machine Learning	Lecture	3	3	-	60	40	100		16	40
MM	ITR 41MMP404	Practical Based on DevOps	Practical	1	-	2	30	20	50		08	20
MM	ITR 41MMP405	Practical Based on Business Intelligence	Practical	1	-	2	30	20	50		08	20
MM	ITR 41MMP406	Practical Based on Machine Learning	Practical	1	-	2	30	20	50		08	20
ME	ITR 41MEL403	Geospatial Technology	Lecture	3	3	-	60	40	100		16	40
	ITR 41MEL404	Ethical Hacking										
ME	ITR 41MEP403	Practical based on Geospatial Technology	Practical	1	-	2	30	20	50		08	20
	ITR 41MEP404	Practical based on Ethical Hacking										
OJT	ITH41JTP401	On Job Training	Practical	4		8	60	40	100		16	40
				20	**12**	**16**	**420**	**280**	**700**			
	Total											

Fourth Year - Semester VIII

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation, **Course Category:** MM- Major Mandatory, ME-Major Elective, MI-Minor, OE-Generic / Open electives, VSC-Vocational skill course, SEC- Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project.

Four Year (Semester VII) Honours with Research

Course Category	Course Code	Course Title	Nature of Course	No. of Credits	Teaching (Contact hrs/ week)		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
Fourth Year - Semester VIII												
					L	P	Internal	External	Total	Internal	External	Total
MM	ITH41MM L407	Machine Learning	Lecture	3	3	-	60	40	100		16	40
MM	ITH41MML408	Natural Language Processing	Lecture	3	3	-	60	40	100		16	40
MM	ITH41MMP406	Practical Based on Machine Learning	Practical	1	-	2	30	20	50		08	20
MM	ITH41MMP407	Practical Based on Natural Language Processing	Practical	1	-	2	30	20	50		08	20
ME	ITH41MEL405	Remote Sensing	Lecture	3	3	-	60	40	100		16	40
	ITH41MEL406	Digital Image Processing	Lecture									
ME	ITH41MEP 405	Practical based on Remote Sensing	Practical	1	-	2	30	20	50		08	20
	ITH41MEP 406	Practical based on Digital Image Processing	Practical									
RM	ITH41RM L401	Research Methodology	Lecture	3	3	-	60	40	100		16	40
RM	ITH41RM P401	Practical based on Research Methodology	Practical	1	-	2	30	20	50		08	20
RP	ITH 41RPJ401	Research Project	Practical	4	-	8	60	40	100		16	40
Total				**20**	**12**	**16**	**420**	**280**	**700**			

Note: Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation, **Course Category:** **M**M-Major Mandatory, ME-Major Elective, MI-Minor, OE-Generic / Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project

Fourth Year - Semester VIII

Course Category	Course Code	Course Title	Nature of Course	No. of Credits	Teaching (Contact hrs/week)		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
MM	ITR41MML408	Big Data Analytics	Lecture	3	3	-	60	40	100		16	40
MM	ITR41MML409	Deep Learning	Lecture	3	3	-	60	40	100		16	40
MM	ITR41MMP408	Practical Based on Big Data Analytics	Practical	1	-	2	30	20	50		08	20
MM	ITR41MMP409	Practical Based on Deep Learning	Practical	1	-	2	30	20	50		08	20
ME	ITR41MEL407	.Geographical Information systems	Lecture	3	3	-	60	40	100		16	40
	ITR41MEL408	Multimodal Biometrics	Lecture									
ME	ITR41MEP407	Practical based on Geographical Information systems	Practical	1	-	2	30	20	50		08	20
	ITR41MEP408	Practical based on Multimodal Biometrics	Practical									
RP	ITH41RPJ402	Research Project	Practical	8		16	120	80	200		32	80
			Total	**20**	**09**	**22**	**390**	**260**	**650**			

Note:

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation, **Course Category:** **M**M-Major Mandatory, ME-Major Elective, MI-Minor, OE-Generic / Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project

Semester: FIRST

Syllabus
Semester-I

Course code: - ITH41MML101 **Course name:** Introduction to Information and Communication Technology	
Course category: Major Mandatory	
Credits: 2 **Teaching scheme:** L-2 P-0 **Evaluation scheme:** CA–30, ESE–20	
Pre-requisites: Basic Knowledge of Computer	
Course Objectives:	
1. To understand basic topics and the current trends that are essential to the ICT industry	
2. To analysis the challenges & job opportunities in the Information Technology fraternity	
Course Outcomes: At the end of the course, the students will be able to -	
CO1: Understand the current trends, job opportunities and challenges of IT industries.	
CO2: Identify the different elements of an information system, including input, output and processing elements.	
CO3: Identify Digital Model: E-commerce & M-commerce	
CO4: Recognize and distinguish the role of IT.	

Contents:-

Unit	Content	Teaching hours
1	**Information Technology Basics -** What is ICT, ICT and IT, Functional Areas of an Organization, Applications of ICT Tools, Introduction Internet Telephony, Webcasting, Social Networking, and Computer Supported Cooperative Working (CSCW) New Model in Digital Economy: E-commerce, M-Commerce **Role of ICT in Organization** Role of ICT in Human Resource Management, Role of ICT in Finance and Account Management, Role of ICT in Marketing Management Role of ICT in Information System Management Role of ICT in Operations Management. Role of ICT in Business.	10
2	**Communications and Devices –** Computer architecture, Computer and its Characteristics Identify the different hardware components of a computer system, including CPU, RAM. Input/output devices and storage devices; Evaluate examples of software application**s.** Use of Software in ICT, New Communication Models: Internet, Intranet, extranet, Video-conferencing, Audio Conferencing	10
3	**Emerging Trends in Information Communication Technologies job opportunities in the fields. –** Machine Learning with advance Artificial Intelligence (AI), Quantum Computing (Supercomputing), Augmented Reality (AR) and Virtual Reality (VR),Global Internet of Things (IoT), Block chain technology, Data Science & Business Analytics, Deep Learning Drones Technology, Cloud computing Robotic Process Automation (RPA), Design Thinking.	10

Text Books: 1. Information Technology: Theory And Practice By Sinha, Pradeep K., Sinha, Priti	
Reference Books: 1.Introduction to Information Technology By V.Rajaraman.	

Syllabus
Semester-I

Course code ITH41MMP101	**Course name:** Practical based on Introduction to Information and Communication Technology **Course category:** Major Mandatory

Credits: 1   **Teaching scheme:** L-0 P-2   **Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Basic Knowledge of Computer.

Course Objectives:

1. Support functions: administrative, technical and supportive functions

2. New learning: new teaching and learning methods, techniques and tools

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

CO1: Basic knowledge in hardware/software methods and tools for solving real-life and practical problems with an orientation to lifelong learning.

CO2: Identify Possess strong fundamental concepts in Information Communication Technology to address technological challenges.

CO3: Learning the formatting skills on paragraphs, tables, lists, pages and awareness of new communication models.

CO4: An ability to use the techniques, skills, and modern engineering technology tools, standard processes necessary for practice as an IT professional.

Contents –

Sr. no.	Description of Practical	Practical hours
1	1. Computer Fundamental -Input Devices 2. Central processing Unit component 3. Output Devices 4. Computer Booting 5. Introduction to Binary Number System	10
2	6. Operating System Installation 7. M.S Word Introduction 8. Internet Browsing , 9. M.S. PowerPoint introduction 10. M.S. Excel introduction	10
3	11. New Communication Models 12. Video-conferencing, Audio Conferencing 13. Webcasting, 14. Social Networking 15. E-commerce, M-Commerce	10

Text Books:
1. Information Technology: Theory And Practice By Sinha, Pradeep K., Sinha, Priti
2. Introduction to Information Technology By V.Rajaraman
Reference Books:
1. Introduction to Information Technology By V.Rajaraman.
2.. Information Technology: Theory And Practice By Sinha, Pradeep K., Sinha,

Syllabus
Semester-I

Course code: - ITH41MML102	**Course name:** Computer Architecture

Course category: Major Mandatory

Credits: 2	**Teaching scheme:** L-2 P-0 Evaluation	**Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Basics of Computer Hardware & Software

Course Objectives:

 1. Student understands of the basic structure and operation of a digital computer and various processors.

 2. To analysis the challenges & job opportunities in the Information Technology fraternity

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

CO1: Student understands of the basic structure and operation of a digital computer.

CO2: To learn the architecture and assembly language Programming of microprocessor

CO3: To study the different Processors

Contents –

Unit	Content	Teaching hours
1	**Computer Arithmetic –** Number System: Decimal System Binary Number System, Hexadecimal Number System,Octal Number System, Number Conversion: Decimal to Other, Binary to Other, Octal to Other, Hexadecimal to Other, BCD Numbers, ASCII Code, Computer Arithmetic: Addition, Subtraction. **Logic Gates & Boolean Algebra-** Positive & Negative Logic, Truth Table Logic Gates: AND, OR, NOT, NAND, NOR and Exclusive-OR Gate, Universal Gates. Postulates & Theorems of Boolean Algebra (Idempotent, Complementation, Commutative, Associative, Distributive, De-Morgan's Theorem)	10
2	**Arithmetic Circuits –** Combinational Circuits, Implementing Combinational logic. Arithmetic Circuits: Half-Adder, Full-Adder, Half-Sub tractor, Full-Sub tractor. **Fundamentals of Microprocessors-** Comparison of 8-bit, 16-bitand 32-bitmicroprocessor.8086 Pin configuration,8086 Internal Architectures, Execution Unit & Bus Interface, Flag Registers, Introduction to Addressing Modes	10
3	**8086 Interrupt and InterruptApplications-** Interrupts of 8086,Hardware Interrupts, Software Interrupts **Latest Trends in Microprocessor-** RISC and CISC Architectures, Design: Multicore Processor and Multicore Processing, Multicore Technology and Intel, Dual Core and Core Duo Processors, Corei3, i5, Mobile Processors.	10

Text Books:	
1. Digital Electronics: Principles, Devices and Applications	
2. Microprocessors & Multi core systems By Lyla B Das	
Reference Books:	
1. Microprocessor and Interfacing By Douglas V Hall	
2. Digital Design By M. Morris Mano	

Syllabus
Semester-I

Course code: - ITH41MMP102	**Course name:** Practical Based on Computer Architecture

Course category: Major Mandatory

Credits: 1   **Teaching scheme:** L-0 P-2   **Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Pre-university mathematics.

Course Objectives:

1. Student understands of the basic structure and operation of a digital computer and various processors.

2. To analysis the challenges & job opportunities in the Information Technology fraternity

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

CO1: Student understands of the basic structure and operation of a digital computer.

CO2: To learn the architecture and assembly language Programming of microprocessor

CO3: To study the different Processors.

Contents –

Sr.no.	Description of Practical	Practical hours
1	1. To Perform Number systems Conversations 2. To Perform Binary Arithmetic operations 3. To Verify the truth table of Basic Logic Gates 4. To Verify the truth table of Universal Logic Gates 5. To verify the truth table of Special Purpose Logic Gates.	10
2	6. State and Prove Demorgan's Theorem 7. To Study and Verify Combinational Logic Circuits (Half adder) 8. To Study and Verify Combinational Logic Circuits (Fulladder) 9. ToStudyGeneralPurposeRegistersof8086Microprocessor 10. To Study Special Purpose Registers of8086Microprocessor	10
3	11. To Study 8086 Pin Diagram and its Functioning 12. ToStudy8086 Interruptandits Applications 13. ToStudyPentium Pro Architecture 14. ToAnalyzeandCompare PentiumandCore-i3Processor 15. ToAnalyzeandCompareRISCandCiSCArchitecture	10

Text Books:
1. Digital Electronics: Principles, Devices and Applications By Anil K. Maini
2. Micro Processors & Multi core systems By Lyla B Das
Reference Books:
1.Microprocessor and Interfacing By Douglas V Hall
2.Digital Design By M. Morris Mano

Syllabus
Semester-I

Course code: - ITH41VSP101	**Course name:** Practical Based on C Programming

Course category: - Vocational skill course

Credits: 2	**Teaching scheme:** L-0 P-4	**Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Pre-university mathematics.
Course Objectives:
1. Programming Paradigm help students to create properly designed programs.
2. Learning algorithms and practicing coding
3. Come up with varieties of solutions to a single problem
Course Outcomes: At the end of the course, the students will be able to -
CO1: Describe the Modularization and basic structure of program.
CO2: Implements and Analyze the usage of flowcharts and pseudo code so as to become comfortable with logic development tools and understand their interrelationship.
CO3: Determine and explore the workings of decision making, looping, and array manipulation.
CO4: Create Complex programs to build and process using significant amount of data and solve the real-life problem.

Contents –

Unit	Description of Practical	Practical hours
1	1. Introduction to C, Syntax and basic structure of C program, Execution of C program 2. Get students familiar with different data types in C. 3. Get students familiar with different operators and expressions in C. 4. Understanding decision making using forms of IF statements 5. Programs to understand the concepts of loops in the programming.(For loop)	10
2	1. Programs to understand the concepts of loops in a program. (do and while loop) 2. Understanding decision making using forms of switch statements 3. Understanding decision making using forms of break, continue etc. statements 4. Perform different programs to understand the concept of Array. 5. To apply the knowledge of array to upgrade it on multidimensional array	10
3	1. Perform different programs to understand the concept of Array. 2. To apply the knowledge of array to upgrade it on multidimensional array (Project)	10

Text Books:	1. C Programing E. Balaguruswamy
	2. Programming in ANCI C
Reference Books:	1. Programming Language Design Concepts 2. Programming Logic and Design

Syllabus
Semester-I

Course code: ITH41SEL101	**Course name:** Programming logic and Design

Course category: - Skill Enhancement course

Credits: 2	**Teaching scheme:** L-2 P-0	**Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Pre-university mathematics.

Course Objectives:

1. Programming Paradigm help students to create properly designed programs.

2. Learning algorithms and practicing coding

3. Come up with varieties of solutions to a single problem

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

CO1: Recognize and understand components of Computer System, Programming and most importantly summarize the advantages of structured programs

CO2: Describe the Modularization and basic structure of program.

CO3: Implements and Analyze the usage of flowcharts and pseudo code so as to become comfortable with logic development tools and understand their interrelationship
Determine and explore the workings of decision making, looping, and array manipulation.

Contents –

Unit	Content	Teaching hours
1	**An Overview of Computers and Programming-** Computer System, Programming Logic, Program Development Cycle, Pseudo code Statements & Flowchart, Programming and User Environments, Evolution of Programming Model. **Elements of High-Quality Programs-** Declaring and Using Variables and Constants, Operators: Performing Arithmetic Operations, Modularization: Modularizing a Program and its Advantages, Creating Hierarchy Charts, Features of Good Program Design **Understanding Structure-** The Disadvantages of Unstructured Spaghetti Code, Three Basic Structures - sequence, selection and loop, using a Priming Input to Structure a Program, Reasons for Structure, Recognizing Structure, Structuring and Modularizing Unstructured Logic.	10
2	**Making Decisions-** Boolean Expressions and the Selection Structure, Using Relational Comparison Operators, Understanding AND Logic, OR Logic & NOT Logic, Making Selections within Ranges, Precedence Combining AND & OR operators. **Looping-** Advantages of Looping, Loop Control Variable, Nested Loop, Avoiding Common Loop Mistakes, Using a *'for'* Loop, Common Loop Applications.	10

| 3 | **Arrays-**

Storing Data in Arrays, How an Array Can Replace Nested Decisions, Using Constants with Arrays Searching an Array for an Exact Match, Using Parallel Arrays, Searching an Array for a Range Match, Remaining within Array Bounds, Using a for Loop to Process an Array | 10 |

Text Books:
1. C Programing E. Balaguruswamy
2. Programming in ANCI C
Reference Books:
1. Programming Language Design Concepts By David A Watt
2. Programming Logic and Design By Joyce Farrell

Semester: SECOND

Syllabus
Semester-II

Course code: ITH41MML103	**Course name:** Database Management System

Course category: - Major Mandatory

Credits: 2	**Teaching scheme:** L-2 P-0	**Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Pre-university mathematics

Course Objectives:

1. Discuss Database management systems, databases and its applications

2. Familiarize the students with a good formal foundation on the relational model

3. Outline the various systematic database design approaches

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

CO1: Identify the basic concepts and various data model used in database design ER modelling concepts and architecture use and design queries using SQL

CO2: Describe Recognize and understand the basic concepts of database, knowledge, classifications of Architecture of database, database users, define advantages of the database

CO3: Draw E-R diagram, schema diagram, classify attributes, entity, entity set, relationship

CO4: Learn DDL, DML.DCL Commands, set operations

Contents –

Unit	Content	Teaching hours
1	**Introduction to basic concepts of DBMS-** Database System Application , Purpose of Database System, Database Architecture : 3-Level architecture Database Users & Administrators Responsibilities, Functional Components of Database system: Storage & Query Processor, Transaction Management	10
2	**Data Modeling & Design-** Type of Data Model Relation Data Model , E-R Data Model,Object Based Data Model, Semi-Structured Data Model Hierarchical & Network Data Model, E-R Data Model: Entity, Entity set, Entity types, Attributes, Types of Attributes, E-R diagram. Mapping Cardinalities , Data Association , Constraints : Integrity constraints I & II, Database Design : Overview of Design Process,Designing Phase, Normalization(1NF,2NF,3NF)	10
3	**Relational Data Model-** Basic Structure, Database Schema, Integrity Rules, E.F.Codds Rules, Relational Algebra: Union , Intersection , Difference, Cartesian Product, Selection , Projection, Join : Natural, & Outer Join, Division, Trigger, Stored procedure with advantages and disadvantages	10

Text Books:
1. Database System concepts   Korth, Siberschatz
2. An Introduction to Database System B. Desai
Reference Books:
1. Database System concepts Korth, Siberschatz
2. An Introduction to Database System   B. Desai

Syllabus
Semester-II

Course code ITH41MMP103	**Course name:** Practical Based on Database Management System
Course category: Major Mandatory	
Credits: 1 **Teaching scheme:** L-0 P-2	**Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Information about computer system

Course Objectives:

1. This course provides an introduction to relational database systems. The topics covered include the relational model,

2. SQL transactions, database design, and concepts and algorithms for building database management systems.

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

CO1: Apply relational database theory and be able to describe relational algebra expression, tuple and domain relation expression from queries

CO2: Transform an information model into a relational database schema and to use a data definition language and/or utilities to implement the schema using a DBMS

CO3: Use an SQL interface of a multi-user relational DBMS package to create, secure, populate, maintain, and query a database.

CO4: Demonstrate a rudimentary understanding of programmatic interfaces to a database and be able to use the basic functions of one such interface.

Contents –

Sr.no.	Description of Practical	Practical hours
1	1. Design and draw E-R diagrams. 2. Study of DDL commands(create & Alter) 3. Study of DML commands (Insert, update & delete) & DCL commands (GRANT & REVOKE) with examples 4. Write & execute queries using select command using where, group by, order by and having clauses 5. Study of Single Row Functions with examples	10
2	6. Study of conversion functions with examples 7. Study of Join (natural, Inner) 8. Study of Join (outer, left & right) and Division Operations with examples 9. Study of Constraints primary key, foreign key, unique and check constraints on tables with Examples 10. Study of Basic Operations of Relational Algebra with examples (Union, Intersection)	10

3	11. Create emp table and dept table with appropriate field and apply table constraints 12. Create student table with appropriate fields and apply DDL and DML commands. 13. Use any table and do select operations using operators 14. Use any table and do select operations using clauses. 15. Use any tables and do select operations using aggregate functions	10

Text Books:
1. Database System concepts Korth, Siberschatz
2. An Introduction to Database System B. Desai

<u>Syllabus</u>
<u>Semester-II</u>

Course code: - ITH41MML104	Course name: Data Structure

Course category: Major Mandatory

Credits: 2	Teaching scheme: L-2 P-0	Evaluation scheme: CA–30, ESE– 20

Pre-requisites: Information about computer system

Course Objectives:

1. Apply the Knowledge of Data Structure to flexibly work with various types of data structure.

2. Implement various algorithms of Data Structures using their programming logics

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

CO1: Recognize and Understand basic terminologies of Data structure, classification, and most importantly summarize the advantages of Data structure with Arrays and its operations

CO2: Describe the Modularization and basic structure of algorithms and programs of Linked list and Trees.

CO3: Determine and explore the workings of making, looping, and array manipulation and many more concepts of programming

CO4: Create Complex programs to build and process using significant amount of data and solve the real-life problems with all the concept of data structure

Contents –

Unit	Content	Teaching hours
1	**Introduction to Data Structure –** Define data structure, classification and types of data structure, Data Organization and Data Structure, Basic Terminology: Data item, Fields, Records, Files, Entity, Attributes **Arrays-** Representation of Linear Arrays, Traversing, Insertion and Deletions Sorting & Searching Algorithms, Multidimensional Arrays: 2D & M-D Concept, Record: Record Structures, Representation in Memory	10
2	**Linked List-** Concept of Linked List, Representation of linked List in memory Traversing a linked list, Searching a linked list: sorted and unsorted, Insertion & Deletion in Linked List, Header Linked List & Two way List	10
3	**Stacks, Queues-** Stack: Operation, Array Representation of Stack, linked representation of stack, Arithmetic Expression POLISH & POSTFIX, Application of stacks: Quicksort, Queue: Representation of queues & link.Types of Queues: Deques & Priority Queue, Liner and non-liner DS	10

Text Books:
1. Fundamentals of Data structures Horowitz & Sahani
2. An introduction to data structures and application Jean Paul Tremblay & Pal G. Sorenson
Reference Books:
1. Fundamentals of Data structures Horowitz & Sahani
2. An introduction to data structures and application Jean Paul Tremblay & Pal G. Sorenson

Syllabus
Semester-II

Course code: ITH41MMP104	**Course name:** Practical Based on Data Structure

Course category: Major Mandatory

Credits: 2	**Teaching scheme:** L-0 P-2	**Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Basic Knowledge of Computer

Course Objectives:
1. Apply the Knowledge of Data Structure to flexibly work with various types of data structure
2. Implement various algorithms of Data Structures using their programming logics

Course Outcomes: At the end of the course, the students will be able to –
CO1: Recognize and Understand basic terminologies of Data structure, classification, and most importantly summarize the advantages of Data structure with Arrays and its operations
CO2: Describe the Modularization and basic structure of algorithms and programs of Linked list.
CO3: Implements and Analyze the usage of Graph, Stack, Queues and Recursion.
CO4: Determine and explore the workings of making, looping, and array manipulation and many more concepts of programming

Contents –

Sr.no.	Description of Practical	Practical hours
1	1. Write a program using DIV (J, K) which reads a positive integer N>10 and determines whether or not N is a prime number. 2. Write a program which counts the number of particular character/word in the String. 3. Write a program which reads words WORD1 and WORD2 and then replaces each occurrence of word1 in text by word2 4. Implementation Traversing algorithm of Array: 5. Write the programs for traversing of n item using the array.	10
2	6. Implement linear search algorithm using C. 7. Implement binary search algorithm using C. 8. Implement Bubble sort algorithm using C. 9. Implementation traversing algorithm of Linked List: 10. Write the programs for traversing of an item from the linked list	10
3	11. Implementation Insertion and Deletion algorithms of Stack: 12. Write the programs for push and pop operation using the stacks. 13. Implementation Insertion and Deletion algorithms of Queue: 14. Write the programs for insertion and deletion of an item from the queues. 15. Implementation Deletion algorithm of Array:	10

Text Books: 1. Fundamentals of Data structures Horowitz & Sahani.
Reference Books: 1. An introduction to data structures and application Jean Paul Tremblay & Pal G. Sorenson

Syllabus
Semester-II

Course code ITH41VSP102	Course name: Web Fundamental	
Course category: Vocational skill course		
Credits: 2	Teaching scheme: L-0 P-4	Evaluation scheme: CA–30, ESE–20
Pre-requisites: Pre-university mathematics.		

Course Objectives:

1. Describe HTML document structure and associated elements: doctype

2. Describe the purpose of, and use additional HTML tags

3. Explain how CSS allows for separation of display and document structure

4. Identify the main parts of a URL and describe the role of each: protocol, host, port, path, query parameter, fragment

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

CO1: After completing this course, students will be able to create structure, organize, and publish a website using HTML and CSS.

CO2: Learning HTML & CSS is also an essential first step in learning how to code web pages professionally.

CO3: Students will work as Web Developers, Visual Designers, Front-End Web Developers in the IT field.

Contents –

Sr.no.	Description of Practical	Practical hours
1	1. Introduction to HTML. Create a basic HTML file 2. Create a static webpage using table tags of HTML 3. Create a static web page which defines all text formatting tags of HTML in tabular format 4. Create webpage using list tags of HTML 5. Create webpage to include image using HTML tag	10
2	6. Write a program to create a web page to print paragraphs in colors. 7. Create a form using the Element & Formatting tag. 8. Create a Form using Image Tag. 9. Create a Form using Image Tag. 10. Create employee registration webpage using HTML form objects	10
3	11. Create fream webpage using HTML form objects 12. Linking to a document in the same directory 13. Viewing the document source 14. Using the SSH File Transfer window to transfer files 15. Website creating using various tools	10

Text Books:
1. HTML & CSS By Jon Duckett
2. The complete reference HTML & CSS Thomas A. Powell
Reference Books: 1.HTML, CSS, and JavaScript All in One: Covering HTML5, CSS3, and ES6, Sams Teach Yourself By Julie C. Meloni and Jennifer Kyrin

Syllabus
Semester-II

Course code: - ITH41SEL102	**Course name:** Operating System

Course category: Skill Enhancement course

Credits: 2	**Teaching scheme:** L-2 P-0	**Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Basic Knowledge of Computer

Course Objectives:

1. Introduce modern operating systems basic concepts, policies, and mechanisms.

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

CO1: Compare various process scheduling algorithms.

CO2: Describe the Apply the principles of concurrency.

CO3: Design deadlock, prevention and avoidance algorithms

CO4: Compare and contrast various memory management schemes.

Contents –

Unit	Content	Teaching hours
1	**Introduction to Operating System-** Operating System Definition, OS as resource management, Structure of Operating System, Component of Computer System, Services provided by Operating System, Types of Operating System	10

2	**Processes and Threads –**
	   Process concept: PCB, Process State, Operation on Process. Concurrency: Concurrent process, Threads, Multithreading Synchronization Deadlock
	CPU Scheduling-
	   Time-slicing and the quantum, Preemptive and non-preemptive algorithms
	Memory Management –
	   Main memory organization and management, Virutal memroy organization ,Paging and Segmentation, Virtual memory management algorithms and issues
		10

3	**Linux System –**
	   Basic Concepts; System Administration-Requirements for Linux System Administrator, Setting up a LINUX Multifunction Server, Domain Name System, Setting Up Local Network Services;
	Virtualization-
	   Basic Concepts, Setting Up Xen, **VMware** on Linux Host and Adding Guest OS **Docker:** Overview, Features, Components of Docker, Architecture.
		10

Text Books: 1. Operating System Concepts A. Silberschatz ,By P.B. Galvin & G. Gagne	
2. Guide to Operating Systems By Greg Tomsho	
Reference Books:1.Operating System Concepts and Basic Linux Commands By Shital Ghate	
2. Docker: A Quick-start Beginner's Guide By Andy Hayes	

Semester: THIRD

Syllabus
Semester-III

Course code ITH41MML201	**Course name:** Data Warehousing

Course category: Major Mandatory

Credits: 2	**Teaching scheme:** L-2 P-0	**Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Basic RDBMS Concept

Course Objectives:

1. To introduce the concept of data Mining as an important tool for enterprise data management and as a cutting edge technology for building competitive advantage.
2. To enable students to effectively identify sources of data and process it for data mining.
3. To make students well versed in all data mining algorithms, methods, and tools.

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

CO1: Design the database architecture for storing large data.

CO2: Understand and implement various operations used for data mining

CO3: Analyze the data using existing data mining tools

CO4: Prepare the data needed for data mining algorithms in terms of attributes and class inputs, training, validating, and testing files.

Contents -

Unit	Content	Teaching hours
1	**Introduction to Data Warehouse** Architecture and Infrastructure: Data Warehouse Architecture, Infrastructure and Metadata Management, Extract Transform Load Cycle introduction, ETL overview Extraction, Loading, Transformation techniques.	6
2	**Information Access and Delivery:** - Matching information to classes of users OLTP and OLAP System, OLAP – the need, Design of the OLAP database. OLAP operations: slice, dice, rollup, drill-down etc. OLAP implementations. Data Mart, Type of Data Mart, OLAP Tools and The Internet.	8
3	**Trends in Data Warehousing:** Continued growth in data warehousing, expansion, significant trends: Real time data warehousing, multiple data types, data visualization, parallel processing, data warehouse appliances, query tools, browser tools, data fusion, data integration, Analytics, Data Warehousing and CRM, Agile development. **Emergence of Standards:** Metadata, OLAP	8
4	**Web Enabled Data warehouse:** The warehouse to the web, The web to the warehouse, The web enabled configuration. **Planning and project management:** Planning your Data Warehouse, Justify how different is your project, assessment of readiness, The life cycle approach, and The development Phases: Adopting Agile technology, The Project team organization and management. **Data Design and architectural plan:** Structure for Business Dimensions, Structure for Key measurements, levels of detail, composition of components, tools and products.	8

Text Books:	
1.	Data Warehousing C.S.R. Prabhu PHI Publication
2.	Web Warehousing and Knowledge Management Mattision TMH ASIN, Osborne/McGraw-Hill (1 June 1999)
3.	Data Warehousing – Fundamentals for IT professionals, Willey Publication, Paulraj Ponniah, 2nd Edition.
Reference Books:	
1.	Data Mining Data Warehousing- Nilesh magar Vision Publication.
2.	The Data Warehouse Lifecycle Toolkit, Thornthwaite, Kimball, Reeves Ross, John Wiley & Sons.

Syllabus
Semester-III

Course code ITH41MML202	**Course name:** Object Oriented Programing Using C++

Course category: Major Mandatory

Credits: 2	**Teaching scheme:** L-2 P-0	**Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Knowledge of C Programming Language

Course Objectives:

1. Students are able to implement the applications and can develop the Programs with classes and objects.

2. Developing in C++ the application is more optimized and efficient than C.

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

CO1: Understanding Object Oriented Concepts.

CO2: Perform object oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs

CO3: Demonstrate the use of various OOPs concepts with the help of programs.

CO4: Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming.

Contents -

Unit	Content	Teaching hours
1	**Principles of Object oriented Programming** • Object oriented concepts; Features, advantages and Applications of OOPS. **Introduction to C++ Programming Language** Tokens, Expressions, Control structures, Data types, new operators and keywords, using namespace concept	6
2	**Structure of C++**: Simple C++ Program, Introduction to Reference variables, pointer, Classes and Objects, Access specifiers, Defining Data members and Member functions, Array of objects.	8
3	**Functions in C++** • Call by reference, Return by reference, Function overloading and default arguments; Inline function; Static class members, Friend Function **Constructors and destructor Constructor:** • Types of constructors; Memory allocation (new and delete); Destructor.	8
4	**Operator overloading Overloading function:** Overloading Unary and Binary operators, Overloading using friend function, Type casting and Type conversion **Inheritance:** Types of inheritance with examples, Virtual base classes, Virtual functions and Pure virtual function, Abstract base classes Managing console I/O; C++ stream classes, Usage of manipulators.	8

Text Books:
1. Object oriented programming with C++, E. Balaguruswamy, Tata Mc-Graw Hill Publication. 4th Edition.
2. The C++ Programming Language, Bjarne Stroustrup, Addison Wesley, 1997.
3. Object-Oriented Programming with C++, A.K. Sharma, January 2014, Pearson India.
Reference Books:
1. Object oriented programming in C++ Robert Lafore Galgotia Publication, 2002 by Sams Publishing
2. Object Oriented Programming with C++	8th Edition, E.Balagurusamy, 2020.

Syllabus
Semester-III

Course code ITH41MML203	**Course name:** Statistical Method
Course category: Major Mandatory	

Credits: 2	**Teaching scheme:** L-2 P-0	**Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Basic mathematics.

Course Objectives:

1. The emphasis of course is on descriptive statistics. It gives an idea about the various statistical methods, measures of central tendency, measure of dispersion and correlation. Statistics mainly indulge on mathematics and logic.

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

CO1: Understand the elementary statistical methods.

CO2: Apply the measures of central tendency, measure of dispersion and co-relation to solve our day-to-day life problem.

CO3: Analyze the data to represent it graphically or tabulate and interpret it to generate information.

CO4: Have the critical thinking in the theory of probability and its applications in real life problems.

Contents -

Unit	Content	Teaching hours
1	**Statistical Methods:** Definition, scope and importance of Statistics, concepts of statistical population and sample. **Data & Types of data**: Primary and Secondary data, qualitative & quantitative data, Numerical (discrete, continuous), Categorical and Ordinal. Cross-section, time series, failure, industrial, directional data. Attributes, variables.	6
2	**Processing of Data**: Completeness, Consistency, Accuracy and Editing. Accuracy of Measurement. **Classification, Tabulation and Graphical Representation:** Preparation of Tables, Presentation of Data: Variable, Random Variable, Frequency, And Frequency Distribution. Diagrammatic representation of Measures of Skewness and Kurtosis: Data: Line and Bar Diagram, Histogram, Component Bar diagram, Pie Chart, Line Graph, Frequency polygon and Ogive.	8
3	**Measures of Central Tendency:** Characteristics of Good measure of Central Tendency. Concept of central tendency- for Group and Ungroup data. **Mean:** Arithmetic mean (A.M.): simple and weighted Merits and demerits. Geometric mean (G.M.): computation for G M, Merits demerits and applications of G.M., Harmonic Mean (H.M.): computation for frequency, non-frequency data, merits & demerits of H.M.	8
4	**Median:** Definition, Median for grouped and non-grouped data, Properties and Merits & demerits. **Mode:** Definition, Mode for grouped & Non-grouped data, Graphical Method for finding mode, Merits and demerits.	8

Text Books:
1. Basic Statistics, B.L. Agarwal, New Age International (P) Limited.
2. Fundamental of Mathematical Statistics, S. C. Gupta & V. K. Kapoor, Sultan Chand & Sons, 2002.
Reference Books:
1. Fundamentals of Statistics, S.C. Gupta, Himalaya Publishing House Pvt. Ltd.
2. Fundamentals of Statistics (English, Paperback, K.N. Nagar)

Syllabus
Semester-III

Course code ITH41MMP201	Course name: Practical Based on Data warehousing

Course category: Major Mandatory

Credits: 1	**Teaching scheme:** L-0 P-2	**Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Basics of excel, DBMS

Course Objectives:

This course will introduce the concepts of data ware house and data mining, which gives a complete description about the principles, used, architectures, applications, design and implementation of data mining and data ware housing concepts.

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

CO1: Understand the functionality of the various data mining and data warehousing component

CO2: Appreciate the strengths and limitations of various data mining and data warehousing models

Contents -

Sr. No.	Description of Practical	Practical Hours
1	Creation of a Data Warehouse. (Google Big Query, Amazon Redshift)	2
2	Study on Apriori Algorithm.	2
3	Implementation of FP-Growth Algorithm.	2
4	Build and demonstrate the K-means clustering.	2
5	Design and implement one Hierarchical clustering algorithm.	2
6	Classify the Bayesian Classification.	2
7	Implement the Decision Tree structure.	2
8	Apply the Support Vector Machines.	2
9	Implement the classification for web mining.	2
10	Case Study on Text Mining.	2
11	Project	10

Text Books:
1. Data Warehousing C.S.R. Prabhu, PHI Publication.
2. Web Warehousing and Knowledge Management Mattision, Osborne/McGraw-Hill (1 June 1999)
3. Data Mining Data Warehousing- Nilesh magar, Vision Publication
Reference Books:
1. A Practical Guide to Data Mining for Business and Industry, Andrea Ahlemeyer-Stubbe, Shirley Coleman, Wiley
2. Data Mining and Data Warehousing Principles and Practical Techniques, Parteek Bhatia

Syllabus
Semester-III

Course code ITH41MMP202	**Course name:** Practical Based on Object Oriented Programing Using C++

Course category: Major Mandatory

Credits: 1 **Teaching scheme:** L-0 P-2 **Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Basic knowledge of programming.

Course Objectives:

To understand how C++ improves C with object-oriented features.

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

CO1: Understand how C++ improves C with object-oriented features.

CO2: apply how to write inline functions for efficiency and performance.

CO3: Understand the syntax and semantics of the C++ programming language

CO4: Learn how to design C++ classes for code reuse

Contents-

Sr. No	Description of Practical	Practical Hours
1	Program on Check Whether a Given Number is Even or Odd	2
2	Program to Find Sum of Digits of a Number	2
3	Implement the program whether a given Year is a Leap Year	2
4	Program to Check Whether a Character Is Uppercase, Lowercase Alphabet A Digit Or A Special Symbol.	2
5	Program to Find Greatest Among Three Numbers	2
6	Illustrate the Program to Check Number Is Positive Or Negative	2
7	Program to Find Number Is Prime Or Not	2
8	Program to Find Area of a Triangle / Square / Circle / Rectangle Using Switch Statement.	2
9	Program to Print All Value Of An Array.	2
10	Program to Illustrate Inheritance.	2
11	Project	10

Text Books:
1. Object Oriented programming with C++, E. Balaguruswamy,Tata Mc-Graw Hill, 4th Edition
2. The C++ Programming Language, Bjarne Stroustrup, Addison Wesley
Reference Books:
1. Object oriented programming in C++ Robert Lafore Galgotia Publication, 2002 by Sams Publishing
2. Object Oriented Programming with C++	8th Edition, E.Balagurusamy, 2020.

Syllabus
Semester-III

Course code: ITH41VSP201	**Course name:** Advance Excel
Course category: Vocational skill course	
Credits: 2 **Teaching scheme:** L-0 P-4	**Evaluation scheme:** CA–30, ESE–20
Pre-requisites: Basics of Excel.	
Course Objectives:	
Possessing the ability to use spreadsheets, graphs, tables, calculations, and automation	
Course Outcomes: At the end of the course, the students will be able to -	
CO1: Create templates after writing complex worksheets and workbooks.	
CO2: Work with named ranges and create lists.	

Contents -

Sr. No	Description of Practical	Practical Hours
1	Practical on Chart Recommendations	4
2	Practical on Format Charts	4
3	Practical on Chart Design.	4
4	Practical on Richer Data Labels.	4
5	Practical on Leader Lines	4
6	Perform the New Functions	4
7	Practical on Instant Data Analysis	4
8	Practical on Sorting Data by Color	4
9	Practical on Slicers. Practical on Flash Fill	4
10	Practical on Pivot Table Tools.	4
11	Project	20

Text Books:
1. Excel Formulas and Functions: Cool Tips and Tricks With Formulas in Excel, Caprioru 2019
2. Beginner Excel Essentials 2019 by M. L. Humphrey.
Reference Books:
1. Advanced Excel: How to Use Vlookup & Index Match Functions, Sterling Libs Fcca, Straight Street Publishing, 2016
2. Simplified Practical Guide to Microsoft Excel: Learning Microsoft Excel from Basic to Advanced by Karl Brian, 2022

Semester: FOURTH

Syllabus
Semester-IV

Course code: ITH41MML204	**Course name:** Data Mining
Course category: Major mandatory	

Credits: 2	**Teaching scheme:** L-2 P-0	**Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Basic knowledge of DBMS and Data Organizations & applications.

Course Objectives:

To develop an understanding of the strengths and limitations of popular data mining techniques and to be able to identify promising business applications of data mining.

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

CO1: Evaluate different models used for OLAP and data preprocessing.

CO2: Learn to differentiate between situations for applying different data-mining techniques

CO3: Explore data, Mean and Median.

CO4: Data Mining Classifiers and comparative study.

Contents -

Unit	Content	Teaching hours
1	**Introduction to Data Mining:** Why Mine Data, Data Commercial Viewpoint, Scientific Viewpoint, Motivation, Definitions, Origins of Data Mining, Data Mining Tasks, Classification, Clustering, Association Rule, Discovery, Sequential Pattern Discovery, Regression, Challenges of Data Mining.	6
2	**Data Mining Data:** What is Data, Attribute Values, Measurement of Length, Types and Properties of Attributes, Discrete and Continuous Attributes, Types of data sets, Data Quality, Data Preprocessing, Aggregation, Sampling, Dimensionality Reduction, Feature subset selection, Feature creation, Discretization and Binarization, Attribute Transformation, Density.	8
3	**Data Mining: Exploring Data:** Data Exploration Techniques, Summary Statistics, Frequency and Mode, Percentiles, Measures of Location, Mean and Median, Measures of Spread, Range and Variance, Visualization, Representation, Arrangement, Selection, Visualization Techniques, Histograms, Box Plots, Scatter Plots, Contour Plots, Matrix Plots, Parallel Coordinates, Other Visualization Techniques, OLAP : OLAP Operations.	8
4	**Data Mining Classification:** Basic Concepts, Decision Trees, Model Evaluation, Classification: Definition, Classification Techniques, Tree Induction, Measures of Node,Impurity, Practical Issues of Classification, ROC curve, Confidence Interval for Accuracy, Comparing, Performance of Two Models. Comparing Performance of Two Algorithms. **Alternative Techniques:** Rule- Based Classifier, Rule Ordering Schemes, Building Classification Rules, Instance- Based Classifiers, Nearest Neighbor Classifiers, Bayes Classifier, Naive Bayes Classifier, Artificial Neural Networks (ANN), Support Vector Machines.	8

Text Books:
1. Introduction to Data Mining, Tan, Steinbach, Kumar
2. Data mining concepts and techniques, Han, J. Kamber, M. Pei, J. Morgan, Kaufmann, 3rd Edition.
3. Principles and Theory for Data Mining and Machine Learning, Bertrand Clarke, Ernest Fokoue, Hao Helen Zhang, Springer Publishing
Reference Books:
1. JavaScript and jQuery for Data Analysis and Visualization, Jon Raasch, Graham Murray, Vadim Ogievetsky
2. Data Mining: The Textbook, by Charu C. Aggarwal

Syllabus
Semester-IV

Course code: ITH41MML205	Course name: Core Java	Course category: Major Mandatory
Credits: 2	Teaching scheme: L-2 P-0	Evaluation scheme: CA–30, ESE–20

Pre-requisites: Knowledge of Programming language C or C++ is helpful but not mandatory.

Course Objectives:

Learn OOP concepts helps to become Java developer.

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

CO1: Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.

CO2: Able to solve real world problems using OOP techniques (Objects and Classes).

CO3: Able to understand the use of Inheritance and Interface.

CO4: Apply classes, objects, members of a class and the relationships among them needed for a specific problem.

Contents -

Unit	Content	Teaching hours
1	**An Introduction to Java:-** A Short History of Java o Features or buzzwords of Java o Comparison of Java and C++ , Java Environment o Simple java program , Java Tools – jdb, javap, javadoc, Java IDE – Eclipse/Net Beans , Types of Comments , Data Types, Final Variable, Declaring 1D, 2D array.	6
2	**Objects and Classes:-** Defining Your Own Classes, Access Specifiers (public, protected, private, default), Array of Objects , Constructor, Overloading Constructors and use of 'this' Keyword , static block, static Fields and methods, Predefined class – Object class methods (equals(), toString(), hashcode(), getClass()), Inner class, Creating, Accessing and using Packages,Wrapper Classes.	8
3	**Inheritance and Interface:-** Inheritance Basics (extends Keyword) and Types of Inheritance, Superclass, Subclass and use of Super Keyword , Method Overriding and runtime polymorphism, Use of final keyword related to method and class, Use of abstract class and abstract methods, Defining and Implementing Interfaces.	8
4	**Exception Handling:-** Dealing Errors, Exception class, Checked and Unchecked exception, Catching exception and exception handling, Creating user defined exception Strings, Streams and Files o String class and StringBuffer Class, Formatting string data using format() method.	8

Text Books:
1. Complete reference Java, Herbert Schildt, 5th edition, McGraw-HIll
2. Beginning Programming with Java For Dummies (5th Edition)
3. Head First Java: A Brain-Friendly Guide (2nd Edition)
Reference Books:
1. Programming with Java, A primer, E. Balagurusamy, 4th edition
2. Java: Programming Basics for Absolute Beginners (1st Edition)

Syllabus
Semester-IV

Course code: ITH41MML206		Course name: Software Engineering
Course category: Major Mandatory		
Credits: 2	Teaching scheme: L-2 P-0	Evaluation scheme: CA–30, ESE–20
Pre-requisites: Basics of Software tools. Problem solving skill.		
Course Objectives:		
Be successful professionals in the IT field with solid fundamental knowledge of software engineering.		
Course Outcomes: Students will be able to-		
CO1: Decompose the given project in various phases of a lifecycle		
CO2: Choose appropriate process model depending on the user requirements.		
CO3: Perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.		
CO4: Enhance ability to function effectively on User Interface and Risk Management.		

Contents -

Unit	Content	Teaching hours
1	**Introduction to Software Engineering:** Study of Different Models, Software Characteristics Components, Applications, Layered Technologies, Processes, Methods and Tools, GenericView of Software Engineering, Process Models- Waterfall model, Incremental, Evolutionary process models- Prototype, Spiral, and Concurrent Development Model.	6
2	**Requirements Engineering Problem Recognition**: Requirement Engineering tasks, Processes, Requirements Specification, Use cases, and Functional specification, requirement validation, Requirements Analysis, Modeling – different types,	8
3	**Structured System Design:** Design Concepts, Design Model, Software Architecture, Data Design, Architectural Styles and Patterns, Architectural 05 05 80 Design, Alternative architectural designs, Modeling Component level design and its modeling, Procedural Design,Object Oriented Design.	8
4	**User Interface Design:** Concepts of UI, Interface Design Model, Internal and External Design, Evaluation, Interaction, and Information Display Software 02 05 5. Planning a Software Project Scope and Feasibility, Effort Estimation, Schedule and staffing, Quality Planning, Risk management-identification, assessment, control, project monitoring plan, Detailed Scheduling.	8

Text Books:
1. Fundamentals of Software Engineering, Rajib Mall, PHI Learning, 2014
2. Software Engineering: A Practitioner's Approach Roger Pressman, McGraw Hill Education
Reference Books:
1. Software Engineering – An Engineering Approach, James F.Peters & Witold Pedrycz, Wiley
2. Software Engineering – Principles and Practice, Waman Jawadekar, McGraw Hill Education

Syllabus
Semester-IV

Course code: ITH41MMP203	**Course name:** Practical Based on Data Mining
Course category: Major Mandatory	

Credits: 1	**Teaching scheme:** L-0 P-2	**Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Practical knowledge of RDBMS is helpful

Course Objectives:

To develop an understanding of the strengths and limitations of popular data mining techniques and to be able to identify promising business applications of data mining.

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

CO1: Evaluate different models used for OLAP and data preprocessing.

CO2: Learn to categorize and carefully differentiate between situations for applying different data-mining techniques.

CO3: Apply Data Mining Classification.

CO4: Understand Data Mining Classifiers and comparative study.

Contents -

Sr.No.	Description of Practical	Practical Hours
1	Preprocessing on dataset student.arff	2
2	Preprocessing on dataset labor.arff	2
3	Association rule process on dataset contactlenses.arff using apriori algorithm	2
4	Association rule process on dataset test.arff using apriori algorithm	2
5	Classification rule process on dataset student.arff using j48 Algorithm	2
6	Classification rule process on dataset employee.arff using j48 algorithm	2
7	Implementation of classification rule process on dataset employee.arff using id3 algorithm	2
8	Implementation of classification rule process on dataset employee.arff using naïve bayes algorithm	2
9	Implementation of clustering rule process on dataset iris.arff using simple k-means	2
10	Implementation of clustering rule process on dataset student.arff using simple k-means.	2
11	Project	10

Text Books:
1. Introduction to Data Mining, Tan, Steinbach, Kumar
2. Data mining concepts and techniques, Han J., Kamber M., Pei J. Morgan, Kaufmann, 3rd Edition.
Reference Books:
1. Data Mining, Fourth Edition: Practical Machine Learning Tools and Techniques, 2016, Fourth Edition, Ian H. Witten, Eibe Frank, Mark A. Hall, Morgan Kaufmann Publishers Inc.
2. Principles and Theory for Data Mining and Machine Learning, Bertrand Clarke, Ernest Fokoue, Hao Helen Zhang, Springer Publishing

Syllabus
<u>Semester-IV</u>

Course code: ITH41MMP204	**Course name:** Practical Based on Core Java
Course category: Major Mandatory	

Credits: 1	**Teaching scheme:** L-0 P-2	**Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Knowledge of Programming Language C or C++ is helpful

Course Objectives:

1. Learn how to implement object-oriented designs with Java.

2. Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.

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

CO1: Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.

CO2: Validate input in a Java program.

CO3: Able to understand the use of abstract classes.

CO4: classes, objects, members of a class and the relationships among them needed for a specific problem.

Contents -

Sr. No.	Description of Practical	Practical Hours
1	Broadcast a program to print ―Hello World‖ on the screen.	2
2	Implement the Java program to display the following pattern. i. ***** ii. **** iii. *** iv. ** v. *	2
3	Broadcast the Java program to print the area and perimeter of a circle.	2
4	Create a Java program to add two binary numbers	2
5	Build a Java program to reverse a string.	2
6	Program to count the letters, spaces, numbers and other characters	2
7	Implement a Java function that calculates the sum of digits for a given char array	2
8	Find the smallest and largest element from the array.	2
9	Designed a class that demonstrates the use of constructor and destructor.	2
10	Program to implement single level inheritance.	2
11	Project	10

Text Books:
1. Complete reference Java, Herbert Schildt,5th edition, McGraw-HIll
2. Programming with Java, A primer, E. Balagurusamy, 4th edition

Reference Books:
1. Beginning Programming with Java For Dummies (5th Edition)
2. Java: Programming Basics for Absolute Beginners (1st Edition)

Syllabus
Semester-IV

Course code: ITH41SEP201	Course name: Bootstrap	
Course category: Skill Enhancement course		
Credits: 2	Teaching scheme: L-0 P-2	Evaluation scheme: CA–30, ESE–20
Pre-requisites: Knowledge of HTML and CSS helps to understand Bootstrap		
Course Objectives:		
This course is oriented towards students whose primary purpose is just to get a mobile-first responsive design up and running quickly and immediately.		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Learn how to build Responsive Websites with ease.		
CO2: understand How Bootstrap Components Work and apply it.		

Contents-

Sr.no.	Description of Practical	Practical Hours
1	**BS Functions**: BS Get Started, BS Grid Basic, BS Typography, BS Tables, BS Images, BS Jumbotron, BS Wells, BS Alerts.	4
2	BS Buttons, BS Button Groups, BS Glyphicons.	4
3	**BS Badges/Labels:** BS Progress Bars, BS Pagination, BS Pager, BS List Groups, BS Panels, BS Dropdowns, BS Collapse, BS Tabs/Pills, BS Navbar, BS Forms, BS Inputs, BS Inputs 2,BS Input Sizing.	4
4	**BS Media Objects,** BS Carousel, BS Modal, BS Tooltip, BS Popover, BS Scrollspy, BS Affix, BS Filters.	4
5	**Bootstrap Grids:** BS Grid System, BS Stacked/Horizontal.	4
6	**BS Grid**: Small, BS Grid Medium, BS Grid Large, BS Grid Examples.	4
7	**Bootstrap Themes:** BS Templates, BS Theme "Simply Me" BS Theme "Company", BS Theme "Band"	4
8	**Bootstrap CSS Ref:** CSS All Classes, CSS Typography, CSS Buttons, CSS Forms, CSS Helpers, CSS Images, CSS Tables.	4
9	CSS Dropdowns, CSS Navs Glyphicons.	4
10	**Bootstrap JS Ref:**JS Affix,,JS Alert, JS Button, JS Carousel, JS Collapse, JS Dropdown JS Modal, JS Popover, JS Scrollspy, JS Tab, JS Tooltip	4
11	**Project**	20

Text Books:
1. Bootstrap by Jake Spurlock Released May 2013, Publisher(s): O'Reilly Media, Inc.
2. Tutorials point Book PDF
3. Bootstrap in 24 Hours, Sams Teach Yourself, Jennifer Kyrnin, 2015.
Reference Books:
1. Bootstrap Jake Spurlock, O'Reilly Media, Inc.
2. Mastering Bootstrap 4 – Second Edition: Master the latest version of Bootstrap 4 to build highly customized responsive web apps, Benjamin Jakobus, Jason Marah, 2018

Semester: FIFTH

Syllabus
Semester-V

Course code: ITH41MML301	**Course name:** Introduction to Data Science
Course category: Major Mandatory	

Credits: 2	**Teaching Scheme:** L-2 P-0	**Evaluation Scheme:** CA-30 ESE-20

Pre-requisites: Mathematical background and programming skills sufficient enough to learn new languages and software are required. Basic knowledge of statistics.

Course Objectives:

Understand and learn the lifecycle and phases of data science and work comfortably with data science

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

CO1: To develop fundamental knowledge of concepts underlying data science

CO2: To develop practical data analysis skills, which can be applied to practical problems

CO3: To explain how math and information sciences can contribute to building better algorithms and software.

CO4: To develop applied experience with data science software, programming, applications and processes.

Contents -

Unit	Content	Teaching hours
1	**Introduction to Data Science:** Definition and applications, Skills needed basic steps in Data Science, Benefits and uses of data science and big data. Facets of Data: Structured data, unstructured data, Natural Language, Machine generated data; Graph based or network data, Audio, Image and Video, Streaming data, Data Science Process: Overview of data science process. Basics of retrieving data, data cleansing, transforming data, data modeling.	06
2	**Steps for Data Science Process:** Step 1: Setting the research goal, Step 2: Retrieving data, Step 3: Cleansing, Integrating and transforming data. Step 4: Exploratory data analysis, Step 5: Build the model, Step 6: Presentation and automation. Sentiment analysis and its applications: Definition, types of sentiments, applications, case study. Uses of Text mining.	08
3	**Data with R Studio:** Using an integrated development environment, installing R studio, Creating R Script, History, overview. Data types variable, operators, and string. Syntax of R objects. R functions: Statistical functions, Built in functions, User defined functions.	08
4	**Objects in R Language:** Creating and manipulation of R Objects Vector, List, Matrices, Arrays, Factors, Data frames, Data Interfaces: CSV file, Excel file, Text file, Charts and Graphs: Pie chart, Bar chart, Boxplot, Histogram, Advanced visualization techniques.	08

Text Books :
1. Jeffrey S.Saltz,Jeffrey M.Stanton Introduction to Data Science Ebook SAGE Publications
2. Galit Shmueli, Peter C. Bruce, Inbal Yahav, Nitin R. Patel, Kenneth C. Lichtendahl Jr.,Data Mining for Business Analytics: Concepts, Techniques and Applications in R, Wiley
Reference Books:
1. Rachel Schutt & Cathy O'Neil Doing Data Science, O' Reilly, First Edition, 2013
2. B. Ram Computer Fundamental, BPB Publication

Syllabus
Semester-V

Course code: ITH41MML302	Course name: Python Programming
Course category: Major Mandatory	
Credits: 2 **Teaching Scheme:** L-2 P-0	**Evaluation Scheme:** CA-30 ESE-20
Pre-requisites: Programming skills sufficient enough to learn new languages and software are required. Basic knowledge of programing language	
Course Objectives:	
Understand and learn the lifecycle and phases of data science and work comfortably with data science projects	
Course Outcomes: At the end of the course, the students will be able to -	
CO1: To understand importance of Python for development.	
CO2: Develop a skill to implement Python Programming.	
CO3: Hands-on Python experience for professional advancement.	
CO4: Render and export projects optimized for various platforms, including web, broadcast, and social media.	

Contents -

Unit	Content	Teaching hours
1	**Introduction to Python:** Getting Started: Introduction to Python- an interpreted high level language, interactive mode and script mode. Variables, Expressions and Statements. Variables and Types-mutable and Immutable variable and Keywords. Operators and Operands in Python. (Arithmetic, relational and logical operators), Operator precedence, Expressions and Statements (Assignment statement) Taking input (using raw input() and input()) and displaying output - print statement, Comments in Python.	06
2	**Conditional and Looping Construct** if - else statement and nested if – else while, for, use of range function in for, Nested loops break, continue, pass statement Use of compound expression in conditional constructs. **Functions:** Built-In Function, invoking built in functions Module(Importing entire module or selected objects using from statement) Functions from math, random, time & date module. **Composition User Define Function:** Defining , invoking functions, passing parameters (default parameter values, keyword arguments) Scope of variables, void functions and functions returning values	08
3	**String :** Creating, initializing and accessing the elements, String operators: +, *, in, not in, range, slice [n:m] String built in functions & methods: len, capitalize, find, isalnum, isalpha, isdigit, lower, islower, isupper, upper, lstrip, rstrip, isspace, istitle, partition, replace, join, split, count, decode, encode, swapcase Strings constants defined in string module. **Errors and Exceptions**: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions(try - finally)	08

4	**Concept of mutable list:** creating, initializing and accessing the elements of list List operations (Concatenation, Repetation, Membership, list slices), List comprehensions List **functions & methods**: len, insert, append, extend, sort, remove, reverse, pop, Tuples, Immutable concept, creating, initializing and accessing the elements in a tuple, Tuple functions: cmp(), len(), max(), min(), tuple(),Sets , Concept of Sets: creating, initializing and accessing the elements of Sets operation (Membership, union, intersection, difference, and symmetric difference, **Dictionaries:** Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, Traversing, appending, updating and deleting elements Dictionary functions & Methods: cmp, len, clear(), get(), has_key(), items(), keys(), update(), values()	08

Reference Books:
1. Mark Lutz's Programming Python O'Really.
2. Jake VanderPlas Python Data Science Handbook O' Reilly

Syllabus
Semester-V

Course code: ITH41MML303	**Course name:** Computer Networks
Course category: Major Mandatory	
Credits: 2 **Teaching Scheme:** L-2 P-0	**Evaluation Scheme:** CA-30 ESE-20
Pre-requisites: A foundational understanding of key concepts in computer science or information technology, covering basic programming concepts and fundamental computer architecture.	
Course Objectives:	
To gain knowledge of computer networks and essential terminologies related to network hardware, software models, and topologies. To learn network architectures and protocols, services that enable seamless communication.	
Course Outcomes: At the end of the course, the students will be able to -	
CO1: Knowledge of basics of computer network, architectures, network hardware, software types of network, reference models including OSI and TCP/IP, network standardization.	
CO2: Understanding of the physical and data link layer design issues, transmission medias, multiplexing, switching, framing, error detection and control mechanism.	
CO3: Understanding of Ethernet, multiple access protocol, wireless LANs, broadband, Bluetooth, addressing & routing schemes, congestion control algorithms.	
CO4: Knowledge of transport protocols-UDP, TCP, its design issues and concepts of application, layer & protocols.	

Contents -

Unit	Content	Teaching hours
1	**Introduction:** Uses of computer networks, types of network, network hardware, network software, OSI reference model, TCP/IP reference model, example networks, network standardization.	06
2	**Physical Layer:** Theoretical basis for data communication, network topologies, guided transmission media, wireless transmission, communication satellites, Digital modulation and multiplexing, public switched telephone network, mobile telephone system, cable television. **Data Link Layer:** Data link layer design issues, error detection and correction, elementary data link protocols, sliding window protocol.	08
3	**Medium Access Control Sub layer:** Channel allocation problem, multiple access protocols, Ethernet, wireless LANs, broadband wireless, Bluetooth, data link layer switching. **Network Layer:** design issues, routing algorithms, congestion control algorithms, internetworking, and network layer in the internet.	08
4	**Transport Layer:** Services provided to the upper layers, transport service primitives, Berkeley sockets, elements of transport protocols, congestion control, transport protocols-UDP & TCP. **Application Layer:** Domain name system, electronic mail, world wide web, streaming audio and video, content delivery.	08

Reference Books:
Reference Books: 1. Data Communications and Networking -Behrouz A. Forouzan, Fifth Edition, McGraw Hill.
2. Computer Networks- A Systems Approach – Larry L. Peterson & Bruce S. Davie, Fifth Edition.

Syllabus
Semester-V

Course code: ITH41MMP301 **Course name:** Practical Based on Introduction to Data Science **Course category:** Major Mandatory	

Credits: 1	**Teaching Scheme:** L-0 P-2	**Evaluation Scheme:** CA-30 ESE-20

Pre-requisites: Basics Knowledge of programming & Data Mining.

Course Objectives: Understand and learn the lifecycle and phases of data science and work comfortably with data science projects.

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

CO1: To develop fundamental knowledge of concepts underlying data science

CO2: To develop practical data analysis skills, which can be applied to practical problems

CO3: To explain how math and information sciences can contribute to building better algorithms and software.

CO4: To develop applied experience with data science software, programming, applications and processes.

Content -

Sr.no.	Description of Practical	Practical Hours
1	Write an R program to create student records using different data types (numeric, character, logical). Store the records in an Excel file using appropriate R packages.	2
2	Develop an R program to store student marks and apply at least 10 statistical functions	2
3	Create a dataset of student marks and visualize the data using: Bar Chart, Line Graph, Histogram, Pie Chart	2
4	Write an R program to create a vector and perform basic operations	2
5	Demonstrate how to create and manipulate a list object containing different data types	2
6	Write a program to create a matrix and perform the following operations: Matrix addition, subtraction, and multiplication	2
7	Create a data frame containing student details (Name, Age, Marks).	2
8	Create a multi-dimensional array and perform basic operations like accessing elements and slicing data	2
9	Write an R proam to calculate statistical measures such as mean, mod, median, etc.	2
10	Develop an R program to write a data frame to a CSV file	2
11	Project	10

Reference Books:
1. Rachel Schutt & Cathy O'Neil Doing Data Science, O' Reilly, First Edition, 2013.
2. B. Ram Computer Fundamental, BPB Publication.

Syllabus
Semester-V

Course code: ITH41MMP302	**Course name:** Practical Based on Python Programming
Course category: Major Mandatory	

Credits: 1	**Teaching Scheme:** L-0 P-2	**Evaluation Scheme:** CA-30 ESE-20

Pre-requisites: Basic C, C++ programming Computer Skills.

Course Objectives:

Understand and use variables. Work with common Python data types like integers, floats, strings, characters, lists, dictionaries, as well as pandas Data Frames Advanced techniques such as 3D layers,

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

CO1: To understand importance of Python.

CO2: Develop a skill to implement Python Programming.

CO3: Hands-on Python experience for professional advancement.

CO4: To use and implement standard programming constructs like development phase.

Content -

Sr.no.	Description of Practical	Practical Hours
1	Calculate the Area of a Triangle in Python	2
2	Swap Two Variables Without a Third Variable in Python	2
3	Find the Largest Number Among Three in Python	2
4	Generate Fibonacci Series Using a Function in Python	2
5	Swap First and Last Elements in a List Using Python	2
6	Display a Multiplication Table Using Functions in Python	2
7	Split a List into Chunks of Size N in Python	2
8	Find Duplicate Characters in a String Using Counter in Python	2
9	Generate Possible Words from Given Characters in Python	2
10	Implement the Tower of Hanoi Algorithm in Python	2
11	Project	10

Reference Books:
1. Jake VanderPlas Python Data Science Handbook O' Reilly.
2. Mark Lutz's Learning Python O'Really.

Syllabus
Semester-V

Course code: ITH41MEL301	**Course name:** Java Script
Course category: Major Elective	

Credits: 3	**Teaching Scheme:** L-3 P-0	**Evaluation Scheme:** CA-60 ESE-40

Pre-requisites: Basic Programming Knowledge of HTML and CSS.

Course Objectives:

Learn how JavaScript works and how it is used in web development

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

CO1: Ability to understand the fundamental of JavaScript.

CO2: Demonstrate objects and arrays usage.

CO3: Define functions and methods.

CO4: Proficiency in developing interactive and dynamic web applications.

Contents -

Unit	Content	Teaching hours
1	**Introduction** to JavaScript, Features of JavaScript, Advantages and Disadvantages of JavaScript, Writing JavaScript into HTML, Basic Programming Techniques: Data Types and Literal: Number, Boolean, String, Null, Structure of a JavaScript program, Type Casting, Creating Variables, Incorporating Variables in a Script, The JavaScript Array.	09
2	Operators and Expressions in JavaScript: Arithmetic Operators, Logical Operators, Comparison Operators, String Operators, Assignment Operators, The Conditional Expression Ternary Operator, Special Operators: delete, new, void, JavaScript Programming Constructs, Conditional Checking: if, if else, if else if, switch	09
3	Super Controlled- Endless loops: for loop, while loop, do-while loop, for-in loop, Functions in JavaScript: Built-in Functions, User Defined Functions, Placing Text in a Browser, Dialog Boxes: Alert Dialog Box, Prompt Dialog Box, Confirm Dialog Box	09
4	The JavaScript Document Object Model, Handling Events Using JavaScript, Forms Used By a Website: The Form Object-The Form Object's Methods, The Text Element, Password Element, Button Element, Checkbox Element, Radio Element, Text Area Element, Select and Option Elements, Other Built-in Objects in JavaScript	09
5	**Introduction to Full-Stack Development** Role of a Full-Stack Developer, Overview of Front-End, Back-End, and Databases, Understanding Client-Server Architecture, Front-End Development (UI/UX & Client-Side Programming), A. HTML & CSS (Structure & Styling), HTML5 Fundamentals (Tags, Forms, Media, Tables, etc.), Responsive Web Design (Media Queries, Bootstrap, Tailwind) CSS Animations & Transitions AJAX Basics & Asynchronous JavaScript (Callbacks, Promises, Async/Await)	09

Text Book :
1. Ivan Bayross, Web Enabled Commercial Applications Development Using-HTML, JavaScript, DHTML and PHP, 4th Revised Edition, BPB Publications.
2. A Smarter Way to Learn JavaScript by Mark Mayers.
Reference Books:
1.JavaScript 2.0-The Complete Reference, Second Edition by Thomas Powell and Fritz Schneider

Syllabus
Semester-V

Course code: ITH41MEL302	Course name: Agile software development
Course category: Major Elective	

Credits: 3	Teaching Scheme: L-3 P-0	Evaluation Scheme: CA-60 ESE-40

Pre-requisites: Basic knowledge of software development processes and working experience within a team-based environment. Exposure to traditional project management methodologies

Course Objectives:

1. Deep understanding of agile principles and methodologies

2. Working in team under agile Frameworks and methodologies

3. Understand the role of agile leadership and servant leadership

4. Guide learners in Agile Process and Frameworks with continuous improvements

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

CO1: Students will start to manage software development effectively

CO2: Create, Manage, and facilitate Agile Team to enhance collaboration

CO3: Improve project delivery through continuous feedback and iterative development.

CO4: Able to generate a demonstrative and adaptive environment that project needs in an organizational environments

Contents -

Unit	Content	Teaching hours
1	**Introduction to Software Project Management:-** Introduction to Project Management Concepts, Role of Project Manager, Management Level, structure and its process, Overview of Software Project Management (SPM) and Importance Project Spectrum , Software Development Life Cycle (SDLC), Tools and Techniques in Traditional Project Management. Project Planning and Scheduling Project Scope Management: Defining Scope, Resources, Work Breakdown Structure, process and importance, Estimation Techniques: Effort and Cost Estimation, COCOMO model, Project Scheduling: Gantt Charts, Project Evaluation & Review Technique (PERT), Critical Path Method (CPM).	09
2	**Introduction to Agile & Agile Project Management :-** Agile principles & values, Traditional vs. Agile project management, Agile frameworks: - Agile Manifesto, Adopting Agile Mindset, -Benefits of Agile, -Agile Lifecycle, **Agile Roles and Responsibilities,** -Agile /Scrum Roles, -Agile responsibilities, -Comparisons on Agile Roles	09
3	**Agile Frameworks & Methodologies:-** Overview of Agile frameworks, Scrum framework: Roles, artifacts, ceremonies, Overview of Sprint, Kanban: Flow management, Kanban Board, Work In Process(WIP) limits, Lean principles & Agile scaling frameworks , Scaling Agile for Large Enterprise, Large Scale Scrum , Extreme Programming (XP) – Agile for Developers, Disciple Agile Delivery	09

4	**Agile Planning, Estimation & Execution:-** AGILE EPICS, Features, User stories and Tasks, Framework under EPICS, Backlog management & User Stories, Agile estimation: User Story Points, Planning, Sprint planning & estimation, **Agile Leadership, Collaboration & Stakeholder Management:-** Handling Team Conflicts & Agile Coaching, Agile Roles: Product Owner, Scrum Master, Developers, Team Collaboration in Agile, Leadership with Agile Roles: Product Owner, Scrum Master, Developers, Stakeholder Communication & Expectation Management	09
5	**Agile Metrics, Continuous Improvement & Certifications** Agile Metrics – Measuring Success in Agile Projects Velocity, Burndown Chart, Burnup Chart Cycle Time, Lead Time Escaped Defects, Cumulative Flow Diagram (CFD) ,Continuous Improvement – Retrospectives & Process Enhancement, Agile Retrospective - Importance Types of Retrospective,**Mad, Sad, Glad** – Understanding team emotions **Start, Stop, Continue** – Actionable improvements,**Sailboat Retrospective** Identifying risks and goals, **Agile Certifications- Career aspects**	09

Text Books:
1. Agile Software Development, Principles, Patterns, and Practices-Robert C. Martin Pearson Publications
2. Software Project Management- Hughes Bob- McGraw Hill Education Imprint
Reference Books:
1. The Art of Agile Development- James shore & Shane Warden -O'reilly Publications
2. Agile Project Management - J. Ross - BPB Publications
Online Resources:
1. NPTEL / SWAYAM lectures, https://www.pmi.org/certifications/agile-certifications, https://www.atlassian.com/agile/kanban

Syllabus
Semester-V

Course code: ITH41MEP301	**Course name:** Practical Based on Java Script
Course category: Major Elective	

Credits: 1	**Teaching Scheme:** L-0 P-2	**Evaluation Scheme:** CA-30 ESE-20

Pre-requisites: Basic Programming Knowledge of HTML and CSS

Course Objectives: Learn how JavaScript works and how it is used in web development

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

CO1: Ability to understand the fundamental of JavaScript.

CO2: Proficiency in developing interactive and dynamic web applications.

Content -

Sr. No	Description of Practical	Practical Hours
1	Using the alert() Method in JavaScript	02
2	Assigning and Adding Variables in JavaScript	02
3	Defining and Using User-Defined Functions in JavaScript	02
4	Calling a Function from Another Function in JavaScript	02
5	Implementing Conditional Statements in JavaScript	02
6	Working with Loops in JavaScript	02
7	Handling Dates with Date(), getDate(), and getDay() in JavaScript	02
8	Applying String Methods to Text in JavaScript	02
9	Using min(), max(), and round() Functions in JavaScript	02
10	Accessing Elements with getElementById() and getElementsByClassName() in JavaScript	02

Text Books:
1. Ivan Bayross, Web Enabled Commercial Applications Development Using-HTML.
2. JavaScript, DHTML and PHP, 4th Revised Edition, BPB Publications.
3. A Smarter Way to Learn JavaScript by Mark Mayers.
Reference Books:
1. JavaScript 2.0-The Complete Reference, Second Edition by Thomas Powell and Fritz Schneider.

Syllabus
Semester-V

Course code: ITH41MEP302	**Course name:** Practical Based on Agile software
Course category: Major Elective	

Credits: 1	**Teaching Scheme:** L-0 P-2	**Evaluation Scheme:** CA-30 ESE-20

Pre-requisites: Basic knowledge of software development processes and working experience within a team-based environment. Exposure to traditional project management methodologies

Course Objectives:

1. Deep understanding of Agile principles and methodologies

2. Working in team under Agile Frameworks and methodologies

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

CO 1: Students will start to manage software development effectively

CO 2: Create, Manage, and facilitate Agile Team to enhance collaboration

CO 3: Improve project delivery through continuous feedback and iterative development.

CO 4: Confidently conduct stand-ups, sprint reviews, and retrospectives.

Content -

Sr.no.	Description of Practical	Practical Hours
1	**Project Charter Creation with Agile Mindset & Principles** Define a project vision, objectives, stakeholders, scope, and constraints. Create a charter document outlining roles and responsibilities. Compare and Explore Agile values from the Agile Manifesto.	2
2	**Work Breakdown Structure (WBS) Development** Break the project into smaller, manageable tasks. Implement as per Agile works and how it improves software development. Use tools like MS Project, Trello, or Jira to visualize tasks.	2
3	**Project Scheduling with Gantt Chart** Develop a timeline using Gantt charts in MS Project or online tools. Identify task dependencies and milestones	2
4	**Implement Agile Frameworks in Real-World Projects** Hands-on application of Scrum, Kanban, and Lean principles use tool like JIRA Work with Sprint planning, user stories, and iterative development.	2
5	**Use Agile Tools & Techniques in Live Projects** Set up a Scrum board in Jira, Trello, or Azure DevOps. Manage and understand backlog, sprints, and task tracking in an Agile tool.	2
6	**Develop Estimation & Planning Skills** Use real techniques like Story Points, Planning Poker, and Velocity tracking, Perform backlog refinement and sprint forecasting.	2

7	**Facilitate Agile Ceremonies** Practice conducting Daily Stand-ups, Sprint Reviews, and Retrospectives, Learn techniques for improving team collaboration.	2
8	**Manage Agile Teams & Stakeholders**: - Lead cross-functional teams in an Agile environment, Handle stakeholders' expectations using Agile reporting tools.	2
9	**Adapt Agile in Different Business Scenarios** Work with Agile in startups, enterprises, and hybrid project management setups, Learn how to integrate Agile with DevOps.	2
10	**Handle Agile Challenges & Continuous Improvement** Learn to manage scope creep, risk, and impediments in Agile projects, Focus on continuous learning and delivery improvement.	2
11	**Project**	10

Text Books:
1. Agile Software Development, Principles, Patterns, and Practices-Robert C. Martin Pearson Publications
2. Software Project Management- Hughes Bob- McGraw Hill Education Imprint
Reference Books:
1. The Art of Agile Development- James shore & Shane Warden -O'reilly Publications
2. Agile Project Management - J. Ross - BPB Publications
Online Resources: 1. NPTEL / SWAYAM lectures.
1. https://www.pmi.org/certifications/agile-certifications
2. https://www.atlassian.com/agile/kanban

Syllabus
Semester-V

Course code: ITH41VSP301	**Course name:** Practical Based on Mobile App Development
Course category: Vocational skill Course	

Credits: 2	**Teaching Scheme:** L-0 P-4	**Evaluation Scheme:** CA-30 ESE-20

Pre-requisites: Basic knowledge of Understand Java/Kotlin for Android development

Course Objectives:

1. To enable students to have a good understanding of smart phones and developing apps for Android phones.

2. To engineer effective software systems for mobile phones

3. To develop android apps

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

CO1: Perform advanced rotoscoping and motion tracking. Interpreted features of Android Operating System.

CO2: Configure Android environment and development tools.

CO3: Develop rich user Inferences by using layouts and controls.

CO4: Use user Interface component for android application development.

Content:

Sr.no.	Description of Practical	Practical Hours
1	Compare Various operating System with Android os.	2
2	Install/ Configure JDK, Android Studio & Android SDK.	2
3	Create a simple mobile app that displays "Hello, World!" on the screen.	2
4	Develop a program to implement Frame layout, Table layout & relative layout.	2
5	Program to implement text view & edit view.	2
6	Program to implement Button, Image Button & Toggle button.	2
7	Program to implement Checkbox.	2
8	Develop a program to implement Radio Button & Radio Group.	2
9	Develop a program to implement Progress Bar.	2
10	Develop a program to implement date & Time Picker.	2
11	Project	10

Reference Books:
1. Rotoscoping: Techniques and Tools for the Aspiring Artist by Benjamin Bratt
2. Matchmoving: The Invisible Art of Camera Tracking by Tim Dobbert

Semester: SIXTH

Syllabus
Semester-VI

Course code: ITH41MML304	**Course name:** Data Analytics
Course category: Major Mandatory	

Credits: 2	**Teaching Scheme:** L-2 P-0	**Evaluation Scheme:** CA-30 ESE-20

Pre-requisites: Basics of Programming and Data Science Applications

Course Objectives:

The objective of this course is to provide comprehensive knowledge of python programming paradigms and Data Analytics

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

CO1: Demonstrate the use of built-in objects of Python

CO2: Demonstrate significant experience with python program development environment.

CO3: Implement numerical programming, data handling and visualization through NumPy modules

Contents -

Unit	Content	Teaching hours
1	**Explorative Analysis:-** Understanding the Dataset, Checking the structure of the data (head(), info(), describe()), Identifying missing values and handling them, Checking data types of each column, Summary Statistics, Calculating mean, median, mode, standard deviation, etc., Identifying outliers and anomalies, Data Visualization, Univariate Analysis (Analyzing a single variable), Histograms, boxplots, density plots, Bivariate Analysis (Relationships between two variables), Scatter plots, correlation matrices, pair plots, Multivariate Analysis, Heatmaps, clustering, PCA (Principal Component Analysis),Handling Missing Data.	08
2	**Data Analytics Library:**Using Numpy Basics of NumPy-Computation on NumPy-Aggregations-Computation on Arrays Comparisons, Masks and Boolean Arrays-Fancy Indexing-Sorting Arrays-Structured Data: NumPy's Structured Array.	06
3	**Data Manipulation With Pandas:-**Introduction to Pandas Objects - Data indexing and Selection - Operating on Data in Pandas -Handling Missing Data – Hierarchical Indexing - Combining Data Sets - Aggregation and Grouping - Pivot Tables.	08
4	**Visualization And Matplotlib:-**Basic functions of matplotlib - Simple Line Plot, Scatter Plot - Density and Contour Plots -Histograms, Binnings and Density - Customizing Plot Legends, Colour Bars – Three Dimensional Plotting in Matplotlib.	08

Reference Books:
1. Python Data Science Handbook - Essential Tools for Working with Data Jake VanderPlasO'Reily Media Inc., 2016.
2. An Introduction to Python and Computer Programming Zhang.Y Springer Publications**,**2016
3. Data Science from Scratch First Principles with Python, Joel Grus O'Reilly Media, 2016.

Syllabus
Semester-VI

Course code: ITH41MML305		Course name: Cloud Computing
Course category: Major Mandatory		
Credits: 2	**Teaching Scheme:** L-2 P-0	**Evaluation Scheme:** CA-30 ESE-20
Pre-requisites: Basic Knowledge of networking & Operating system		
Course Objectives:		
Understanding basics of cloud computing and Key concepts of Cloud Analytics and different cloud computing services.		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Understand Cloud Computing Basics		
CO2: Understand the use of Cloud Computing in Data Analytics		
CO3: Learn the Concept of Cloud Infrastructure		
CO4: Understand Business imperative of Cloud Computing		

Contents -

Unit	Content	Teaching hours
1	**Introduction to Cloud computing:-**Evolution of computing paradigms, Concept of cloud, Introduction to virtualization and virtual machine, Virtualization in fabric/cluster/grid context, Virtual network, Information model & data model for virtual machine, Service Oriented Architecture, On Demand Computing, Web services: SOAP versus REST.	06
2	**Cloud Computing Technologies:-** Introduction to Cloud Computing, Cloud Architecture and Cloud Storage, Characteristics of cloud computing, Components and Organizational scenarios of clouds, Administering and Monitoring cloud services, Benefits and Limitations of cloud computing, Deploy application over cloud: Cloud computing technology, Accessing the cloud, Cloud Applications, Migrating to the Cloud, Software Licenses, Cloud Cost Model, Service Levels for Cloud Applications.	08
3	**Web Services and Platforms:-** Service Models, Software-as-a-Service, Platform-as-a-Service, Infrastructure -as-a-Service, Process-as-a-Service, Application-as-a-Service, Storage-as-a-Service, Information-as-a-Service, Integration-as-a-Service, Security-as-a-Service, Management/Governance-as-a-Service, Testing-as-a-Service, Comparison among IAAS, PAAS, SAAS Cloud computing platforms	08
4	**Cloud Disaster Management:-** Cloud Disaster Management, Disaster Recovery, Disaster Recovery Planning, Benefits of a cloud Disaster Recovery service, Disaster Recovery as a Cloud Service, Cloud data Centers, Comparing approaches	08

Text Books:
1. Cloud Computing Dr.Pandey U.S. & Dr. Chaudhary Kavita S. Chand Publishing.
2. Cloud Computing Miller Pearson Education India.
Reference Books:
1. Learning Amazon Web **Services** (AWS): A Hands-On Guide to the Fundamentals of AWS CloudMark Wilkins-First Edition.
2."Handbook of cloud computing" by Borko Furht, Armando Escalante published by springer(2010)

Syllabus
Semester-VI

Course code: ITH41MML306	**Course name:** Drone Technology
Course category: Major Mandatory	

Credits: 2	**Teaching Scheme:** L-2 P-0	**Evaluation Scheme:** CA-30 ESE-20

Pre-requisites: Knowledge of Networking, peripheral devices and sensors.

Course Objectives:

To familiarize the students with the concepts and techniques used in design of a small drones and its applications.

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

CO1: Learn about the various types of Drones and its applications.

CO2: Learn about the various components of drone design

CO3: Design basic types of drone systems.

CO4: Develop a Drone mechanism for specific applications

Contents -

Unit	Content	Teaching hours
1	**Introduction to Drones:** Definition and history of drones, Types of drones, Drone components and terminology, Regulations and Guidelines for drone usage. Drone technology impact on the businesses- Drone business through entrepreneurship- Opportunities/applications for entrepreneurship and employ ability, Basics of Aero Dynamics Drone Design and Assembly: Design considerations for drone airframe and propulsion systems, Selecting and assembling drone components such as motors, batteries, flight controllers, and cameras, Basic wiring and soldering techniques.	10
2	**Drone Flying and Operations:** Concept of operation for drone -Flight modes- Operate a small drone in a controlled environment- Drone controls Flight operations –management tool –Sensors-Onboard storage capacity - Removable storage-devices- Linked mobile devices and applications Drone Motors: Working, Types: Brush and Brushless Motors, motor sizing and identification, mounting patterns and thread size, Thrust to Weight ratio, KV ratings, advanced motor selection.	10
3	**Future Drones and Safety:** The safety risks- Guidelines to fly safely - Specific aviation regulation and standardization- Drone license- Miniaturization of drones- Increasing autonomy of drones -The use of drones in swarms Applications of Drone: Overview of commercial and industrial drone applications, Case studies and examples of successful drone deployments, GPS based navigation system, Drone Camera Systems, Agro application, Drone Delivery, Drones in inspection of transmission lines and power distribution -Drones in filming and panoramic picturing. Future trends and developments in the drone industry.	10

Reference Books:
1. Practical Drones: Building, Programming, and Applications E. Tooley Apress, 2021.
2. Getting Started with Drone: How to Build, Fly, and Program Your Own Drone D. McLeod Apress, 2019

Syllabus
Semester-VI

Course code: ITH41MMP303	Course name: Practical Based on Data Analytics
Course category: Major Mandatory	

Credits: 1	Teaching Scheme: L-0 P-2	Evaluation Scheme: CA-30 ESE-20

Pre-requisites: Basics of Programming and Data Science Applications.

Course Objectives: The objective of this course is to provide comprehensive knowledge of python programming paradigms and Data Analytics.

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

CO1: Learn User interface. Course Outcomes: At the end of the course, the students will be able to –

CO2: Demonstrate the use of built-in objects of Python

CO3: Demonstrate significant experience with python program development environment

CO4: Implement numerical programming, data handling and visualization through NumPy modul

Content -

Sr.no.	Description of Practical	Practical Hours
1	Demonstrate usage of branching and looping statements	2
2	Demonstrate Recursive functions and Demonstrate Lists	2
3	Demonstrate Tuples and Sets	2
4	Data Analytics Using Numpy.	2
5	Demonstrate handling of missing data.	2
6	Demonstrate hierarchical indexing.	2
7	Data Manipulation With Pandas.	2
8	Visualization And Matplotlib	2
9	Demonstrate Scatter Plot	2
10	Demonstrate 3D plotting	2
11	Project	10

Reference Books :
1. Python Data Science Handbook - Essential Tools for Working with Data
2. Jake VanderPlas O'Reily Media Inc., 2016.

Syllabus
<u>Semester-VI</u>

Course code: ITH41MMP304	**Course name:** Practical Based on Cloud Computing
Course category: Major Mandatory	

Credits: 1	**Teaching Scheme:** L-0 P-2	**Evaluation Scheme:** CA-30 ESE-20

Pre-requisites: Basic Knowledge of networking & Operating system.

Course Objectives:

Understanding basics of cloud computing and Key concepts of Cloud Analytics and different cloud computing services.

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

CO1: Understand Cloud Computing Basics

CO2: Understand the use of Cloud Computing in Data Analytics

Content -

Sr.no.	Description of Practical	Practical Hours
1	Install Virtual box/VMware Workstation with different flavors of Linux or windows Operating System	2
2	Install a C compiler in the virtual machine created using virtual box and execute Simple Programs	2
3	Install Google App Engine. Create hello world app and other simple web applications using python/java.	2
4	Use Google App Engine launcher to launch the web applications.	2
5	Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim	2
6	Find a procedure to transfer the Text files from one virtual machine to another virtual machine	2
7	Find a procedure to transfer the Image files from one virtual machine to another virtual machine	2
8	Find a procedure to transfer the Video files from one virtual machine to another virtual machine	2
9	Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)	2
10	Install Hadoop single node cluster and run simple applications like wordcount.	2
11	Project	10

Reference Books:
1. Cloud Computing Dr.Pandey U.S. & Dr. Chaudhary Kavita S. Chand Publishing
2**.** Cloud Computing Miller Pearson Education India.
3**.** Learning Amazon Web Services (AWS): A Hands-On Guide to the Fundamentals of AWS Cloud Mark Wilkins-First Edition.

Syllabus
Semester-VI

Course code: ITH41MEL303		Course name: PHP
Course category: Major Elective		
Credits: 3	Teaching Scheme: L-3 P-0	Evaluation Scheme: CA-60 ESE-40
Pre-requisites: Basic of knowledge of programming language.		
Course Objectives:		
The objective of this course is to provide the necessary knowledge to design and develop dynamic, database-driven web applications using PHP.		
Course Outcomes: At the end of the course, the students will be able to - Understand the server side programming language.		
CO1: Create PHP programs that use various PHP library functions, And that manipulates the Web-site.		
CO2: Understand the Form Handling in PHP.		
CO3: Understanding to the database connectivity.		
CO4: Understanding different type's displays and tracking. Basics of Visualization.		

Contents -

Unit	Content	Teaching hours
1	**Introduction to PHP:** Evaluation of PHP, Basic Syntax, Defining variable and constant, PHP Data type, Operator and Expression, Decisions and loop Making Decisions, Doing Repetitive task with looping, Mixing Decisions and looping with Html, Function :What is a function, Define a function, Call by value and Call by reference, Recursive function, Library function, Concept of String.	09
2	**Array :** Anatomy of an Array, Creating index based and Associative array Accessing array, Element Looping with Index based array, Looping with associative array using each () and foreach(), Some useful Library function. Handling Html Form with PHP :GET & POST Method, Capturing Form, Data Dealing with Multi-value filed, and Generating File uploaded form, redirecting a form after submission.	09
3	**PHP Include and Require Working with file in PHP :** Directories Understanding file& directory, Opening and closing, a file, Coping, renaming and deleting a file, working with directories, Creating and deleting folder, File Uploading & Downloading.Session and Cookie: Introduction to Session Control, Session Functionality What is a Cookie, Setting Cookies with PHP. Using Cookies with Sessions, Deleting Cookies, Registering Session variables, Destroying the variables and Session.	09
4	**Database Connectivity with MySQL**: Introduction to DBMS, Connection with MySQL Database, Performing basic database operation (DML) (Insert, Delete, Update, Select), Setting query parameter, Executing query Join (Cross joins, Inner joins, Outer Joins, Self joins.)	09
5	**Exception Handling Understanding**: Exception and error, Try, catch, throw. Error tracking and debugging	05

Text Book :
1. Learning PHP and MySQL Michele E. Davis, Jon A. Phillips
2. Beginning PHP and MySQL W Jason Gilmore Build Your Own Database Driven
3. Web Site Using PHP & MySQL Kevin Yank.
Reference Books:
1. Virtual and Augmented Reality (VR/AR), Bernhard Jung, Paul Grimm, Ralf Doerner, Wolfgang Broll 2022.

Syllabus
Semester-VI

Course code: ITH41MEL304	Course name: UI / UX
Course category: Major Elective	
Credits: 3 **Teaching Scheme:** L-3 P-0	**Evaluation Scheme:** CA-60 ESE-40
Pre-requisites: Basic knowledge of Graphic Design & Design Principals	
Course Objectives:	
The basic objective of User Experience & User Interface Design is to Design user friendly simple, functional website And Mobile Apps.	
Course Outcomes: At the end of the course, the students will be able to –	
CO1: Understand the concept of User Experience Design, solve problems using UX Techniques, Structure and manage the User Requirements for Projects.	
CO2: Learn to create personas, journey maps, Empathy map, and wireframes.	
CO3: Students efficiently use Design principles when design user interface for websites or mobile apps.	
CO4: Create Mockup design for mobile apps.	

Contents -

Unit	Content	Teaching hours
1	**Basics of User Experience Design** Define User Experience Design, UXD Myths, Need of User Experience Design, Definition, Advantages of UXD, UXD Strategy, Principals of UXD, Project Objective and Approach, Business Requirements, UXD Elements, characteristics of UXD, UX Laws.	10
2	**Research Using UX Process** Design thinking phases, Exploring the problem, generating ideas, Refining solution, Empathy map, User Research: User interviews, contextual inquiry, survey, focus group, card sorting, research techniques, personas: what are Personas, why create personas, finding information for personas.	10
3	**Generating Ideas and Content Management** Better Deliverables, Defining to Design, Information Architecture, Wireframing, Sitemaps, Grids and Layouts, user flow diagram, Prototyping, wireframe vs Prototype, Usability Testing, Feedback.	10
4	**The Importance & Principals of User Interface** Defining the User Interface, Importance of good design, Graphical User Interface, difference between UI and UX, Screen Design, color theory, Design Principals: Typography, Imagery, Emphasis, Balance, Alignment, Contrast, Repetition, color, space, Proximity, Hierarchy, Naturalness, Consistency, Friendliness, Clarity, Interaction, Transparency.	10
5	**Elements of User Interface Design** Input controls, Informational Components, other components, Interaction Design, Color Psychology, Mobile-first design approach, Flexible grids and responsive design, media queries.	05

Text Book :
1. A Project Guide to UX Design by Russ Unger and Carolyn Chandler, Second Edition New Riders publication.
2. The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques, Wilbert O. Galitz, third edition WILEY publication.
3. Design Thinking for Dummies by Christian Muller-Roterberg , Wiley publication.
Reference Books:
1. The UX Design Field Book, Doug Collins, 2022.
2. UI/UX Design Basics and Fundamentals, John RICHARDS, Independently Published, 2018

Syllabus
Semester-VI

Course code: ITH41MEP303	**Course name:** Practical Based on PHP

Course category: Major Elective

Credits: 1	**Teaching Scheme:** L-0 P-2	**Evaluation Scheme:** CA-30 ESE-20

Pre-requisites: Basic Knowledge of Simulation.
Course Objectives:
Basic of knowledge of programming language
Course Outcomes: At the end of the course, the students will be able to –
CO 1: Understand the server side programming language.
CO 2: Create PHP programs that use various PHP library functions and that manipulates the Web-site.
CO 3: Understand the Form Handling in PHP.
CO 4: Understanding to the database connectivity.

Contents -

Sr. No	Description of Practical	Practical Hours
1	Program to Compute the Sum of Individual Digits of a Number	2
2	Script to Determine Whether a Number is Odd or Even	2
3	Implementation to Check if a Given Number is Prime	2
4	Code to Calculate the Factorial of a Number	2
5	Program to Verify if a Number is a Palindrome	2
6	Script to Generate the Fibonacci Series Without Recursion	2
7	Program to Generate the Fibonacci Series Using Recursion	2
8	Code to Reverse a Given Number	2
9	Program to Display the Multiplication Table of a Number	2
10	Script to Swap Two Numbers (With and Without Using a Third Variable)	2
11	Implementation to Determine if a Given Year is a Leap Year	2
12	Based Registration Form Using HTML and Basic PHP Processing	2
13	Registration Form with Session and Cookies Management	2
14	Program to Compute the Sum of Individual Digits of a Number	2
15	Script to Determine Whether a Number is Odd or Even	2

Text Books :
1. Learning PHP and MySQL Michele E. Davis, Jon A. Phillips
2. Beginning PHP and MySQL W Jason Gilmore Build Your Own Database Driven
3. Web Site Using PHP & MySQL Kevin Yank.
Reference Books:
1. Virtual and Augmented Reality (VR/AR), Bernhard Jung, Paul Grimm, Ralf Doerner, Wolfgang Broll 2022

Syllabus
Semester-VI

Course code: ITH41MEP304	**Course name:** Practical Based on UI/UX

Course category: Major Elective

Credits: 1   **Teaching Scheme:** L-0 P-2   **Evaluation Scheme:** CA-30 ESE-20

Pre-requisites: Basic Knowledge of Graphic Design.

Course Objectives:

Create Empathy map, User Persona and journey map for user research design user friendly simple, functional website And Mobile Apps.

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

CO1: Create empathy map for understanding user requirements

CO2: Design user persona and journey map for product information.

CO3: Draw information architecture and wireframe for organizing and presenting information.

CO4: Design mobile app screen.

Contents -

Sr.no.	Description of Practical	Practical Hours
1	Write five features of any mobile app.	2
2	Design Empathy map for Coffee shop app.	2
3	Write User Persona for Designing E-Commerce Website.	2
4	Write Journey Map for Traveling app.	2
5	Create wireframe structure for Music app.	2
6	Create Information Architecture for E-Commerce Website.	2
7	Design mobile app screens for educational website.	2
8	Design animated screens for app journey information.	2
9	Design animated slideshow for app features.	2
10	Design text animation for app feature.	2
11	Project.	10

Text Books :

1. A Project Guide to UX Design by Russ Unger and Carolyn Chandler, Second Edition New Riders publication.

2. The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques, Wilbert O. Galitz, third edition WILEY publication.

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Reference Books:

1. UI/UX Design Basics and Fundamentals, John RICHARDS, Independently Published, 2018