Curriculum Structure for B. Tech. Information Technology Programme

(In light of NEP 2020)

NCrF Level 6

For students admitted in 2023-24 onwards

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

Near Kathora Naka, Amravati, Maharashtra

PIN 444 604

www.gcoea.ac.in

Structure for B. Tech. Programme In light of NEP 2020

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For students admitted in 2023-24 onwards

Key Features of Curriculum

1. Multiple entry and exit option after every year.

2. Provision for Open Electives (OE), Vocational and Skill Enhancement Courses (VSE), Ability Enhancement Courses (AE), Indian Knowledge System (IKS), Value Education Courses (VE), Co-Curricular Courses (CC) in addition to program core courses.

3. Mandatory internship of one semester.

4. Credits for Value education courses, Ability Enhancement Courses, Co-Curricular Curricular Activities.

5. Mandatory Non-Credit Courses.

6. Interdisciplinary and multidisciplinary education through single and double minors and open electives.

7. Skill based courses and multiple exit level.

8. Provision for learning in online mode through Swayam/ NPTEL etc courses

9. Provision for B.Tech. Honours with Research degree through research project.

10. Opportunity for learner to choose courses of their interest in all disciplines.

11. Provision of Skill Based Courses and internship/Field project/mini projects for exit options at each level.

12. Flexibility for all types of learners i.e. Good, Normal and Exit

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Good Students	Normal Students	Exit
B. Tech. Major with Multidisciplinary Minor	B. Tech. Major with Multidisciplinary Minor	Additional 08 credits in the form of skill-based courses / labs, internship, mini projects shall be offered in 8 weeks.
B. Tech. Honors and Multidisciplinary Minor	--	
B. Tech. Honors with Research and Multidisciplinary Minor	--	
B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	--	

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Credit Distribution for each year and Exit Option

NCrFLevel	Year / Semester	Exit Option	Credits	Additional Credits for exit students	Total Credits
4.5	Semester I & II	U. G. Certificate	43	08	51
5.0	Semester III & IV	U. G. Diploma	88	08	96
5.5	Semester V & VI	B. Vocational/B.Sc. Engg.	127	08	135
6.0	Semester VII & VIII	B. Tech. Major with Multidisciplinary Minor	167	--	167
		B. Tech. Honors and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. Honors with Research and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	167+18=185	--	185

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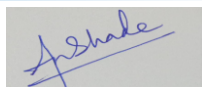*(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)*

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Course Category-wise Credit Distribution

Course Category	As per NEP GR	GCOEA Credits	CC	As per NEP GR	GCOEA Credits
BSC/ESC	30	30	BS	14-18	18
			ES	16--12	12
Program Courses	64-76	67	PC	44-56	47
			PE	20	20
Multidisciplinary Courses	22	22	MM	14	14
			OE	8	8
Skill Courses	8	8	VSE	8	8
Humanities, Social Science & Management (HSSM)	14	14	AE	4	4
			EM	4	4
			IKS	2	2
			VE	4	4
Experiential Courses	22	22	RM	4	4
			FP	2	2
			PR	4	4
			IN/OJT	12	12
Liberal Learning Courses	4	4	CC	4	4
Total Credits	**164-176**	**167**		**164-176**	**167**

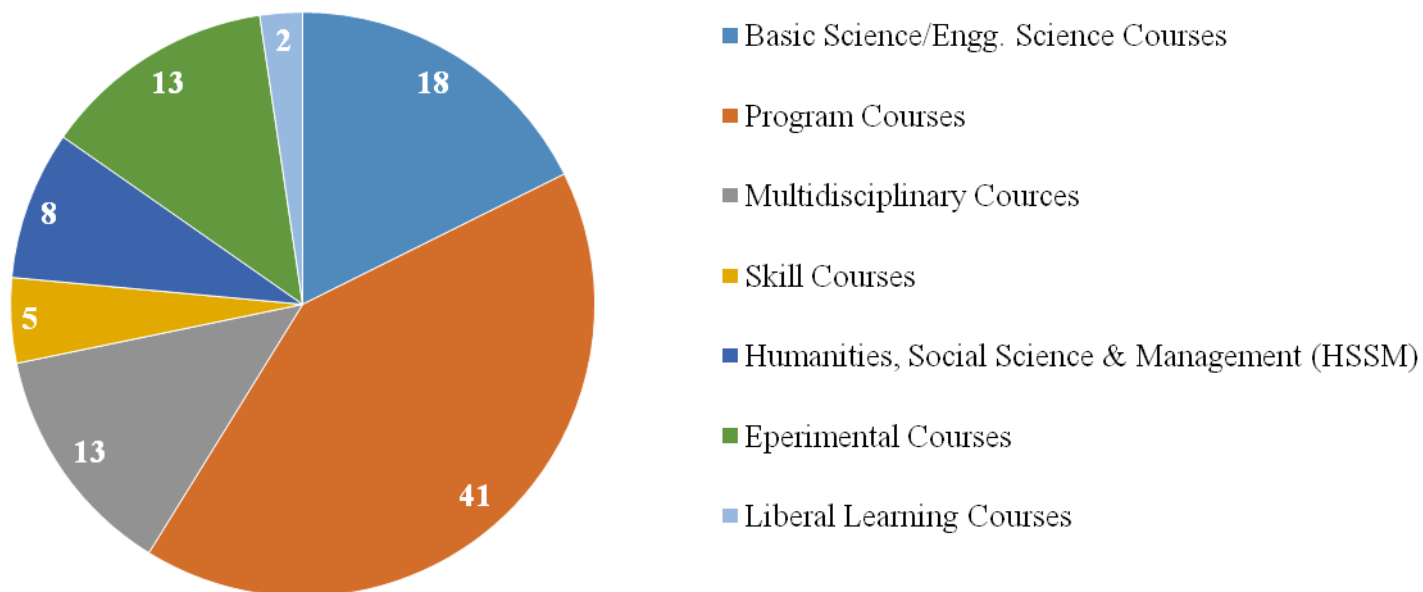Sign
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Broad Course Category Framewok Credits Percentage

Pie chart values:
- Basic Science/Engg. Science Courses — 18
- Program Courses — 41
- Multidisciplinary Cources — 13
- Skill Courses — 5
- Humanities, Social Science & Management (HSSM) — 8
- Eperimental Courses — 13
- Liberal Learning Courses — 2

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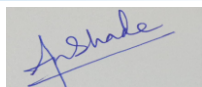*(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)*

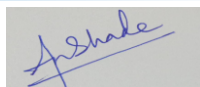Page 6 / 81

Course Category Credits
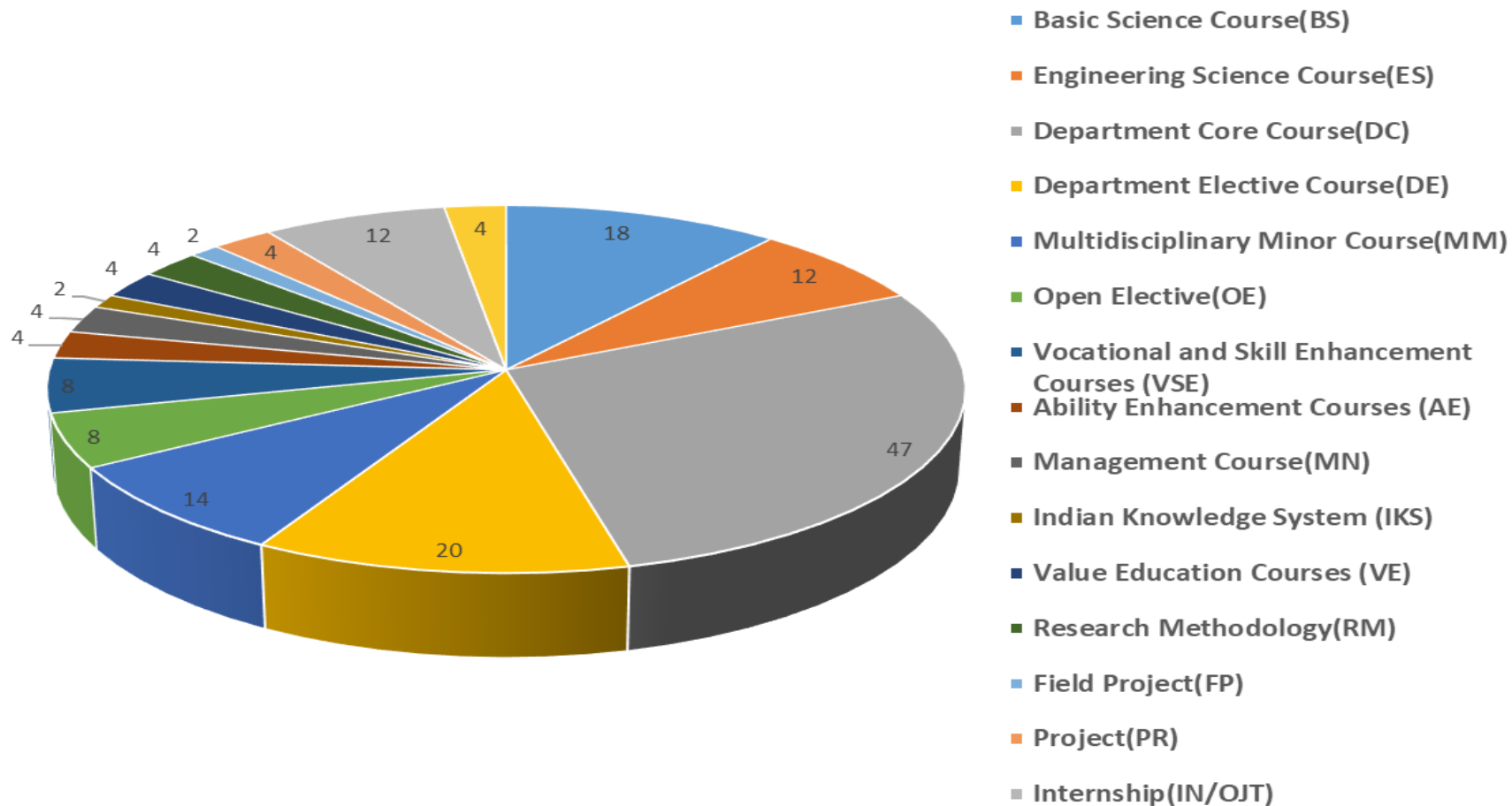
Legend:
- Basic Science Course(BS)
- Engineering Science Course(ES)
- Department Core Course(DC)
- Department Elective Course(DE)
- Multidisciplinary Minor Course(MM)
- Open Elective(OE)
- Vocational and Skill Enhancement Courses (VSE)
- Ability Enhancement Courses (AE)
- Management Course(MN)
- Indian Knowledge System (IKS)
- Value Education Courses (VE)
- Research Methodology(RM)
- Field Project(FP)
- Project(PR)
- Internship(IN/OJT)

Values shown on chart: 18, 12, 47, 20, 14, 8, 8, 4, 4, 2, 4, 4, 2, 4, 12, 4

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Semester-wise Credit Distribution

Sr. No.	SEM	I	II	III	IV	V	VI	VII	VIII	Total Credits	NEP Requirement
1	Basic Science Course (BS)	8	7	3						18	14-18
2	Engineering Science Course (ES)	8	4							12	12-16
3	Program Core Course (PC)		6	13	13	9	3	3		47	44-56
4	Program Elective Course (PE)					4	8	8		20	20
5	Multidisciplinary Minor Course (MM)			3	3	3	3	2		14	14
6	Open Elective Course (OE)				3	3		2		8	8
7	Vocational & Skill Enhancement Course (VSE)			2	2	1	1	2		8	8
8	Ability Enhancement Course (AE)	1	3							4	4
9	Entrepreneurship / Management Courses (EM)			1					3	4	4
10	Indian Knowledge System (IKS)	2								2	2
11	Value Education Course (VE)	2	2							4	4
12	Research Methodology (RM)							4		4	4
13	Field Project (FP)						2			2	2
14	Project (PR)							4		4	4
15	Internship (IN)								12	12	12
16	Co-Curricular Course (CC)				2	2				4	4
	Total Credits	**21**	**22**	**22**	**23**	**22**	**17**	**21**	**19**	**167**	164-176

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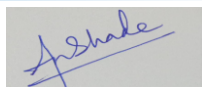
General Instructions:

(1) 10% content of syllabus of each theory course shall be completed by the students with self-study. The 10% portion of each course (for self-study) shall
 be declared by concerned course-coordinator at the beginning of teaching of the course.

(2) Student can complete **any Course** or programme elective coursesPE1 to PE5 in "online" mode, offered through SWAYAM/ NPTEL portal or equivalent platform which provides Evaluation Mechanism with the permission of Departmental Faculty Board (DFB). In this case –

(i) Students can register and complete these online courses any time after beginning of third semester, however, the student must successfully complete and pass the course, and submit the score card/certificate before declaration of result of respective semester in which the course is being offered.

(ii) In case, if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute in respective semester as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc) of the course, and successfully complete the course.

(3) In eighth semester, the students have to complete mandatory internship of one semester in the company/ organization approved by the DFB.

(4) In eighth semester during internship, the students have to complete the theory courses in any one of the two modes:
(i) **Online courses** offered through SWAYAM/ NPTEL or equivalent platform which provides Evaluation mechanism with the permission of DFB: In this case, students can register and complete these online courses any time after beginning of third semester and complete the course and submit the score card/ certificate before declaration of result of eighth semester.
 In case if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc) of the course personally as per the schedule declared by the institute, and successfully complete the course.

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(ii) **Self-study mode:** In this case the student will have to study the course offered by the institute of his/her own. The student shall appear for all the college assessments/ examinations (CT1/CT2, TA and ESE) personally as per the schedule declared by the instituteand successfully complete the course.

(5) In addition to program specific courses, the students have to complete vocational skill courses, internship, field projects connected to **major degree**.

(6) Exit Option: The exit option at the end of each year will be available to students after even semester. e. 2nd semester, 4th semester &6th semester and will commence from AY 2024-25 for UG Certificate, AY 2025-26 for UG Diploma, AY 2026-27 for B. Voc./B. Sc. Engineering degree.

(7) Students opting for exit at any level (after odd semesters or even semester) will have to earn additional eight credits before exit in skill based vocational courses and internship/apprenticeship/mini project to make them eligible to get UG certificate / UG Diploma or B. Voc./B. Sc. Engineering degree as per eligibility.

(8) Re Entry and Lateral Entry: Students opting for exit at any level after even semester, will have the option to re-enter the programme from where they left off in odd semesters within **four years of exit.** There shall be a gap of at least **one year** between exit and re-entry to UG programme.

(9) Students opting for exit after odd semester, i.e. 1st, 3rd, 5th or 7th semester will have the option to re-enter the programme from where they left off in even semesters only. There shall be a gap of at least **one year** between exit and re-entry to UG programme.

(10) Maximum period for completion of B. Tech. programme:
The student has to complete the degree programme within the stipulated **maximum period of eight years** from the date of admission to first year UG. The maximum duration of the programme includes the period of exit, withdrawal, absence and different kinds of leaves permissible to a student but it shall exclude the period of rustication of the student from the institute. However, genuine cases on confirmation of valid reasons may be referred to Academic Council for extending this limit by **additional one year**.

(11) Eligibility for admission to the UG Bachelor's Degree with Honours/ Research/Double Minor:
Students with minimum **CGPA of 7.5** without backlog courses at the end of fourth semester and should have earned 84 **credits** are eligible for admission to the UG Bachelor's Degree with Honours/ Research/ Double Minor.

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Multiple exits: Following options are available for multiple exists:

Option	NCrF Level	Qualification Title	Additional credit requirement	Bridge courses
Exit-1	4.5	One year UG certificate course in Engg/Tech	8	2 Month Internship **OR** Online Two skill courses at ITI Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project
Exit-2	5.0	Two year UG Diploma I Engg/Tech	8	2 Month Internship **OR** Online Two skill courses at Diploma Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project
Exit-3	5.5	Three year Bachelor Degree in Vocation (B.Voc) or B.Sc. (Engg./Tech)	8	2 Month Internship **OR** Online Two skill courses at Degree Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project

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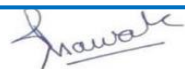Member Secretary

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			SEMESTER –III											
Category	**Course Code**	**Name of the Course**	**Teaching Scheme**				**Evaluation Scheme**						**Total**	**Credits**
											Practical			
			TH	**TU**	**PR**	**Total**	**CT-1**	**CT-2**	**TA**	**ESE**	**ICA**	**ESE**		
BS5	SH1301E/SH1302B	Transform & Statistical Methods	3	-	-	3	15	15	10	60	-	-	100	3
MM1	IT1315/IT1316	Multidisciplinary Minor-1	3	-	-	3	15	15	10	60	-	-	100	3
PC3	IT1301	Data Structure & Algorithms	3	-	-	3	15	15	10	60	-	-	100	3
PC4	IT1302	Computer Organization & Architecture	3	-	-	3	15	15	10	60	-	-	100	3
PC5	IT1303	Digital Logic Design	3	-	-	3	15	15	10	60	-	-	100	3
PC6	IT1304	Object Oriented Technology	3	-	-	3	15	15	10	60	-	-	100	3
PC7	IT1305	Object Oriented Technology Lab	-	-	2	2	-	-	-	-	25	25	50	1
VSE1	IT1306	Data Structure & Algorithms Lab	-	-	2	2	-	-	-	-	25	25	50	1
VSE2	IT1307	Digital Logic Design Lab	-	-	2	2	-	-	-	-	25	25	50	1
EM1	IT1310	Idea Lab	-	-	2	2	-	-	-	-	50	-	50	1
Total			**18**	**0**	**8**	**26**	**90**	**90**	**60**	**360**	**125**	**75**	**800**	**22**

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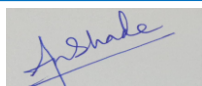*(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)*

@ Based on seminar, Internship Report, Internship/ Project evaluation

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Total	Credits
							Theory				Practical			
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
MM2	IT1415/ IT1416	Multidisciplinary Minor-2	3	-	-	3	15	15	10	60	-	-	100	3
PC8	IT1401	Design & Analysis of Algorithms	3	-	-	3	15	15	10	60	-	-	100	3
PC9	IT1402	Operating Systems	3	-	-	3	15	15	10	60	-	-	100	3
PC10	IT1403	Database Management Systems	3	-	-	3	15	15	10	60	-	-	100	3
PC11	IT1404	Computer Network	3	-	-	3	15	15	10	60	-	-	100	3
VSE3	IT1405	Computer Network Lab	-	-	2	2	-	-	-	-	25	25	50	1
OE1	SH1401	Open Elective 1	3	-		3	15	15	10	60	-	-	100	3
PC12	IT1406	Operating Systems Lab	-	-	2	2	-	-	-	-	25	25	50	1
VSE4	IT1407	Database Management Systems Lab	-	-	2	2	-	-	-	-	25	25	50	1
CC1	SH1402	Co-curricular Course	-	-	4	4	-	-	20	-	-	-	20	2
Total			**18**	**-**	**10**	**28**	**75**	**75**	**70**	**300**	**75**	**75**	**770**	**23**

SEMESTER –IV

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Co-Curricular Course: Active Participation in Activities such as: Sports, Tech-fest, College Club Activity, University level /college level cultural activities, Drama, painting, annual day, department student's association/IE/ISTE, paper presentation, foreign language certificate, NCC etc
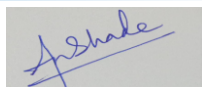
Co-Curricular Course Activities minimum hours: 2 hours per week or 24 hours

Category	Course Code	Name of the Course @	Teaching Scheme				Evaluation Scheme						Total	Credits
							Theory				Practical			
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
EXIT CRITERIA FOR U. G. DIPLOMA														
EX2	IT1411	Certified Multimedia Developer (level 3)	-	-	8	8	-	-	-	-	50	-	50	4
EX2	IT1412	Certified Office Automation and IT Assistant	-	-	8	8	-	-	-	-	50	-	50	4
OR														
EX2	IT1413	Internship / Technical Project	-	-	16	16	-	-	-	-	100@	-	100	-

@ Based on seminar, Internship Report, Internship/ Project evaluation

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Equivalence Scheme

Programme Name:-B. Tech. Information Technology

S N.	Course code with Name of course(NEW) (NEP Version-II)			Course code with Name of course (old) Revised Curriculum 2019-20		
1	**Code**	**Name**	**Credit**	**Code**	**Name**	**Credit**
2	SH1301	Mathematics 3	3	SHU321B *SHU322B	Transform and Linear Algebra Differential Equation and Transform	3
3	**IT1315**	**Multidisciplinary Minor**	**3**		**Newly added**	
4	IT1301	Data Structure & Algorithms	3	ITU322	Data Structure & Algorithms	4
5	IT1302	Computer Organization & Architecture	3	ITU321	Computer Organization & Architecture	3
6	IT1303	Digital Logic Design	3	ITU323	Digital Logic Design	3
7	IT1304	Object Oriented Technology	3		Newly added	
8	IT1305	Object Oriented Technology Lab	1	ITU326	Object Oriented Technology Lab	4
9	IT1306	Data Structure & Algorithms Lab	1	ITU324	Data Structure & Algorithms Lab	1
10	IT1307	Digital Logic Design Lab	1	ITU325	Digital Logic Design Lab	1
11	IT1310	Idea Lab	1		**Newly added**	
12		**No Equivalence**		SHU323	Introduction to Constitution of India	-
13		**No Equivalence**		SHU324	Effective Technical Communication	3
14	IT1401	Design & Analysis of Algorithms	3	ITU424	Design & Analysis of Algorithms	3
15	IT1402	Operating Systems	3	ITU423	Operating System	3
16	IT1403	Database Management Systems	3	ITU422	Database Management Systems	3
17	IT1404	Computer Network	3	ITU522	Computer Network	3
18	IT1405	Computer Network Lab	1	ITU527	Computer Network Lab	1
19	IT1223	Discrete Mathematics	3	ITU421	Discrete Mathematics	4
20	SH1401	Open Elective 1	3		Newly added	
21	IT1407	Operating Systems Lab	1	ITU427	Operating System Lab	1

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22	IT1408	Database Management Systems Lab	1	ITU426	Database Management Systems Lab	1
23	SH1402	Co-curricular Course	2		Newly added	
24	IT1411	Certified Multimedia Developer(level 3)	4		Newly added	
25	IT1412	Certified Office Automation and IT Assistant	4		Newly added	
26	IT1413	Internship / Technical Project	8		Newly added	
27	IT1415	**Multidisciplinary Minor**	3		Newly added	
28		**No Equivalence**		ITU425	Organizational Behavior	3
29		**No Equivalence**		ITU428	Design & Analysis of Algorithms Lab	1
30	IT1222	Python Programming Lab	1	ITU429	Python Programming Lab	2
31		**No Equivalence**		SHU422	Environmental Studies	-
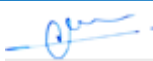
LIST OF OPEN ELECTIVE COURSES		
OE-I	**OE-II**	**OE-III**
Appreciating Indian Music	**Environmental law**	**Operational Research**
Introduction to Human Psychology	**Cyber law**	**Digital Marketing**
Nanotechnology, Science and Application	**Introduction to Mass Communication**	**Biology for Engineers**
Introduction to Exercise Physiology & Sports Performance	**Foreign Language Japanese (N5) / German (A1)**	**Foreign Language Japanese(N4) /German(A2)**
SWAYAM/NPTEL https://onlinecourses.nptel.ac.in/noc22_hs57/preview https://onlinecourses.nptel.ac.in/noc24_hs39/preview https://onlinecourses.nptel.ac.in/noc19_mm21/preview https://onlinecourses.nptel.ac.in/noc24_hs86/preview	**SWAYAM/NPTEL**	**SWAYAM/NPTEL**

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SEMESTER –V

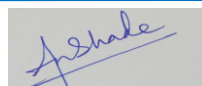| Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Total	Credits
							Theory				Practical			
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
MM3	IT1515/ IT1516	Multidisciplinary Minor-3	3	--	--	3	15	15	10	60	--	--	100	3
PC13	IT1501	Internet of Things	3	--	--	3	15	15	10	60	--	--	100	3
PC14	IT1502	Formal languages & Automata Theory	2	--	--	2	15	15	10	60	--	--	100	2
PC15	IT1503	Artificial Intelligence	3	--	--	3	15	15	10	60	--	--	100	3
PE1	IT1504	Program Elective 1	3	--	--	3	15	15	10	60	--	--	100	3
OE2	SH1501	Open Elective 2	3	--		3	15	15	10	60	--	--	100	3
PC16	IT1505	Artificial Intelligence Lab	--	--	2	2	--	--	--	--	25	25	50	1
VSE5	IT1506	Internet of Things Lab	--	--	2	2	--	--	--	--	25	25	50	1
PE2	IT1507	Program Elective 1 Lab	--	--	2	2	--	--	--	--	25	25	50	1
CC2	SH1502	Co-curricular Course	--		4	4	--	--	20	--	--	--	20	2
MNC2	SH1503	Soft Skills	2			2			20		--	--	20	0
Total			**19**		**10**	**29**	**90**	**90**	**100**	**360**	**75**	**75**	**790**	**22**

Co-Curricular Course: Active Participation in Activities such as: Sports, Tech-fest, College Club Activity, University level /college level cultural activities, annual day, department student's association/IE/ISTE, paper presentation, foreign language certificate, NCC etc **Co-Curricular Course Activities minimum hours :**:2 hours per week or 24 hours

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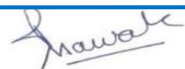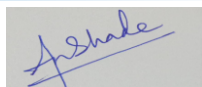*(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)*

ADDITIONAL CRITERIA FOR HONORS													
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Total	Credits
							Theory				Practical			
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	CT1	CT2	TA	ESE	ICA	ESE		
PEH1	IT1521	Program Elective for Honors 1 (Swayam/MOOCS/NPTEL/ Online) from Basket	3	-	-	3	15	15	10	60	-	-	100	3
PEH2	IT1522	Program Elective for Honors 2 (Swayam/MOOCS/NPTEL/ Online) from Basket	3	-	-	3	15	15	10	60	-	-	100	3
Total			6	-	-	6	30	30	20	120	-	-	200	**6**

ADDITIONAL CRITERIA FOR HONORS WITH RESEARCH													
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Total	Credits
							Theory				Practical			
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
PER1	IT1531	Research Project Stage 1	-	-	08	08	-	-	-	-	100	-	100	4
Total			-	-	08	08	-	-	-	-	100	-	100	4

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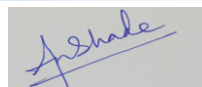*(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)*

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Total	Credits
							Theory				Practical			
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
ADDITIONAL CRITERIA FOR DOUBLE MINOR (SPECIALIZATION)														
MN1	IT1541	Minor Track Course 1 From Basket	3	-	-	3	15	15	10	60	-	-	100	3
MN2	IT1542	Minor Track Course 2 From Basket	3	-	-	3	15	15	10	60	-	-	100	3
		Total	6	-	-	6	30	30	20	120	-	-	200	6

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Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Total	Credits
							Theory				Practical			
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
MM4	IT1615/ IT1616	Multidisciplinary Minor-4	3	-	-	3	15	15	10	60	-	-	100	3
PC17	IT1601	Machine Learning	3	-	-	3	15	15	10	60	-	-	100	3
PE3	IT1602	Program Elective 2	3	-	-	3	15	15	10	60	-	-	100	3
PE4	IT1603	Program Elective 3	4	-	-	4	15	15	10	60	-	-	100	4
VSE6	IT1604	Machine Learning Lab	-	-	2	2	-	-	-	-	25	25	50	1
PE5	IT1605	Program Elective2 Lab	-	-	2	2	-	-	-	-	50		50	1
FP	IT1606	Minor Project	-	-	4	4	-	-	-	-	50		50	2
MNC3	IT1607	Entrepreneurship and Sustainable Development	2	-		2	15	15	20	-	-	-	50	0
MNC4	SH1601	NCC/NSS/Community Service etc.	-	-	-	-	-	-	20	-	-	-	-	0
		Total	15	-	8	23	75	75	80	240	125	25	600	17

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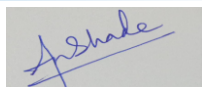*(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)*

Category	Course Code	Name of the Course @	Teaching Scheme				Evaluation Scheme						Total	Credits
							Theory				Practical			
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
EX3	IT1611	Data Analysis Assistant	-	-	8	8	-	-	-	-	50	-	50	4
EX3	IT1612	Cyber Security Assistant	-	-	8	8	-	-	-	-	50	-	50	4
OR														
EX3	IT1613	Internship / Technical Project	-	-	16	16	-	-	-	-	100@	-	100	8

@ Based on seminar, Internship Report, Internship/ Project evaluation

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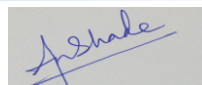*(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)*

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ADDITIONAL CRITERIA FOR HONORS														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Total	Credits
							Theory				Practical			
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
PEH3	IT1621	Program Elective for Honors 3 (Swayam/MOOCS/NPTEL/ Online) from Basket	3	-	-	3	15	15	10	60	-	-	100	3
PEH4	IT1622	Program Elective for Honors 4 (Swayam/MOOCS/NPTEL/ Online) from Basket	3	-	-	3	15	15	10	60	-	-	100	3
Total			6	-	-	6	30	30	20	120	-	-	200	6

ADDITIONAL CRITERIA FOR HONORS WITH RESEARCH														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Total	Credits
							Theory				Practical			
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
PER2	IT1631	Research Project Stage 2	-	-	12	12	-	-	-	-	100	100	200	6
Total			-	-	12	12	-	-	-	-	100	100	200	6

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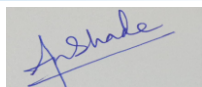| ADDITIONAL CRITERIA FOR DOUBLE MINOR (SPECIALIZATION)														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Total	Credits
							Theory				Practical				
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	CT1	CT2	TA	ESE	ICA	ESE			
MN3	IT1641	Minor Track Course 3 From Basket	3	-	-	3	15	15	10	60	-	-	100	3
MN4	IT1642	Minor Track Course 4 From Basket	3	-	-	3	15	15	10	60	-	-	100	3
		Total	6	-	-	6	30	30	20	120		-	200	6

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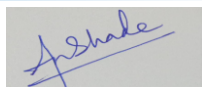*(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)*

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Equivalence Scheme Third Year

Programme Name : B. Tech. Information Technology

S N.	Course code with Name of course (NEW) (NEP Version-II)		Credit	Course code with Name of course (old) Revised Curriculum 2019-20		Credit
	Code	**Name**	**Credit**	**Code**	**Name**	**Credit**
1	IT1515	MDM-3 (Machine Learning Foundation)	3	ITU524	Machine Learning	3
2	IT1516	MDM-3 (Object Oriented Design & Programming)	3		Newly Added	
3	IT1501	Internet of Things	3	ITU525(C)	Internet of Things	3
4	IT1502	Formal Languages and Automata Theory	2	ITU523	Formal Languages & Automata Theory	4
5	IT1503	Artificial Intelligence	3	ITU622	Artificial Intelligence	4
6	IT1504	IT1504(A): Software Engineering	3	ITU521	Software Engineering	4
7		IT1504(B): Foundation of Cryptography	3		No Equivalence	
8		IT1504(C): Data Analytics	3	ITU721(A)	Data Analytics	3
9	IT1505	Artificial Intelligence Lab	1	ITU628	Artificial Intelligence Lab	2
10	IT1506	Internet of Things Lab	1		Newly Added	
11	IT1507	IT1507(A): Software Engineering Lab	1	ITU529	Software Engineering Lab	1
12		IT1507(B): Foundation of Cryptography Lab	1		Newly Added	
13		IT1507(C): Data Analytics Lab	1		Newly Added	
14	IT1615	MDM-4 (Fundamentals of Deep Learning)	3		Newly Added	
15	IT1616	MDM-4 (Software Testing)	3		Newly Added	
16	IT1601	Machine Learning	3	ITU524	Machine Learning	3

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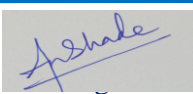*(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)*

17	IT1602	IT1602(A): Deep Learning	3		Newly Added	
18		IT1602(B): Wireless & Mobile Computing	3	ITU623	Wireless & Mobile Computing	3
19		IT1602(C): Cloud Computing	3	ITU625	Cloud Computing	3
20	IT1603	IT1603(A): Software Construction & Development Strategies	4		Newly Added	
21		IT1603(B): Network Architecture & Wireless Protocol	4	ITU624(A)	Network Architecture and Wireless Protocols	3
22		IT1603(C): Data Mining	4	ITU526	Data Warehousing &Data Mining	4
23	IT1604	Machine Learning Lab	1	ITU528	Machine Learning Lab	1
24	IT1605	IT1605(A): Deep Learning Lab	1		Newly Added	
25		IT1605(B): Wireless & Mobile Computing Lab	1		Newly Added	
26		IT1605(B): Cloud Computing Lab	1		Newly Added	
27	IT1606	Minor Project	2	ITU630	Minor Project	3
28	IT1607	Entrepreneurship and Sustainable Development	0		Newly added	
29	IT1404	Computer Network	3	ITU522	Computer Network	3
30		No Equivalence		ITU525(A)	Information Retrieval	3
31		No Equivalence		ITU525(B)	Parallel Architecture	3
32	IT1405	Computer Network Lab	1	ITU527	Computer Network Lab	1
33		No Equivalence		ITU530	Data Warehousing &Data Mining Lab	1
34		No Equivalence		ITU621	Geo Spatial Technologies	3
35		No Equivalence		ITU623(A)	Web Mining	3
36		No Equivalence		ITU623(A)	Parallel Programming	3
37		No Equivalence		ITU624(C)	Distributed Computing	3
38		No Equivalence		ITU633(A)	Computer Oriented Operation Research	3

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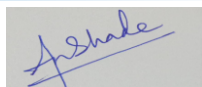*(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)*

39	IT1301	Data Structure & Algorithms	3	ITU633(B)	Introduction to Data Structures	3
40		No Equivalence		ITU627	Geo Spatial Technologies Lab	1
41		No Equivalence		ITU629	Web & Internet Technology Lab	2

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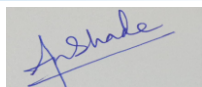
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Total	Credits
							Theory				Practical			
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
MM5	IT1715/ IT1716	Multidisciplinary Minor 5	-	-	4	4	-	-	-	-	50	50	100	2
PC18	IT1701	Cryptography & Network Security	3	-	-	3	15	15	10	60	-	-	100	3
PE6	IT1702	Program Elective 4	4	-	-	4	15	15	10	60	-	-	100	4
PE7	IT1703	Program Elective 5	4	-	-	4	15	15	10	60	-	-	100	4
OE3	SH1701	Open Elective 3	2	-	-	2	15	15	10	60	-	-	100	2
VSE7	IT1704	PE4 Lab	-	-	2	2	-	-	-	-	25	25	50	1
VSE8	IT1705	PE 5 Lab	-	-	2	2	-	-	-	-	25	25	50	1
PR	IT1706	Project	-	-	8	8	-	-	-	-	50	50	100	4
MNC4	IT1707	Engineering Economics and Finance	2	-	-	2	15	15	20	-	-	-	50	0
Total			**15**	**0**	**16**	**31**	**75**	**75**	**60**	**240**	**150**	**150**	**750**	**21**

SEMESTER –VII

Note: Project Guide Teaching load: 8 hrs/week

Students can register for the elective in seventh semester under Multidisciplinary Minor 4using **SWAYAM/NPTEL** etc. portal. Courses will be of completely student's choice but approved by DFB of concerned department (other than MM1 to MM3) and should be **at least of 12 weeks** including tutorials, which will be considered as **4 credit course**.

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Students can register and complete online courses for Multidisciplinary Minor 4any time after completion of semester IV, however, the student must successfully complete and pass the course, and submit the score card/certificate before declaration of result of VII th semester.

			Teaching Scheme				**Theory**				**Practical**		**Total**	**Credits**
ADDITIONAL CRITERIA FOR HONORS														
Category	**Course Code**	**Name of the Course**												
			TH	**TU**	**PR**	**Total**	**CT1**	**CT2**	**TA**	**ESE**	**ICA**	**ESE**		
PEH5	IT1721	Program Elective for Honors 1 (Swayam/MOOCS/NPTEL/ Online) from Basket	3	-	-	3	15	15	10	60	-	-	100	3
PEH6	IT1722	Program Elective for Honors 2 (Swayam/MOOCS/NPTEL/ Online) from Basket	3	-	-	3	15	15	10	60	-	-	100	3
Total			6	-	-	6	30	30	20	120	-	-	200	**6**

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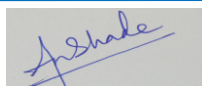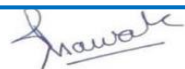*(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)*

ADDITIONAL CRITERIA FOR HONORS WITH RESEARCH													
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Total	Credits
							Theory				Practical			
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
PER3	IT1731	Research Project Stage 3	-	-	16	16	-	-	-	-	100	200	300	8
		Total	-	-	16	16	-	-	-	-	100	200	300	8
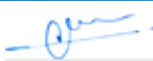
ADDITIONAL CRITERIA FOR DOUBLE MINOR (SPECIALIZATION)													
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Total	Credits
							Theory				Practical			
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
MN5	IT1741	Minor Track Course 5 From Basket	3	-	-	-	15	15	10	60	-	-	100	3
MN6	IT1742	Minor Track Course 6 From Basket	3	-	-	-	15	15	10	60	-	-	100	3
		Total	6	-	-	-	30	30	20	120	-	-	200	6

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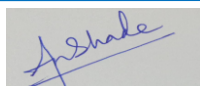*(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)*

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Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE	Total	
RM	SH1801	Research Methodology	4	-	-	4	15	15	10	60	-	-	100	4
EM2	IT1801	Entrepreneurship Management Course	3	-	-	3	15	15	10	60	-	-	100	3
IN	IT1802	Internship (Online reviews - one in each month)	-	-	-	-	-	-	-	-	100	200	300	12
		Total	7	0	0	7	30	30	20	120	100	200	500	19

SEMESTER –VIII

Note: Internship guide teaching load: 4 hours per week

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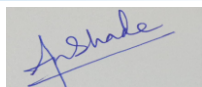*(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)*

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Program Electives for the V,VI,VII and VIII Semester

SWAYAM/NPTEL etc. portal. Courses for PE1 to PE5 should be related to concerned vertical approved by DFB and should be **at least of 12 weeks** including tutorials.

Tracks	Program elective I	Program elective II	Program elective III	Program elective IV	Program elective V
	Sem 5	Sem 6	Sem 6	Sem 7	Sem 7
Artificial Intelligence and Software Engineering	Software Engineering	Deep Learning	Software Construction and Development Strategy	Reinforcement Learning / Natural Speech & Language Processing	Software Project Management – Industry Perspective
Networking and Security	Foundation of Cryptography (NPTEL)	Wireless and Mobile Computing	Network Architecture & Wireless Protocol	Cyber Security	Blockchain & Its Applications (NPTEL)
Data Analytics	Data Analytics	Cloud computing	Data Mining	Social Media Analytics	Data Science

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LIST OF MULTIDICIPLINARY MINOR COURSES:

Sr No.	Offering Department	Name of Programme /Minor Course	Students from Department who can register
1	CSE	Data Science	CE,ME,EE,ENTC,INST
		Artificial Intelligence	CE,ME,EE,ENTC,INSTR
2	IT	Machine Learning	CE,ME,EE,ENTC,INST
		Software Engineering	CE,ME,EE,ENTC,INST
3	ENTC	IOT	CE,ME,EE,CSE,IT,INST
		Electronics and Telecommunication Engg.	CE,ME,EE,CSE,IT,INST
4	ME	Mechanical Engineering	CE,EE,ENTC,CSE,IT,INS
		Automation & Robotics	CE,EE,ENTC,CSE,IT,INS
		Industrial Management	ME,CE,ENTC,CSE,IT,EE,INST
5	CE	Building Technology	ME,EE,ENTC,CSE,IT,INST
		Business Economics	ME,EE,ENTC,CSE,IT,INST,CE
6	EE	Energy Engineering	ME,CE,ENTC,CSE,IT,INST
		Electrical Motors & Drives	ME,CE,ENTC,CSE,IT,INST
7	INST	Instrumentation and Control	ME,CE,ENTC,CSE,IT,EE
		Banking and Finance	ME,CE,ENTC,CSE,IT,EE,INST

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Name of Programme /Minor Course	Course Code	Civil Engineering		Mechanical Engineering			Electrical Engineering	
		Building Construction and Management (TRACK-I)	Business Economics (TRACK-II)	Mechanical Engineering (TRACK-I)	Automation & Robotics (TRACK-II)	Industrial Management (TRACK-III)	Energy Engineering(TRACK-I)	Electrical Motors & Drives (TRACK-II)
MinorCourse-1	XX1315/16/17	CE1315 Basics of Civil Engineering	CE1316 Principles of Macroeconomics	ME1315 Production Technology	ME1316 Hydraulics and Pneumatics	ME1317 Organizational Behaviour	EE1315 Introduction to Renewable Energy	EE 1316 Electrical Motors
MinorCourse-2	XX1415/16/17	CE1415 Building Construction	CE1416 Principles of Microeconomics	ME1415 New and Renewable Energy Sources	ME1416 Automation in Manufacturing	ME1417 Human Resource Management	EE1415 Energy Resources, Environment and Economics	EE 1416 Special Electrical Machines
MinorCourse-3	XX1515/16/17	CE1515 Building Planning & Drawing	CE1516 Business Statistics	ME1515 Automobile Engineering	ME1516 Mechatronic Systems	ME1517 Material Management	EE1515 Energy Efficiency in Electrical Utilities	EE 1516 Power Electronics
MinorCourse-4	XX1615/16/17	CE1615 Building Estimates &	CE1616 Financial Accounting	ME1615 Basic of Product Design	ME1616 Industrial Robotics	ME1617 Marketing Management	EE1615 Energy Management	EE 1616 Electrical Drives and

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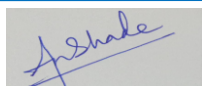*(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)*

								Control
MinorCourse-5	XX1715/16/17	CE1715 Construction Management	CE1716 Minor Project	ME1715 Industrial Management and Quality Control	ME1716 Computer Integrated Manufacturing	ME1717 Corporate Financial Reporting and Analysis	EE1715 Project	EE 1716 Project

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Name of Programme /Minor Course	Course Code	Electronics Engineering		Computer Engineering		Information Technology		Instrumentation Engineering	
		Internet of Things (TRACK-I)	Electronics and Telecommunication Engg. (TRACK-II)	Data Science (TRACK-I)	AI (TRACK-II)	Machine Learning (TRACK-I)	Software Engineering (TRACK-II)	Instrumentation and Control (TRACK-I)	Banking and Finance(TRACK-II)
MinorCourse-1	XX1315/16	ET1315 Introduction to internet of things	ET1316 Digital Circuits	CS1315 Fundamentals of data science	CS1316 Introduction to Artificial Intelligence	IT1315 Essential math for machine learning	IT1316 Data Structure & Algorithms	IN1315 Industrial Measurement I	IN1316 Bank operations Management
MinorCourse-2	XX1415/16	ET1415 IoT Architecture & Protocols	ET1416 Communication Engineering	CS1415 Computational Data Analytics	CS1416 Data Mining	IT1415 Artificial Intelligence	IT1416 Software Engineering	IN1415 Industrial Measurement II	IN1416 Strategic management and innovation in banking
MinorCourse-3	XX1515/16	ET1515 Programming with Arduino and Raspberry-Pi	ET1516 Microprocessor &Embedded System	CS1515 Natural Language Processing	CS1516 Introduction to Machine Learning	IT1515 Machine Learning Foundation	IT1516 Object Oriented Design & Programming	IN1515 Control system Engineering	IN1516 Security analysis and portfolio management
MinorCourse-4	XX1615/16	ET1615 Industrial Internet of Things	ET1616 Wireless Communication	CS1615 Application of data science	CS1616 Optimization Methods in Machine	IT1615 Fundamentals of Deep Learning	IT1616 Software Testing	IN1615 Industrial Automation	IN1616 Spreadsheet based data analysis

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					Learning				
MinorCourse-5	XX1715/16/17	ET1715 Project	ET1716 Project	CS1715 Marketing Analytics for Big Data	CS1716 Human Applications of AI	IT1715 Minor Project	IT1716 Minor Project	IN1715 Programming for PLAC,DCS & SCADA	IN1716 IT operations &Management

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LIST OF PROGRAM ELECTIVES HONOR'S COURSES (Swayam/NPTEL)	
COURSE CODE	**Course Name**
IT1521	Qualitative Research Methods and Research Writing **OR**Natural Resources
IT1522	Social Networks
IT1621	Privacy and Security in Online social media
IT1622	Research Methodology in Natural Sciences
IT1721	Games and Information
IT1722	Business Intelligence & Analytics

Honour's Courses:

IT1521 Qualitative Research Methods and Research Writing By Prof. Aradhna Malik | IIT Kharagpur

https://onlinecourses.nptel.ac.in/noc20_ge01/preview

IT1522 Social Network By Prof. Sudarshan Iyengar, Prof. Yayati Gupta | IIT Ropar, Mahindra University, Hyderabad

https://onlinecourses.nptel.ac.in/noc22_cs30/preview

IT1621 Privacy and Security in Online Social Media By Prof. PonnurangamKumaraguru | IIIT Hyderabad

https://onlinecourses.nptel.ac.in/noc23_cs13/preview

IT1622 Research Methodology in Natural Sciences By Prof. Soumitro Banerjee | IISER Kolkata

https://onlinecourses.nptel.ac.in/noc23_ge06/preview

IT1721 Games and Information By Prof. Ankur A. Kulkarni | IIT Bombay

https://onlinecourses.nptel.ac.in/noc24_cs64/preview

IT1722 Business Intelligence & Analytics By Prof. Saji K Mathew | IIT Madras

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Students may choose the courses given from above list or as per the availability with the Approval of Departmental Faculty Board (DFB)

COURSE CODE	Civil Engineering	Mechanical Engineering	Electrical Engineering	Electronics Engineering	Computer Engineering	Information Technology	Instrumentation
LIST OF MINOR COURSES FOR DOUBLE MINOR (Cyber Security)							
IT1541	-	-	-	-	-	Information Theory for Cyber Security	-
IT1542	-	-	-	-	-	Data Encryption and Compression	-
IT1641	-	-	-	-	-	Steganography and Watermarking	-
IT1642	-	-	-	-	-	Security Assessment and Risk Analysis	-
IT1741	-	-	-	-	-	Database Security and Access Control	-
IT1742	-	-	-	-	-	Blockchain Technology	-

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LIST OF MINOR COURSES FOR DOUBLE MINOR

Information Theory for Cyber Security

https://archive.nptel.ac.in/courses/106/106/106106129/#

https://onlinecourses.nptel.ac.in/noc24_cs121/preview

https://onlinecourses.nptel.ac.in/noc22_ee49/preview

Data Encryption and Compression

https://archive.nptel.ac.in/content/storage2/courses/downloads_new/106105162/noc20_cs21_assigment_13.pdf

https://nptel.ac.in/courses

Steganography and Watermarking

https://swayam.gov.in/nd2_nou20_cs01/preview

Security Assessment and Risk Analysis

https://swayam.gov.in/nd2_nou20_cs01/preview

http://www.cnss.gov/Assets/pdf/nstissi_4011.pdf

Database Security and Access Control

https://www.coursera.org/lecture/advanced-system-security-topics/role-based-access-control-rbac-bYvzS.

Blockchain Technology

https://nptel.ac.in/courses/106105184/

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Guidelines for the Honour with Research Project

The purpose of this course is to introduce students to the process of conducting research projects/work. The students will be helped to conceptualise, design and execute a research project by a teacher guide.

Stage-1:

- Student have to complete online course related to topic/perquisite course prescribed by the assigned guide/BOS
  OR
- The focus will be on discussions and analysis of assignments. Learners will be encouraged to read books and research journals related to his/her research topic (literature review, theory and hypotheses etc) and share them in the seminars and evaluated by two member Team of department and same to be enter in ICA format.

Stage-2:

Sample steps:

- Research design/Methodology
- Sampling tool of data collection
- data processing and analysis
- Plan of research report
- Publish review paper in peer view journal/Scopus indexed journal and seminar on it
- The faculty supervisor will assess the method and procedures used by the learner
- At end evaluated by two member Team of department

Stage-3:

- If applicable initiate Actual implementation
- Data Analysis and Interpretation: The outcome of the research is presented in tabular form with the help of statistical procedures. The data are analysed and interpreted and presented in the form of a research report and presentation/seminar.

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- Report writing
- Publish paper on findings in peer view journal/Scopus indexed journal.
- Two member Team of department will assess the Findings method and procedures
- The faculty supervisor will assess the presentation of major findings depending on the methodology used, presentation of results, interpretation of the results with discussion, summary of the proposed research problem and conclusion.
- Two member Team of department (may evaluated by Guide and external expert) will assess the Findings method and procedures etc

Note: Guide Teaching load: 4 Hrs per student in Research stage -1 /2/3

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Course Code	SH1301E							Course category		BS5	
Course Name	TRANSFORM AND STATISTICAL METHODS										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory				Practical		Total	
				CT	TA	ESE	ESE Duration	ICA	ESE		
03		00	03	30	10	60	2 hrs 30 min	00	00	100	03

Course Objectives:

1. To introduce the basic concept of statistics for analyzing experimental data

2. To familiarize the students with concepts of probability and probability distribution.

3. To study about the mathematical tool like Z-transform, Laplace transform
   an its properties.

4. To introduce the concept of Vector spaces

5. To learn inner product spaces

Basic Statistics: (9 hours)

Measures of Central Tendency: Moments, Skewness and Kurtosis, Correlation and Regression, Probability distributions: Binomial, Poisson and Normal.

Random Variables and Probability Distributions: (9 hours)

Random variables, Discrete and Continuous random variables, Distribution functions, Probability distribution of continuous random variable. Joint distribution of discrete and continuous random variables, Conditional distribution, Mathematical expectation, Mean, moments and variance. Variance for joint distribution and Covariance.

Z-transform: (9 hours)

Definition, Properties of Z-transform, Inverse Z-transform by using properties, Partial fraction method, Residue method, Convolution theorem and power series method
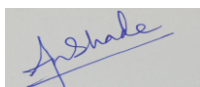
Vector Spaces I: (9 hours)

Vector spaces and Subspaces, Linear dependence and Independence of vectors, Bases and dimensions, Coordinate vectors, Linear transformation, Algebra of linear transformation,

Vector Spaces II: (9 hours)

Representation of linear transformation of matrices relative to basis, Inner product, Inner Product Spaces, Norm and Orthogonality, Orthogonal and orthonormal basis, Gram-Schmidt orthogonalisation process

Text Books:

1.A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2010.

2.Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 44th edition, 2020.

3. Higher Engineering Mathematics, H.K.Das, S.Chand & Company Pvt.Ltd, 2014

Reference Books:

1. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.

2. Introduction to Probability Theory, P. G. Hoel, S. C. Port and C. J. Stone, Universal Book Stall, 2003 (Reprint).

3. A First Course in Probability, S. Ross, 6th Ed., Pearson Education India, 2002.

4. An Introduction to Probability Theory and its Applications, W. Feller, Vol. 1, 3rd Ed., Wiley, 1968.

5. Advanced Engineering mathematics, Reena Garg, Khanna book publishing company, 2021

6. Engineering Mathematics (for semester III), Veerarajan T., Tata McGraw-Hill, New Delhi, 2010

Course Outcomes:

 After successful completion of the course the students will be able to:

SH1301E.1. Apply the basic concept of statistics for analyzing experimental data.

SH1301E.2. Familiarize the students with concepts of probability and probability
distributions.

SH1301E.3. Study about the mathematical tool like Z-transform, Laplace transform and its
properties.

SH1301E.4. Apply the knowledge of Vector spaces for solving engineering problems

SH1301E.5. Use inner product spaces concept to deal problems

CO – PO – PSO Mapping:

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CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
SH1301E.1	3	3	3	3	3	-	-	-	-	-	-	-	2	-	-
SH1301E.2	3	3	3	3	3	-	-	-	-	-	-	-	2	-	-
SH1301E.3	3	3	3	3	3	-	-	-	-	-	-	-	2	-	-
SH1301E.4	3	3	3	3	3	-		-	-	-	-	-	2	-	-
SH1301E.5	3	3	3	3	3	-	-	-	-	-	-	-	2	-	-

0 - Not correlated   1 - Weakly Correlated   2 - Moderately Correlated   3 - Strongly Correlated

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Course Code	SH1302C (DSY students)				Course category		BS5	
Course Name	TRANSFORM AND STATISTICAL METHODS							
Teaching Scheme				**Examination Scheme**				**Credits**
Th	Tu	Pr	Total	Theory				Practical	Total	
				CT	TA	ESE	ESE Duration	ICA	ESE		
03	01	00	04	30	10	60	2 hrs 30 min	00	00	100	04

Course Objectives:

1.To introduce the Linear differential equations of Higher order.

2.To familiarize the students with concepts of probability and probability distribution.

3.To study about the mathematical tool Fourier Series and its properties.

4.To introduce the concept of Vector spaces

5.To learn inner product spaces

Linear differential equations with constant coefficients: (9 hours)

Higher order linear differential equation: complementary functions, Rules to find particular integrals, Cauchy's homogeneous equation, Legendre's linear equation, Method of variation of parameters

Random Variables and Probability Distributions: (9 hours)

Random variables, Discrete and Continuous random variables, Distribution functions, Probability distribution of continuous random variable. Joint distribution of discrete and continuous random variables, Conditional distribution, Mathematical expectation, Mean, moments and variance. Variance for joint distribution and Covariance.

Fourier series: (9 hours)

Fourier series, Dirichlet's conditions, Change of Interval, Fourier series for discontinuous functions, Fourier series for odd and even functions, Half range Fourier series, Harmonic analysis

Vector Spaces I: (9 hours)

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Vector spaces and Subspaces, Linear dependence and Independence of vectors, Bases and dimensions, Coordinate vectors, Linear transformation, Algebra of linear transformation,

Vector Spaces II: (9 hours)

Representation of linear transformation of matrices relative to basis, Inner product, Inner Product Spaces, Norm and Orthogonality, Orthogonal and orthonormal basis, Gram-Schmidt orthogonalisation process

Text Books:

1. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2010.

2. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 44th edition, 2020.

3. Higher Engineering Mathematics, H.K.Das, S.Chand & Company Pvt.Ltd, 2014

Reference Books:

1. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.

2. Introduction to Probability Theory, P. G. Hoel, S. C. Port and C. J. Stone, Universal Book Stall, 2003 (Reprint).

3. A First Course in Probability, S. Ross, 6th Ed., Pearson Education India, 2002.

4. An Introduction to Probability Theory and its Applications, W. Feller, Vol. 1, 3rd Ed., Wiley, 1968.

5. Advanced Engineering mathematics, Reena Garg, Khanna book publishing company, 2021

6. Engineering Mathematics (for semester III), Veerarajan T., Tata McGraw-Hill, New Delhi, 2010

Course Outcomes:

After successful completion of the course the students will be able to:

SH1302C.1. Solve Linear differential equations of Higher orders

SH1302C.2. Familiarize the students with concepts of probability and probability distributions.

SH1302C.3. Study about the mathematical tool like Fourier Series and its properties

SH1302C.4. Apply the knowledge of Vector spaces for solving engineering problems

SH1302C.5. Use inner product spaces concept to deal problems

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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SH1302C.1	3	3	3	3	3	-	-	-	-	-	-	-	2	-	-
SH1302C.2	3	3	3	3	3	-	-	-	-	-	-	-	2	-	-
SH1302C.3	3	3	3	3	3	-	-	-	-	-	-	-	2	-	-
SH1302C.4	3	3	3	3	3	-		-	-	-	-	-	2	-	-
SH1302C.5	3	3	3	3	3	-	-	-	-	-	-	-	2	-	-

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Course Code	IT1301						Course category		PC3
Course Name	DATA STRUCTURES AND ALGORITHMS								
Teaching Scheme				**Examination Scheme**					**Credits**
Th	Tu	Pr	Total	Theory				Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

Course Objectives

1. To impart the basic concepts of data structures and algorithms.
2. To understand concepts about searching and sorting techniques
3. To understand basic concepts about stacks, queues, lists, trees and graphs.
4. To enable them to write algorithms for solving problems with the help of fundamental data structures

Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. Searching: Linear Search and Binary Search Techniques and their complexity analysis.

Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly ,Circular linked list: operations on it.

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees .Applications of Binary Trees. B Tree, B+ Tree(Theoretical aspect only)

Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among

all the methods, Hashing.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Text books

1. Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.
2. Richard Gilberg and Behrouz Forouzan, "Data structures A Pseudo code Approach with C", 2nd edition, 2005, Cengage Learning.

Reference books

1. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
2. "How to Solve it by Computer", 2nd Impression by R.G. Dromey, Pearson Education.
3. "Data structures with C", Seymour Lipschutz, 1st Edition, 2017, SchaumSeries,TataMacGraw Hill

Useful link:

http://nptel.ac.in/courses/106106130/, IIT Madras

http://nptel.ac.in/courses/106103069/, IIT Guwahati

http://nptel.ac.in/courses/106106127/, Prof. Shankar Balachandran, IIT Madras

Course outcomes

Student will be able to

IT1301.1   Analyse the time and computation complexity and justify the correctness of an algorithm. Implement, use and analyse various searching techniques. (Linear Search and Binary Search)

IT1301.2   Design and analyse the algorithm for given problem using of Stacks, Queues

IT1301.3   Learn various types of linked list and related algorithms, complexity analysis and choose appropriate linked list for given application.

IT1301.4   Apply Non-Linear Data Structures Graph, Trees -search and traversal algorithms and determine the time and computation complexity

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IT1301.5 Discuss and Use different Sorting and Hashing Algorithms and compare their performances in term of Space and Time complexity.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1301.1	3	1	2	0	1	0	0	0	0	1	1	1	1	3	2
IT1301.2	3	1	1	0	2	0	0	0	0	1	1	1	1	3	2
IT1301.3	3	1	1	0	2	0	0	0	0	1	1	1	1	3	2
IT1301.4	3	1	1	0	2	0	0	0	0	1	1	1	1	3	2
IT1301.5	3	1	1	0	1	0	0	0	0	1	1	1	1	3	2

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

Assessment Table
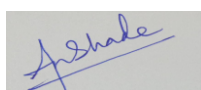
Assessment Tool	Course Outcome				
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Class Test1(15M)	10M	05M			
Class Test2(15M)			10M	05M	
TA (10M)	02M	02M	02M	02M	02M
ESE (60M)	12M	12M	12M	12M	12M

Teacher's Assessment

- NPTEL/Infosys SpringerBoard based Assignment

- Viva

- Mini Projects

- Presentations

- Spoken Tutorials

- Youtube academic content creation on above topics

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Course Code	IT1302					Course category			PC4	
Course Name	COMPUTER ORGANIZATION AND ARCHITECTURE									
Teaching Scheme				**Examination Scheme**						**Credits**
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	30	10	60	02 hrs 30 min	--	--	100	03

COURSE OBJECTIVES

To expose the students to the following:

1. Working of Computer Systems & its basic principles.

2. Current state of art in memory system design.

3. How I/O devices are accessed and its principles.

4. Imparting the knowledge on micro programming

5. Concepts of advanced pipelining techniques.

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, addressing modes, instruction set. Case study – instruction sets of some common CPUs.

Data representation: Signed number representation, fixed and floating point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and add, Booth multiplier.

CPU control unit design: Hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU. Memory system design: semiconductor memory technologies, memory organization. Introduction to x86 architecture.

Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions.

Pipelining and Parallel Processors: Basic concepts of pipelining, throughput and speedup, pipeline hazards. Introduction to parallel processors, Concurrent access to memory and cache coherency.

Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

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TEXT BOOKS

1. "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.

2. "Computer Organization and Embedded Systems", 6th Edition by CarlHamacher, McGraw Hill Higher Education.

REFERENCE BOOK

1. "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill

2. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.

3. "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

COURSE OUTCOMES

At the end of the course, the students will be able to

IT1302.1   Draw the functional block diagram of a single bus architecture of a computer and describe the function of the instruction execution cycle, addressing modes,instruction set.

IT1302.2   Write assembly language program for specified microprocessor for computing 16-bit multiplication, division and I/O device interface.

IT1302.3   Write a flowchart for Concurrent access to memory and cache coherency in Parallel Processors and describe the process.

IT1302.4   Given a CPU organization and instruction, design a memory module and analyze its operation by   interfacing with the CPU.

IT1302.5   Given a CPU organization, assess its performance, and apply design technique to enhance performance using pipelining, parallelism and RISC methodology

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1302.1	1	2	2	0	0	0	0	0	0	3	0	2	1	3	1
IT1302.2	2	2	3	0	0	0	0	0	0	0	0	1	2	3	1
IT1302.3	3	2	1	0	0	3	0	2	0	0	0	3	0	2	3
IT1302.4	1	3	3	0	0	0	1	0	0	1	0	2	2	0	2
IT1302.5	2	1	2	0	0	0	0	0	0	0	0	2	1	1	1

1-   Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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Course Code	IT1303								Course category		PC5
Course Name	DIGITAL LOGIC DESIGN										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

Course Objectives

1. Systematically use mathematical processes to convert any value between any number systems.
2. Apply knowledge of logic gates to select the appropriate gate for the circuit design.
3. Create truth tables by analyzing existing circuits. Design a circuit based on a truth table.
4. Solve novel problems by applying the combinational logic design process.
5. Implement sequential logic to improve digital circuit design.
6. Design a state machine to accomplish specified design task.

UNIT-I: Introduction to Number systems and codes: Binary number systems, Signed binary numbers, Binary arithmetic,1's and 2's complement, Octal number system, hexadecimal number system

UNIT-II: Introduction to gates, Minimization of Boolean function using Karnaugh Map (up to four variable), SOP- POS, Quine - Mclusky methods, Code conversions- Binary code to gray code and gray to binary, BCD to Excess – 3, Excess – 3 to BCD code.

UNIT-III: Design of Combinational Logic Circuits: Modular combinational logic elements, Overview & implementation of multiplexer/ demultiplexer, Implementation of Combinational Logic Circuits using mux / demux, Decoders, Encoders, Priority encoders. Design of Ripple carry adder and Carry look ahead adder, Design of Combinational Circuits using Programmable Logic Devices (PLDs): Programmable Read Only Memories (PROMs), Programmable Logic Arrays (PLAs), Programmable Array Logic (PAL) device.

UNIT-IV: Design of Sequential Logic Circuits: Latches: RS latch and JK latch, Flip-flops-RS, JK, T and D flip flops, Master-slave flip flops, Edge-triggered flip-flops. Analysis and Design of Synchronous Sequential Circuits: Introduction to sequential circuits, Characteristic table, Characteristic equation and Excitation table. Modular sequential logic circuits: Registers, Design of

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Synchronous / Asynchronous using different flip-flops.

UNIT-V: Overview of Shift registers. Counters- Synchronous / Asynchronous, Updown, Ring, Johnson counter. Algorithm State Machines: ASM charts, notation, RTL notation and implementation design of simple controller, multiplexer controller method. VHDL: Introduction to HDL, VHDLLibrary. Memories: Random access memory, TTL RAM cell, parameter read write cycles, ROMs EPROM, MOS-static RAM cell, dynamic RAM cell, refreshing, memory cycles.

Text Books

1 M Morris Mano, "Digital Design" 3rd Edition Prentice Hall 2001 ISBN-10 / ASIN: 0130621218 ISBN-13 / EAN: 9780130621214.

2 R.P. Jain, "Modern Digital Electronics", 3rd Edition, Tata McGraw-Hill, 2003, ISBN 0 – 07 – 049492 – 4.

3 A.P. Malvino, D. P. Leach and G.Saha, "Digital Principles and Applications," 7/e, McGraw Hill, 2010. 37.

Reference Books

1 WakerlyPearon, "Digital Design: Principles and Practices", 3rd edition, 4th reprint, Pearson Education, 2004.

2 A. Anand Kumar, "Fundamentals of digital circuits" 1st edition, PHI publication, 2001. 3 Mark Bach, "Complete Digital Design", Tata MCGraw Hill, 2005.

4 Stephen Brown, "Fundamentals of digital logic design with VHDL" 1st edition, TMH Publication 2002.

Course Outcomes

Students will be able to:

IT1303.1   Apply the knowledge of number systems and codes in problem solving related to code conversion and number system.

IT1303.2   Learn the simplification of logical statements with karnaugh maps.

IT1303.3   Learn and understand the basic concepts of combinational logic devices and apply the concepts in designing them.

IT1303.4   Learn the working principles of decoder, encoder. Understand the fundamentals of sequential logic devices and apply the concepts in designing them.

IT1303.5   Apply and design the logical devices by using all these concepts along with implementation knowledge of hardware and peripheral design.

Teacher's Assessment

- NPTEL based Assignment

- Viva

- Spoken Tutorials

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1303.1	3	1	2	0	1	0	0	0	0	1	1	1	1	3	2
IT1303.2	3	1	1	0	2	0	0	0	0	1	1	1	1	3	2
IT1303.3	3	1	1	0	2	0	0	0	0	1	1	1	1	3	2
IT1303.4	3	1	1	0	2	0	0	0	0	1	1	1	1	3	2
IT1303.5	3	1	1	0	1	0	0	0	0	1	1	1	1	3	2
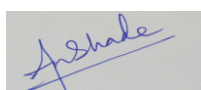
0-Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1304							Course category		PC6
Course Name	OBJECT ORIENTED TECHNOLOGY									
Teaching Scheme				**Examination Scheme**						**Credits**
Th	Tu	Pr	Total	Theory					Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

COURSE OBJECTIVES

1. To introduce the object-oriented programming concepts.
2. To introduce the principles of inheritance and polymorphism.
3. To introduce the implementation of packages and interfaces.
4. To introduce the concepts of exception handling and Java I/O.
5. To introduce the design of Graphical User Interface using applets.

Introduction to Java: Object Oriented Programming Concepts, Procedural Vs Object oriented language. Java Basics: Program component, Compilation cycle, class fundamentals, Data types and Variables.

Operators and Control Statements: Arithmetic operators, relational operators, assignment operators. Selection statement: if, nested if, switch statement. Repetition statements: while, do-while, for, nested loops. Arrays: Basics, one dimensional, Multidimensional, Passing array to methods.

Introducing Classes: Class fundamentals, declaring objects, methods, class data and instance Data, constructor, "this" keyword, access control. Inheritance, Polymorphism, Abstract classes and Interface. Introduction to Math class. Introduction to String and String buffer class.

Java File I/O: File, File Dialog Object, Byte Stream: InputStream, Output Stream, FileInputStream, FileOutputStream, PrintWriter class. Exception Handling: Exception types, using try catch, throw, throws, finally.

Introduction to Swing GUI: Swing API, Working with Swing GUI Components, Working with Graphics, Working with Colors.

TEXT BOOKS

1. Java Complete References , Herbert Schildt, 5th edition, Tata Mc Graw-Hill,2005-06

REFERENCE BOOK

1) Java Programming ,Liag, 7th edition, Prentice Hall India, 2002.

2) An Introduction to OOP with Java , C.Thomas Wu, Indian Adapted Edition, Tata Mc Graw-Hill, 2006

COURSE OUTCOMES

At the end of the course, the students will be able to

IT1304.1 To solve real world problems using OOP techniques.

IT1304.2 To solve problems using java programming constructs.

IT1304.3 To develop swings for web applications.

IT1304.4 To solve problems using java exception handling and I/0.

IT1304.5 To design GUI based applications

CO – PO – PSO Mapping

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1304.1	1	0	3	0	0	1	0	2	0	0	0	2	0	3	0
IT1304.2	2	2	0	0	3	0	0	1	0	0	0	0	0	2	0
IT1304.3	2	1	0	1	2	0	1	0	0	1	0	0	0	3	1
IT1304.4	2	3	2	1	3	2	0	1	0	0	0	0	1	2	2
IT1304.5	1	1	2	0	3	0	0	2	0	1	0	2	0	2	3

0-Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated
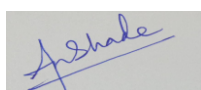
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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1305								Course category			PC7
Course Name	OBJECT ORIENTED TECHNOLOGY LAB											
Teaching Scheme				**Examination Scheme**								**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
--	--	02	02	--	--	--	--	--	25	25	50	1

COURSE OBJECTIVES

1. Gain knowledge about basic language syntax and semantics to write programs
2. Understand the fundamentals of object-oriented programming.
3. Understand the principles of inheritance, polymorphism, abstraction.
4. Understand the principles of I/O handling, exception handling

Suggested List of Experiments/Assignments but not limited to the given list of experiments

1. Study of any integrated development environment such as NetBeans, Eclips.
2. Write a program to calculate the roots of Quadratic equations.
3. Write a Program to implement Arrays in java.
4. Write a program to create a room class, the attributes of this class is roomno, roomtype, roomarea and ACmachine. In this class the member functions are setdata and displaydata.
5. Write a program to create a class named shape. In this class we have three sub classes circle, triangle and square each class has two-member function named draw () and erase (). Create these using polymorphism concepts.
6. Write a program to create interface A in this interface we have two method meth1 and meth2. Implements this interface in another class named MyClass.
7. Write a Program to demonstrate use of Math class.
8. Given two strings of lowercase English letters, **A** and **B**, perform the following operations:
   - Sum the lengths of **A** and **B**.
   - Determine if **A** is lexicographically larger than **B** (i.e.: does **A** come before **B** in the dictionary?).

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- Capitalize the first letter in **A** and **B** and print them on a single line, separated by a space.

9. Write a Program to demonstrate use of different methods of StringBuffer class.

10. Write a program to demonstrate use of Graphics class and Color Class.

11. Write a program to implement concept of File Input Output

12. Write a program to implement the concept of exception handling.

13. Write a Java program that simulates a traffic Signal. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "Stop" or "Ready" or "Go" should appear above the buttons in selected color. Initially, there is no message shown.

14. Develop a mini project using swing GUI component

COURSE OUTCOMES

At the end of the course, the students will be able

IT1305.1   To identify classes, objects, members of a class and relationships among them needed for a specific problem.

IT1305.2   To write application programs using OOP principles and proper program structuring.

IT1305.3   To demonstrate the concepts of polymorphism and inheritance. And Design GUI using Swing programming, Implement concept of I/O, exception handling.

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1305.1	2	1	1	0	2	1	1	0	0	1	0	2	0	2	2
IT1305.2	1	2	0	0	1	0	0	1	0	0	0	0	1	1	0
IT1305.3	3	2	0	1	2	0	1	2	0	1	2	0	0	3	1

0-Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1306								Course category		VSE1
Course Name	DATA STRUCTURES AND ALGORITHMS LABORATORY										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
--	--	02	--	--	--	--	--	---	25	25	50	01

COURSE OBJECTIVES

1. Have a good understanding of how several fundamental algorithm works, particularly those concern with searching and sorting.

2. Have a good understanding of fundamental data structures used in computer science.

3. Be able to analyze space and time efficiency of most algorithms.

4. To be able to design new algorithms or modify existing one for new applications

Suggested List of Experiments/Assignments but not limited to the given list of experiments:

(Note: a. Experiments/assignments can be given to students by the instructor as per current scenario of workability and availability of the technology with a flexibility of students' choice in selecting the experiments from the given list.

b. Experiments aim can be updated or modified or scaled up as per the requirements of the lab sessions and can be chosen from the reference websites.)

1 Write and Implement algorithm the following searching techniques.

- Binary search

- Fibonacci search technique.

Show how above algorithm works in Best case and worst Case

2 Implement Singly linked list and demonstrate how to add/remove node from different locations.

3 Write and implement an algorithm which reads two polynomials $p(x,y,z)$ and $g(x,y,z)$ from the user store it in memory ,perform the addition of two polynomials and display resultant polynomial in Descending order $h(x,y,z)= p(x,y,z) +g(x,y,z)$

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4   A Vegetable and Fruit Mall wants to organize its vegetables and fruit products in a combination of purchase pattern of customers. Solve the problem by suggesting appropriate data structures.

5   Design and implement an algorithm to convert infix expression into postfix and then evaluate it.

6   Application of Doubly Linked List

7   First Come First Served Scheduling Algorithm: Application of Queue

8   (Binary Search Tree) Construct all possible BSTs for keys 1 to N and display the post order traversal of each tree.

9   Implement HeapSort algorithm to sort an integer array in an ascending and try to make it faster as much as possible

10 Implement Shortest Path algorithm (A newspaper delivery boy every day drops newspaper in a society having many lanes and each lane has many houses. Design a program to provide different paths that he can follow and also suggest the path which will make him to finish his tasks with less effort. Solve the problem by suggesting appropriate data structures.

11 Mini Project based on applications of data structures**.**

COURSE OUTCOME

At the end of the course, the students will be able to

IT1306.1   Interpret and compute asymptotic notations to describe work done by an algorithm and relate to the consumption of resources (time/space).

IT1306.2   Exemplify and implement how abstract data types such as stack, queue and linked list can be implemented to manage the memory using static and dynamic allocations.

IT1306.3   Apply various data structures trees(Binary tree, Binary Search trees), graphs to solve programming challenges

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1306.1	3	2	2	0	0	0	0	0	0	0	0	3	2	2	2
IT1306.2	3	2	2	0	0	0	0	0	0	0	0	3	2	2	2
IT1306.3	3	2	2	0	0	0	0	0	0	0	0	3	2	2	2

0-   Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated
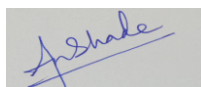
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Course Code	IT1307								Course category		VSE2	
Course Name	DIGITAL LOGIC DESIGN LAB											
Teaching Scheme				**Examination Scheme**								**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
--	--	02	--	--		--	--	---	25	25	50	01

Course Objective

1. Students will learn and understand the Basics of digital electronics.
2. Student will learn to design basic logic circuits, combinational and sequential circuits.
3. To test/verify the functionality of the logic circuits.

Suggested List of Experiments/Assignments but not limited to the given list of experiments:

(Note: a. Experiments/assignments can be given to students by the instructor as per current scenario of workability and availability of the technology with a flexibility of students' choice in selecting the experiments from the given list.

b. Experiments aim can be updated or modified or scaled up as per the requirements of the lab sessions and can be chosen from the reference websites.)

List of Experiments:

1. Implementation of Boolean function using Gates.

2. Code converters: • Binary to gray • Gray to binary Excess – 3 code to BCD • BCD to Excess – 3 code.

3. Design of - • Half adder, full adder. • Design of half subtract or, full subtract or. • K-map examples implementation • Quine-Mc'clusky examples implementation.

4. Design of: • 3 bit odd Parity Checker • 4 bit odd Parity Checker • 3 bit even Parity Checker • 4 bit even Parity Checker

5. Implementation of Multiplexer and Demultiplexer.

6. BCD adder using 4 bit adder IC.

7. Study of flip flops- • RS flip-flop • D flip-flop • T flip-flop • J-K flip-flop

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8. Design of Synchronous Counter. • Design of up / down counters. • Design of Sequence generator. • Design of Ring counter. • Design of Johnson Counter

9. Study practicals on VHDL programming.

Course Outcomes

IT1307.1   Distinguish between analog and digital systems.Identify the various digital ICs and understand their operation.

IT1307.2   Apply Boolean laws and K-map to simplify the digital circuits.

IT1307.3   Understand the function of elementary digital circuits under real and simulated environment. Prepare a report on basics of digital electronics and handling of ICs.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1307.1	3	2	2	0	0	0	0	0	0	0	0	3	2	2	2
IT1307.2	3	2	2	0	0	0	0	0	0	0	0	3	2	2	2
IT1307.3	3	2	2	0	0	0	0	0	0	0	0	3	2	2	2

1-   Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1310								Course category			EM1
Course Name	IDEA LAB											
Teaching Scheme				**Examination Scheme**								**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
--	--	02	02	--		--	--	---	50	--	50	01

Course Objectives:
1. Understand design thinking and innovation concepts and approaches.
2. Understand the problems faced by society.
3. Identify new and unaddressed social needs.
4. Design and development of Small project based on Laboratory equipment like Machine hardware, Electronic hardware and software etc.

Students are expected to complete work in group of max.three students in pertaining to following aspects under the supervision of course coordinator/teacher.
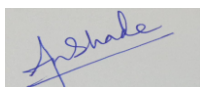
1. Demonstration of modern manufacturing facilities available at the institute
2. Demonstration of automation and programming tools.
3. Active Sessions on brainstorming, creativity, idea generation, problem-solving techniques and new product development.
4. Visit social sites for the identification of social needs and community problems. The report on this visit is to be submitted.
5. Identification of product problems through customer surveys.
6. The minor project based on hardware (along with software if desire).
7. Building prototype and identifying modifications.
8. Write a project report.
9. The Course Coordinator/Teacher may arrange demonstration with poster presentation of all minor projects developed by the students at the end of semester.

Course Outcomes:

IT1310.1 Gain knowledge of design thinking and innovation with the modern machines and devices available in the idea lab.
IT1310.2 Generate different ideas for innovative products through ideation and brainstorming.
IT1310.3 Identify, discuss and justify the technical aspects of the chosen idea with a comprehensive and systematic approach.
IT1310.4 Design and develop innovative products for specific problems considering user-centric perspective and market.
IT1310.5 Communicate and report effectively project related activities.

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References Books:

1. Ulrich, Karl T., Steven D. Eppinger, and Maria C. Yang. Product design and development Vol. 4. Boston: McGraw-Hill higher education, 2008.
2. Mueller-Roterberg, Christian. "Handbook of design thinking." Independently publish 2018 (2018).
3. Koh, Joyce Hwee Ling, et al. Design thinking and education. Springer Singapore, 2015.
4. Uebernickel, Falk, et al. Design thinking: The handbook. World Scientific, 2020.
5. Woolery, Eli. Design thinking handbook. In Vision, 2019.

Web Resource:

1. https://www.coursera.org/learn/uva-darden-design-thinking-innovation?action=enroll
2. https://www.mygreatlearning.com/academy/learn-for-free/courses/design-thinking

Note:

ICA – The Internal Continues Assessment shall be based on project development and knowledge/skill acquired. The performance shall be assessed experiment wise using continues assessment format A and B.

CO-PO-PSO Mapping

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1310.1	3	1	2	0	1	0	0	0	0	1	1	1	1	3	2
IT 1310.2	2	1	1	0	2	0	0	0	0	1	1	1	1	2	2
IT 1310.3	3	1	1	0	2	0	0	0	0	1	1	1	1	3	3
IT 1310.4	2	1	1	0	2	0	0	0	0	1	1	1	1	2	2
IT 1310.5	2	1	1	0	2	0	0	0	0	1	1	1	1	2	2

0- Not Correlated 1-Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1401								Course category		PC8
Course Name	DESIGN AND ANALYSIS OF ALGORITHMS										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

Course Objectives

1. Analyze the asymptotic performance of algorithms
2. Write rigorous correctness proofs for algorithms.
3. Demonstrate a familiarity with major algorithms and data structures.
4. Apply important algorithmic design paradigms and methods of analysis.
5. Synthesize efficient algorithms in common engineering design situations.

Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

Divide and Conquer Technique

General Method, Revision and analysis of merge sort, quick sort and binary search, counting inversions, Finding closest pair of points, Integer multiplication.

Greedy Method

Elements of greedy technique, Activity selection problem, Fractional Knapsack Problem, Job Sequencing problem, Huffman Coding, Finding Single Source Shortest path in graph:

Dijkstra's Algorithm, Revision and analysis of minimum spanning tree algorithms.

Dynamic Programming

Elements of Dynamic Programming, Principles of Dynamic programming- memorization or iteration over sub problems, Assembly line scheduling, Matrix chain multiplication, Longest common subsequence, All pair shortest path algorithm- Floyd-Warshall's Algorithm..

NP-Completeness

Matching , Introduction to NP-Complete , Search/Decision, SAT, Independent Set, 3VC

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,Exact Cover, Multi Set, Subset Sum & Partition, Hamiltonian Circuit.

Approximation Algorithms

The vertex-cover problem, The set-covering problem, The subset sum problem.

Text Books

1   T. H. Cormen, C. E. Leiserson, R. L.Rivest and C. Stein, "Introduction to Algorithms",
     MIT Press/McGraw Hill, Second Edition.

2   Jon Kleinberg, Eva Tardos, "Algorithm Design", Pearson, Addison Wesley

Reference books

1   V. Aho, J. E Hopecroft and J.D. Ullman, The design and analysis of algorithm, Addision- Wesley,
     1974

COURSE OUTCOMES

At the end of the course, the students will be able to

IT1401.1 For a given algorithms analyze worst-case running times of algorithms based on
asymptotic analysis and justify the correctness of algorithms

IT1401.2 Describe the divide-and-conquer paradigm and explain when an algorithmic design
situation calls for it. Synthesize divide-and-conquer algorithms. Derive and solve
recurrence relation

IT1401.3 Describe the greedy paradigm and explain when an algorithmic design situation calls for
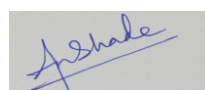it. For a given problem develop the greedy algorithms

IT1401.4 Describe the dynamic-programming paradigm and explain when an algorithmic design
situation calls for it. For a given problems develop the dynamic programming algorithms,
and analyze it to determine its computational complexity

IT1401.5 Develop ability to identify weather given problem is NP-Complete or not, and develop
efficient algorithm that gives good solution

Assessment Table

Assessment Tool	Course Outcome				
	CO1	CO2	CO3	CO4	CO5
Class Test1(15M)	10M	05M			
Class Test2(15M)			10M	05M	
TA (10M)	02M	02M	02M	02M	02M
ESE (60M)	12M	12M	12M	12M	12M

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Teacher's Assessment

- NPTEL/Infosys SpringerBoard based Assignment

- Viva

- Mini Projects

- Presentations

- Spoken Tutorials

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1401.1	3	1	2	0	1	0	0	0	0	1	1	1	1	3	2
IT1401.2	3	1	1	0	2	0	0	0	0	1	1	1	1	3	2
IT1401.3	3	1	1	0	2	0	0	0	0	1	1	1	1	3	2
IT1401.4	3	1	1	0	2	0	0	0	0	1	1	1	1	3	2
IT1401.5	3	1	1	0	1	0	0	0	0	1	1	1	1	3	2

2- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated
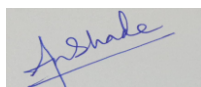
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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1402						Course category		PC9
Course Name	OPERATING SYSTEMS								
Teaching Scheme				**Examination Scheme**					**Credits**
Th	Tu	Pr	Total	Theory				Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

COURSE OBJECTIVES

1. To understand the mechanisms of operating system and the functions performed by the OS.
2. To impart the concept of processes and threads concept. Perform operations on processes and threads.
3. To learn the mechanisms involved in memory management in OS.
4. To gain knowledge on distributed operating system concepts, Mutual exclusion algorithms, deadlock detection algorithms.
5. To enable the students to write scheduling algorithms.
6. To understand the components and management aspects of file management.

Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS-Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine.

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads, Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR.

Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

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Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging. Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

I/O Hardware: I/O devices, Device controllers, Direct memory access, Disk structure, Disk scheduling algorithms File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN.

Text books

1. Avi Silberschatz, Peter Galvin, Greg Gagne, "Operating System Concepts Essentials", 9th Edition, Wiley Asia Student Edition.

2. William Stallings, "Operating Systems: Internals and Design Principles", 5th Edition, Prentice Hall of India.

Reference books

1. Charles Crowley, "Operating System: A Design-oriented Approach", 1st Edition, Irwin Publishing.

2. Gary J. Nutt, "Operating Systems: A Modern Perspective", 2nd Edition, Addison Wesley.

3. Maurice Bach, "Design of the Unix Operating Systems", 8th Edition by Prentice-Hall of India.

4. AchyutGodbole and AtulKahate, "Operating Systems", 3rd Edition, McGraw Hill Publication.

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Online Resources

1. NPTEL: IIT Kharagpur

    https://archive.nptel.ac.in/courses/106/105/106105214/https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

2. NPTEL IIT Delhi-https://archive.nptel.ac.in/courses/106/102/106102132/#

COURSE OUTCOMES

At the end of the course, the students will be able to
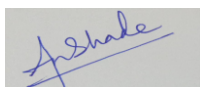
IT1402.1	Explain operating system concepts.
IT1402.2	Represent process management and inter-process communication.
IT1402.3	Design an algorithm for CPU scheduling.
IT1402.4	Apply virtual machine use in dual booting.
IT1402.5	Investigate the role of file system and disk scheduling in operating system performance.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1402.1	2	2	1	0	0	0	0	0	0	0	0	1	2	3	1
IT1402.2	3	2	3	0	1	0	0	0	0	0	0	1	3	3	1
IT1402.3	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
IT1402.4	3	3	3	0	2	0	0	0	0	0	0	1	3	3	1
IT1402.5	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1

Course Code	IT1403					Course category			PC10
Course Name	**DATABASE MANAGEMENT SYSTEMS**								

Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

Course Objectives

1. Analyze database requirements and determine the entities involved in the system and their relationship to one another.
2. Design ER-models to represent simple database application scenarios
3. Devise queries using Relational Algebra, Relational Calculus and SQL
4. To be familiar with basic database storage structures
5. Develop an understanding of essential DBMS concepts such as: database integrity, concurrency

Database system architecture: Introduction to database management system, Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).

Data models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

Relational query languages: Relational algebra, tuple and domain relational calculus, SQL and QBE.

Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms (1NF,2NF,3NF), Dependency preservation, Lossless design.

Query processing and optimization: Forms of a basic SQL query Evaluation of relational algebra expressions, Query equivalence, Join strategies.

Storage structures: Indices, B-trees, hashing.

Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery, Functional dependency.

Text books:

1. "Database System Concepts", 5th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.

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2. "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education

Reference books:

1. "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.

2. "Database Management Systems", Raghu Ramakrishnan, Mcgraw-Hill Education

3. "Fundamentals of Database Systems", By: Elmasri and Navathe, 4th Edition Practical PostgreSQL O'REILLY

Useful link:

https://nptel.ac.in/courses/106105175/, IIT Kharagpur

https://nptel.ac.in/courses/106106093/,IIT Madras

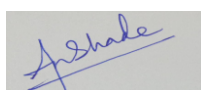https://nptel.ac.in/content/storage2/courses/106106095/pdf/1_Introduction.pdf

Course outcomes

IT1403.1   Design E-R Model for given requirements and convert the same into database tables and normalization.

IT1403.2   Create databases in an RDBMS and enforce data integrity constraints using SQL.

IT1403.3   Solve real world problems using appropriate set, function, and relational models.

IT1403.4   Understand the principles of storage structure and recovery management.

IT1403.5   For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.

IT1403.6   Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1403.1	2	2	3	0	0	0	0	0	0	3	0	3	1	3	1
IT1403.2	2	2	1	0	0	0	0	0	0	0	0	1	2	3	1
IT1403.3	3	2	1	0	0	3	0	2	0	0	0	3	0	2	2
IT1403.4	1	2	3	0	0	0	1	0	0	2	0	1	2	0	2
IT1403.5	1	1	2	0	0	0	0	0	0	0	0	2	1	1	3

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Course Code	IT1404					Course category			PC10
Course Name	COMPUTER NETWORK								

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

COURSE OBJECTIVES

1. To develop an understanding of modern network architectures from a design and performance perspective.

2. To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).

3. To provide an opportunity to do network programming

4. To provide a WLAN measurement ideas.

Data Communication Components: Data Communication System and its components, Data Flow, Computer network and its goals, Representation of data and its flow Networks , Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA
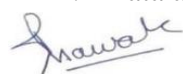
Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm
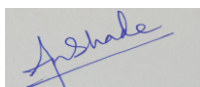
Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Basic concepts of SSL, Firewalls, Basic concepts of Cryptography.

Text Books:

1. Data Communication and Networking, Behrouz A. Forouzan, McGrawHill. 4th Edition.

2. Data and Computer Communication, William Stallings, Pearson Prentice Hall India, 8th

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Edition. Reference Books:

References Book

1. Computer Networks, Andrew S. Tanenbaum, Pearson New International Edition, 8 th Edition.

2. Internetworking with TCP/IP, Douglas Comer, Prentice Hall of India, 6th Edition.

3. TCP/IP Illustrated, W. Richard Stevens, Addison-Wesley, United States of America.

COURSE OUTCOMES

On completion of the course, students will be able to:

IT1404.1   Interpret the functions of the different layer of the OSI Protocol.

IT1404.2   Draw the functional block diagram of wide-area networks (WANs), local area

networks (LANs) and Wireless LANs (WLANs) describe the function of each block.

IT1404.3   Demonstrate design concept for a given requirement (small scale) of wide-area

networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).

IT1404.4   Apply solution to problems related TCP/IP protocol.

IT1404.5   Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP),   WWW,

HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.
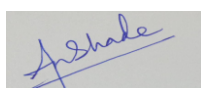
CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1404.1	2	2	0	0	0	0	0	0	0	0	0	0	0	3	0
IT1404.2	2	2	0	0	3	0	0	1	0	0	0	0	0	2	0
IT1404.3	2	3	0	1	3	0	0	0	0	0	0	0	0	3	1
IT1404.4	2	3	2	1	3	2	0	1	0	0	0	0	1	2	2
IT1404.5	3	1	0	0	3	0	0	0	0	0	0	0	0	2	3

0-Not correlated1 - Weakly Correlated 2- Moderately Correlated   3- Strongly Correlated

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Course Code	IT1405								Course category		VSE3
Course Name	COMPUTER NETWORK LAB										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
--	--	--	--	--	--	--	--	--	25	25	50	01

Course Objective:

Students will be able to

1. Use simulation tools
2. Understand the various protocols
3. Implement the various protocols
4. To analyse various routing algorithms.

Minimum Eight Experiments to be performed to achieve course outcomes. It is a representative list of practical/exercises. The instructor may choose experiments to fulfil the course outcomes.

List of Experiments Using **NetSim**

1. Introduction and Installation ofNetSim simulation software
2. Understanding Measures of Network Performance:Throughput and Delay
3. Implementation of Stop and Wait Protocol and Window Protocol.
4. Understanding working of ARP and IP Forwarding within a LAN and across a router
5. Simulate and study the spamming tree protocol
6. Study of Socket Programming and Client – Server model. Create a socket for HTTP for web page upload and download.
7. Write a program to implement RPC (Remote Procedure Call)
8. Understanding Public IP Address & NAT (Network Address Translation)
9. Understanding the working of basic networking commands (Ping, Route. Add/Delete, ACI)
10. Introduction to TCP connection management
11. Reliable data transfer with TCP
12. TCP Congestion Control Algorithms

ICA – The Internal Continuous Assessment shall be based on practical record and knowledge or skills acquired. The performance shall be assessed experiment wise by using continuous assessment format, A & B.

ESE- The End Semester Exam for Practical shall be based on performance in one of the experiments and may be followed by sample questions.

Ex:-Write a code for simulating ARP /RARP protocols.

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Course Outcomes: On completion of the course,

Students will be able to:

   IT1405.1   Use simulation tools
   IT1405.2   Understand the various protocols
   IT1405.3   Implement the various protocols
   IT1405.4   Analyse various routing algorithms

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1405.1	3	2	0	0	2	0	0	0	0	0	0	0	0	2	1
IT1405.2	2	2	0	0	2	0	0	0	0	0	0	0	0	2	1
IT1405.3	2	2	0	0	3	0	0	0	0	0	0	0	0	2	1
IT1405.4	2	2	0	0	3	0	0	0	0	0	0	0	0	2	2

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Course Code	SH1401A								Course Category		OE1
Course Name	Appreciating Indian Music										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical	Total	
				CT-1	Ct-2	TA	ESE	ESE Duration	ICA	ESE	
03	-	-	03	15	15	10	30	2 hrs 30 min	-	-	100	03

Course Objectives:
1. To familiarize students with the historical and cultural context of Indian Classical Music.
2. To introduce students to the fundamental concepts of raga, tala, and improvisation.
3. To develop students' listening skills through analysis and appreciation of classical music recordings.
4. To provide students with practical training in basic vocal or instrumental techniques.
5. To encourage critical thinking and reflection on the aesthetic and philosophical aspects of Indian Classical Music.

Course Contents:

Introduction to Indian Music:
Historical overview: origins, evolution, and major developments, definitions (sangeet, swar and its types, saptak and its types, aroha, aavaroha, pakad, alankar, wadi swar, sanvadi swar,varjit swar, sthayi and antara) Regional variations and prominent classical music traditions (Hindustani and Carnatic). Influence of spirituality, mythology, and philosophy on Indian Classical Music.

Fundamentals of Raga:
Understanding the concept of raga (melodic framework) and its elements, Notation systems and the role of improvisation within the framework of raga (Paluskar and Bhatkhande lipi), Different THAATs and their brief information, Definition of Raga, Sargam geet, the concept of Khyal , aalap and tana, Raga and Time Association, Basic ragas (Bhupali, Yaman, Bhimpalasi and Kedar) along with Aaroha, avaroha, pakad and sargam geet and khyal.

Introduction to Taala:
Understanding the components of a tala cycle (Defining- Taal, Lay and its types, matras, theaka, sum,tali, kaal, avartan).
Study of common talas (Teental, Rupak, Kehrarva, Dadra and Bhajni Theaka)
Practical exercises in clapping and counting rhythms to internalize talas.

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Introduction to Musical Instruments:
Classification of Indian Musical Instruments (String, wind, percussion and Solid Instruments), components parts of Indian classical instruments along with neat sketch
Biography- Ustad Zakir Husen (Tabla), Pandit Appa Jalgaokar (Harmonium)
Pandit Ravi Shankar (Sitar), Pandit Hari Prasad Chaurasiya (Flute), Dr. N Rajam (Violin)

Textbooks:
1. Indian Classical Music By Ravi S. Prasanna
2. Appreciating Indian Music By Emmons E. White
3. Fundamental of Indian Music By. S. Sharma.

References:
1. Indian Music By Dr. Thakur J. Sing

2. Finding the Raga By Amit Choudhari.

3.History of Indian Music By B. A. Pingle

4. Raga Harmony By L. Subramaniam

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

SH1401A.1: Students will demonstrate an understanding of the historical development and cultural significance of various genres and styles of Indian music.
SH1401A.2: Students will understanding classical, folk, and contemporary forms, by discussing key historical milestones and movements.
SH1401A.3: Students will be able to applying knowledge of musical elements such as raga, tala, swara, and laya to identify stylistic features, structural patterns, and aesthetic qualities.
SH1401A.4: Students will develop skills and competencies relevant to careers in music education.
SH1401A.5: Students will develop skills and competencies relevant to research, arts administration, cultural advocacy, or related fields, preparing them for further academic pursuits or professional endeavors in the music industry.
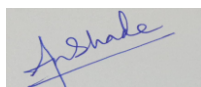
CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
SH1401A.1	1	0	0	0	0	1	2	2	3	0	0	0	1	0	2
SH1401A.2	1	0	0	0	0	1	2	2	3	0	0	0	1	0	2
SH1401A.3	1	0	0	0	0	1	2	2	3	0	0	0	1	0	2
SH1401A.4	1	0	0	0	0	1	2	2	3	0	0	0	1	0	2
SH1401A.5	1	0	0	0	0	1	2	2	3	0	0	0	1	0	2

0 - Not correlated   1 - Weakly Correlated   2- Moderately Correlated 3- Strongly Correlated

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Course Code	SH1401B							Course Category			OE1
Course Name	**Introduction to Human Psychology**										

Teaching Scheme				Examination Scheme								Credits
				Theory					Practical		Total	
Th	Tu	Pr	Total	CT-1	CT-2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30 min	-	-	100	03

Course Objectives:

To make the students will be able to:

1. Understand the human behaviour.

2. Helps humans in exerting more control over situations

3. Basic cognitive processes that guide human behaviours.

4. Tackling everyday problems and attaining optimal solutions

5. Knowledge about human cognitive systems in designing sophisticated Artificial

Intelligence (AI) systems.

Course Contain:

Introduction to Cognitive Psychology:
- History,
- Theory
- Research in Human Cognition

Basic Cognitive Processes:
- Object Perception and Recognition
- Attentional Processes and cognition
- Memory Introduction
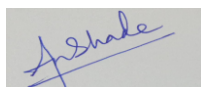- Long Term Memory

Organizational Knowledge:
- Memory of general knowledge.
- Concept Formation
- Visual and Spatial Memory

The Use of Knowledge:
- Human language skills.
- Thought process and Problem Solving

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- Reasoning
- Decision Making

Textbooks:

1. Kathleen Galotti, Cognitive Psychology, Cengage Learning.
2. Robert Stenberg, Applied Cognitive Psychology, Cengage Learning.

References:

1. Bridger Riegler, Cognitive Psychology, Pearson Press
2. Stephen Kosslyn, Cognitive Psychology, PHI Press

Course Outcomes:

At the end of this course, students will demonstrate the ability to

SH1401B.1 To learn history of Human Psychology.

SH1401B.2 To understand, theory and research in Human Psychology.

SH1401B.3 To learn the Basic Cognitive Processes.

SH1401B.4 To understand about Organizational Knowledge.

SH1401B.5 Apply the knowledge of human Psychology to developed process of problem
solving, reasoning, decision making.
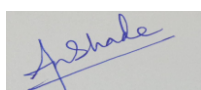
CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
SH1401B.1	2	3	0	0	0	0	0	1	2	0	0	0	3	1	2
SH1401B.2	2	0	0	0	0	0	0	1	2	0	0	0	2	1	1
SH1401B.3	2	2	0	0	0	0	0	1	2	0	0	0	2	1	1
SH1401B.4	2	0	0	0	0	0	0	1	2	0	0	0	2	1	1
SH1401B.5	2	2	0	0	0	0	0	1	2	0	0	0	2	1	1

0 - Not correlated   1 - Weakly Correlated   2- Moderately Correlated 3- Strongly Correlated

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Course Code	SH1401C							Course Category			OE1
Course Name	Nanotechnology, Science and Application										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical	Total	
				CT-1	Ct-2	TA	ESE	ESE Duration	ICA	ESE	
03	-	-	03	15	15	10	60	2 hrs. 30 min	-	-	20	00

Course Objectives:

Students will be able to:
1. To understand the history, background and nature of Nano science and nanotechnology as well as the quantum and Nano sized scale effect on materials.
2. To acquire theoretical understanding of different types of nanostructure
3. To understand the synthesis technique and its types.
4. To learn the different methods of characterization.
5.Aim to approach towards advance research and application of nanoparticals.

Course Contents:

Basics of Nanoscience: Introduction, Effect of reduction of dimensions on physical properties, History of Nanotechnology, Quantum size effect,

Different classes of Nanomaterial's:
Classification based on dimensionality-Quantum Dots, Wells and Wires, preparation of quantum nanostructures, conduction electrons and dimensionality, Fermi gas and density of states, potential wells, partial confinement, properties dependent on density of states, exitons, single electron tunnelling.

Material Synthesis Method:
Nanostructures of one dimension: Crystalline growth, Template based synthesis. Nanostructures of two dimensions: Fundamentals of thin film growth, physical vapour deposition, chemical vapour deposition, atomic layer deposition, self-assembly, Sol-Gel films, and electrochemical deposition.

Material Characterization Methods:
UV visible microscopy, Scanning electron microscopy (SEM), Transmission electron microscope (TEM), x-ray diffraction (XRD). Atomic Force Microscope (AFM)

Application of Nanomaterial's: Agriculture field, Medical field, Space Technology, Food

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Technology, Water Treatment, Energy Sector, Automobile, Electronics Field, Textile Field, Cosmetic.

Textbooks:
1. Introduction to Nanotechnology by C.P. Poole Jr. and F.J. Oweus, Wiley Interscience
2. Nano-Technology by Gregory Timp (Editior), AIP Press, Springer.
3. Pradeep T., "A Textbook of Nanoscience and Nanotechnology", Tata McGraw Hill Education Pvt. Ltd.

Reference Books and website links:
1. Hari Singh Nalwa, "Nanostructured Materials and Nanotechnology", Academic Press
2. Graphene: Synthesis and applications, edited by Wonbong Choi and Jo-won Lee.
3. Semiconductor Nanostructures and Nanodevices Vol 1-5-A. A. Balandin, K. L.Wang.
4. Springer Handbook of Nanotechnology: Bharat Bhushan
5. Nanofabrication towards biomedical application: Techniques, tools, Application and impact: Ed. Challa S., S. R. Kumar, J. H. Carola
6. A. S. Edelstein and R. C. Cammarata, "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Pub., 1998.
7. G. Cao, Nanostructures & Nanomaterials: Synthesis, Properties & Applications , Imperial College Press, 2004.
8. G.A. Ozin and A.C. Arsenault, "Nano chemistry : A chemical approach to nanomaterials", Royal Society of Chemistry, 2005.
9. Joel I. Gersten, "The Physics and Chemistry of Materials", Wiley, 2001.
10. K.W. Kolasinski, "Surface Science: Foundations of Catalysis and Nanoscience", Wiley, 2002.
11. Physical Chemistry – Atkins Peter, Paula Julio.
12. Nanotechnology in Biology and Medicine: Methods, Devices, and Applications.

Course Outcomes:
On completion of the course, students will be able to:
SH1401C.1: To learn basic of Nano science with special, emphasize on nanomaterial's.
SH1401C.2: Correlate physical behavior of materials at the Nano scale.
SH1401C.3: Understand the physical, chemical and other important methods for synthesis of nanoparticles.
SH1401C.4: Understand the various characterization techniques of Nano materials.
SH1401C.5 Apply the knowledge gained to suggest different applications of Nano science and technology.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
SH1401C.1	2	0	2	0	0	0	0	0	1	2	2	3	2	2	1
SH1401C.2	3	2	3	0	2	0	2	0	0	3	2	3	2	2	1
SH1401C.3	3	2	3	2	0	0	3	3	1	3	3	3	2	2	1
SH1401C.4	3	2	3	2	2	0	2	0	0	3	3	3	2	2	1
SH1401C.5	3	2	3	2	2	0	3	1	0	3	3	3	2	2	1

0 - Not correlated   1 - Weakly Correlated   2 - Moderately Correlated   3 - Strongly Correlated
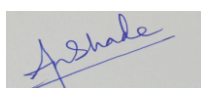
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Member Secretary	BoS Chairperson	Dean Academics	Principal

(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1407								Course category		PC12

| Course Name | **OPERATING SYSTEMS LAB** |

Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
--	--	--	--	--	--	--	--	--	25	25	50	01

Course Objective

1. To expose students with the working of operating system.
2. Enable to demonstrate the process, memory, file and directory management issues of operating system.
3. To introduce LINUX basic commands for operating system concepts.
4. To motivate students to write simple programs in LINUX.

Suggested List of Experiments/Assignments but not limited to the given list of experiments:

(Note: a. Experiments/assignments can be given to students by the instructor as per current scenario of workability and availability of the technology with a flexibility of students' choice in selecting the experiments from the given list. b. Experiments aim can be updated or modified or scaled up as per the requirements of the lab sessions and can be chosen from the reference websites.)

List of Experiment preferably 8 to 10

1. Basic Concepts : Introduction to Linux Operating System , basic commands in Linux and Writing shell scripts in Vi Editor.
2. Process Management:

   i)Use **ps**to search for the **init**process by name.

   ii) What is the **process id** of the **init**process?

   iii) Use the **who am i**command to determine your terminal name.

   iv) Using your terminal name from above, use **ps**to find all processes associated with your terminal.

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v) What is the **process id** of your shell?

vi) What is the **parent process id** of your shell ?

vii) Start two instances of the **sleep 3342** in background.

viii) Locate the **process id** of all **sleep** commands.

ix)Display only those two **sleep** processes in **top**. Then quit top.

x)Use a **standard kill** to kill one of the **sleep** processes.

3.Process Priorities

i). Create a new directory and create six **pipes** in that directory.

ii). Bounce a character between two **pipes**.

iii). Use **top** and **ps**to display information (pid, ppid, priority, nice value, ...) about these two cat processes.

iv). Bounce another character between two other pipes, but this time start the commands **nice**. Verify that all **cat** processes are battling for the cpu. (Feel free to fire up two more cats with the remaining pipes).

V. Use **ps**to verify that the two new **cat** processes have a **nice** value. Use the -o and – C options of **ps**for this.

vi). Use **renice**te increase the nice value from 10 to 15. Notice the difference with the usual commands.

4.Disk partitions

i). Use **fdisk -l** to display existing partitions and sizes.

ii). Use **df -h** to display existing partitions and sizes.

iii). Compare the output of **fdisk**and **df**.

iv). Create a 200MB primary partition on a small disk.

v). Create a 400MB primary partition and two 300MB logical drives on a big disk.

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vi). Use **df -h** and **fdisk -l** to verify your work.

vii). Compare the output again of **fdisk**and **df**. Do both commands display the new partitions?

viii). Create a backup with **dd**of the **mbr**that contains your 200MB primary partition.

ix). Take a backup of the **partition table** containing your 400MB primary and 300MB logical drives. Make sure the logical drives are in the backup.

x). Remove all your partitions with fdisk. Then restore your backups.

5. Logical Volume Management:

i). Create a volume group that contains a complete disk and a partition on another disk.

ii). Create two logical volumes (a small one and a bigger one) in this volume group. Format them with ext3, mount them and copy some files to them.

6.File systems

i). List the file systems that are known by your system.

ii).Create an**ext2** file system on the 200MB partition.

iii).Create an**ext3** file system on one of the 300MB logical drives.

iv).Create an**ext4** on the 400MB partition.

v).Set the reserved space for root on the ext3 file system to 0 percent.

vi).Verify your work with **fdisk**and **df**.

vii).Perform a file system check on all the new file systems.

7.Scheduling

i). Schedule two jobs with **at**, display the **at queue** and remove a job.

ii). As normal user, use **crontab -e** to schedule a script to run every four minutes.

iii). As root, display the **crontab** file of your normal user.

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iv). As the normal user again, remove your **crontab** file.

v). Take a look at the **cron**files and directories in **/etc** and understand them. What is the **runparts**command doing ?

8. Memory Management

i). Use **dmesg**to find the total amount of memory in your computer.

ii). Use **free** to display memory usage in kilobytes (then in megabytes).

iii). On a virtual machine, create a swap partition (you might need an extra virtual disk for this).

iv). Add a 20 megabyte swap file to the system.

v). Put all swap spaces in **/etc/fstab**and activate them. Test with a reboot that they are mounted.

vi). Use **free** to verify usage of current swap.

Course Outcomes

IT1407.1   Implement various commands using open source system of Linux.

IT1407.2   Create simple shell scripts and develop experiments using Linux

IT1407.3   Understand configuration of virtual machine.
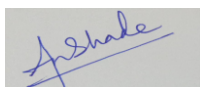
IT1407.4   To be able to explain scheduling in operating system.

CO-PO-PSO MAPPING

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1407.1	3	2	0	0	2	0	0	0	0	0	0	0	0	2	1
IT1407.2	2	2	0	0	2	0	0	0	0	0	0	0	0	2	1
IT1407.3	2	2	0	0	3	0	0	0	0	0	0	0	0	2	1
IT1407.4	2	2	0	0	3	0	0	0	0	0	0	0	0	2	2

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Course Code	IT1408						Course category		VSE4
Course Name	DATABASE MANAGEMENT SYSTEM LABORATORY								
Teaching Scheme				**Examination Scheme**					**Credits**
Th	Tu	Pr	Total	Theory				Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
--	--	--	--	--	--	--	--	--	25	25	50	01

Course Objectives:

1. Develop the logical design of the database using data modeling concepts such as entity relationship diagrams.

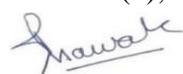2. Be able to understand basic database concepts, applications, data models, schemas and instances.

3. To demonstrate the use of constraints and utilize a wide range of features available in a DBMS package.

4. Manipulate a database using SQL.

Suggested List of Experiments/Assignments but not limited to the given list of experiments:

(Note: a. Experiments/assignments can be given to students by the instructor as per current scenario of workability and availability of the technology with a flexibility of students' choice in selecting the experiments from the given list. b. Experiments aim can be updated or modified or scaled up as per the requirements of the lab sessions and can be chosen from the reference websites.)

Software to be used SQL/NoSQL for implementation

1. Student should decide on a case study and formulate the problem statement.

2. Conceptual designing using ER diagrams (identifying entities, attributes, keys and relationships between entities, cardinalities, generalization, specialization etc.

3. To execute and verify the data definition language commands 1. create 2. alter 3. drop 4. truncate 5. comment 6. rename

4. Create table employee(empno number (4) primary key, ename varchar2 (10), job varchar2(6), sal number (5), deptno number (7)) ;operate following queries on employee

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table: 1) write a query to add a new column in to employee 2) write a query to add multiple columns in to employee

5. To execute and verify the dml and tcl language commands dml (data manipulation language) 1. select 2. insert 3. delete 4. Update

6. Normalization -to remove the redundancies and anomalies in the above relational tables, normalize up to third normal form.

7. To execute and verify the dcl language commands tcl (transaction control language) 1. commit 2. roll back 3. Savepoint

8. To execute and verify the sql commands for nested queries.

9. To execute and verify the sql commands using join queries.

10. To execute and verify the sql commands for views.

11. To write a pl/sql block using different control (if, if else, for loop, while loop.) statements.

12. Mini Project

Course Outcomes:

At the end of the course the students are able to:

IT1408.1   Use the basics of SQL and construct queries using SQL in database creation and interaction.

IT1408.2   Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
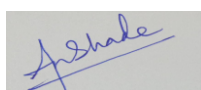
IT1408.3   Formulate, using SQL, solutions to a broad range of query and data update problems

CO-PO-PSO MAPPING

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1408.1	3	2	2	0	2	1	1	1	2	1	2	1	1	2	2
IT1408.2	2	2	2	0	2	1	1	1	2	1	2	1	1	2	2
IT1408.3	2	2	2	0	3	1	1	1	2	1	2	1	1	2	2

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Course Code	IT1501								Course category		PC	
Course Name	**INTERNET OF THINGS**											
Teaching Scheme				**Examination Scheme**								**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

Course Objectives

Aim of the subject is to;

1. Understand general concepts of Internet of Things (IoT).
2. Recognize various devices, sensors and applications.
3. Apply design concept to IoT solutions.
4. Analyse various M2M and IoT architectures.
5. Evaluate design issues in IoT applications.

Introduction to IoT: Overview of Internet of Things, building blocks of IoT, characteristics of IoT systems and IoT levels. IoT and M2M, IoT design methodology, Technology Considerations- IoT Problem Statement, IoT, Technology Enablers, IoT Technology Stack, IoT, Data Considerations, IoT Projects, Introduction to Complexity, IoT Challenges, future of IoT, Applications of IoT, Advantages of IoT.

Retail, Healthcare & Agriculture, IoT Architecture: Reference Architecture, Study and usage of various types of sensors and actuators, IoT devices, gateways.

IoT Physical Devices & Endpoints: Microprocessor, Microcontroller, Microcomputer hardware and software concepts. Study and usage of Prototyping boards like, Arduino, Intel Edison, Raspberry pi etc. (from software and hardware perspective) programming using sketches and python. Other programming languages used for IoT. A generic design methodology for Internet of Things.

Communication: Introduction to communication architecture- Network protocol stack, Different protocols: RF: ZigBee, Blue Tooth, BLE, Z-wave, Mesh network. Communication Channels: GSM/GPRS, 2G, 3G, LTE, Wi-Fi, IoT protocols: MQTT/MQTTS, CoAP, 6LoWPAN, like TCP, UDP, HTTP/S., Comparison of the different IoT protocols.

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Application issues with RF protocol: Power consumption, LOS, reliability. Security aspects. Showcase the GSM module, Cloud platform and framework for developing IoT: An introduction to the use of cloud platforms and frameworks for developing IoT applications. Data Analytics for IoT Cloud. Case studies of successful IoT deployments, Industry best practices for IoT development, Future trends in IoT.

Text Books:

1. Internet of Things: A Hands-on Approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2015.

Reference Books:

1.   Getting Started with Intel Edison, Stephanie Moyerman, Published by Maker Media, Inc., San Francisco, 2016. CA 94111.

2.   Internet of Things (A Hands-on Approach), Vijay Madisetti and Arshdeep Bahga, 1st Edition, VPT, 2014

Course Outcomes:

Students will be able to;

IT1501.1   Understand general concepts of Internet of Things (IoT)

IT1501.2   Recognize various devices, sensors and applications

IT1501.3   Apply design concept to IoT solutions

IT1501.4   Analyse various M2M and IoT architectures

IT1501.5   Evaluate design issues in IoT applications

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1501.1	3	0	0	0	0	2	0	0	0	0	0	0	1	2	1
IT1501.2	1	2	0	0	0	1	2	0	0	1	0	0	3	3	1
IT1501.3	1	0	3	0	2	0	1	0	0	0	1	0	2	3	2
IT1501.4	0	3	0	0	3	3	1	0	0	2	2	0	1	2	2
IT1501.5	0	2	0	0	0	2	0	3	0	0	0	0	2	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1501.1	3	0	0	0	0	2	0	0	0	0	0	1	2	1
IT1501.2	1	2	0	0	0	1	2	0	0	1	0	3	3	1
IT1501.3	1	0	3	0	2	0	1	0	0	0	1	2	3	2
IT1501.4	0	3	0	0	3	3	1	0	0	2	2	1	2	2
IT1501.5	0	2	0	0	0	2	0	3	0	0	0	2	2	3

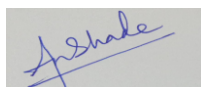0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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Course Code	IT1502						Course category		PC
Course Name	**FORMAL LANGUAGES & AUTOMATA THEORY**								
Teaching Scheme				**Examination Scheme**					**Credits**
Th	Tu	Pr	Total	Theory					
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	Total	
02	--	--	02	15	15	10	60	02 hrs 30 min	--	--	100	02

Course Objectives

Aim of the subject is to;

1. Model the Language acceptors like Finite Automata for Regular Language and Push Down Automata for Context Free Language.
2. Understand formal languages like Regular Language and Context Free Language.
3. Interpret Grammar, Languages and their relationships.
4. Design of Automata as language descriptors and recognizers.

Finite Automata: Alphabet, Language, Operations, Finite state machine, definitions, Finite automation model, Acceptance of strings and languages. Non deterministic finite automation, deterministic finite automation, equivalence between NFA and DFA, Conversion of NFA into DFA, minimization of FSM, equivalence between two FSM's, Moore and Mealy machines.

Regular expressions: Regular sets, regular expressions, identity rules, Manipulation of regular expressions, equivalence between RE and FA, inter conversion, pumping lemma, Closure properties of regular sets.

Regular grammars: right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion between RE and RG

Context free grammar: derivation trees, Chomsky normal form, Greibach normal form, push down automata, definition, model, acceptance of CFL, equivalence of CFL and PDA, interconversion, enumeration of properties of CFL.

Turing machine: Definition, model, design of TM, computable functions, recursive enumerable language, Church's hypothesis, counter machine, types of TM's, Chomsky hierarchy of languages, linear bounded automata and context sensitive language, introduction of DCFL and DPDA, LR (O), grammar, decidability of problems.

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Undecidability: properties of recursive & non-recursive enumerable languages, universal Turing machine, post-correspondence problem, introduction to recursive function theory.

Text Books:

1. Introduction to Automata Theory, Languages and Computation, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, 3rd Edition, Addison-Wesley Publishing Co.,2007.
2. An Introduction to Formal Languages and Automata by Peter Linz,4th Edition, Jones & Bartlett Publication, 2006.

Reference Books:

1. Introduction to Languages and the Theory of Automata, John C. Martin, 2nd Edition, McGraw-Hill Publication, 2003.
2. Elements of Theory of Computation, Lewis H.P. and Papadimition C.H., 2nd Edition, Prentice Hall Publication, 1997.

Course Outcomes:

Students will be able to;

IT1502.1. Understand the fundamental concepts of Formal Languages and Automata.

IT1502.2. Apply the knowledge of Automata Theory, Grammars & Regular Expressions for

  solving various problems.

IT1502.3. Understand the concept of context free languages and Design CFG's and PDA

  for given language.

IT1502.4. Apply different Turing machines techniques to solve problems.

IT1502.5. Analyse automata and their computational power to recognize languages.
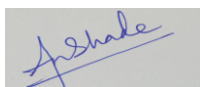
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CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1502.1	3	2	0	0	3	0	0	0	0	0	0	0	0	2	1
IT1502.2	2	2	0	0	3	0	0	0	0	0	0	0	0	2	2
IT1502.3	2	2	0	0	3	0	0	0	0	0	0	0	0	2	1
IT1502.4	2	2	3	0	3	0	0	0	0	0	0	0	0	2	1
IT1502.5	2	2	3	0	3	0	0	0	0	0	3	0	0	2	2

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1502.1	3	2	0	0	3	0	0	0	0	0	0	0	2	1
IT1502.2	2	2	0	0	3	0	0	0	0	0	0	0	2	2
IT1502.3	2	2	0	0	3	0	0	0	0	0	0	0	2	1
IT1502.4	2	2	3	0	3	0	0	0	0	0	0	0	2	1
IT1502.5	2	2	3	0	3	0	0	0	0	0	3	0	2	2

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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Course Code	IT1503								Course category		PC
Course Name	ARTIFICIAL INTELLIGENCE										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

Course Objectives

Aim of the subject is to;

1. Gain a historical perspective of AI and its foundations
2. Become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
3. Investigate applications of AI techniques in intelligent agents, expert systems and other machine learning models.

Introduction: Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, AI ethics and societal impact of AI, Ethical considerations in AI development and deployment, Bias in AI algorithms and data, privacy and security issues in AI.

Knowledge Representation & Reasoning: Syntax and semantics for propositional logic, Syntax and semantics for first order logic, Forward & Backward chaining, Probabilistic reasoning, Hidden Markov Models (HMM), Bayesian Networks, Intelligent Agents.

Knowledge organization and manipulation: Preliminary concept, Examples of search problems, Uniformed and blind search. Informed search, Indexing and retrieval technique, integrating knowledge in memory, knowledge management system.

Knowledge Acquisition: General concept in knowledge acquisition, learning by induction, Analogical and explanation-based learning, reasoning for machine learning, AI vs Machine Learning vs Deep Learning vs Reinforcement Learning.

Expert system: Expert system architectures: Introduction, Applications of expert systems in various domains, Knowledge acquisition and validation, Knowledge system building tools, Case studies on various applications areas of AI in healthcare, agriculture, environment, education, smart-cities, cybersecurity, social-media, banking etc.

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Text Books:

1. Artificial Intelligence, P. H. Winston, 2nd Edition, Addison- Wesley Publication Company, 1984.
2. Introduction to Artificial Intelligence E. Cherniak and D. McDermott, 2nd Edition, Addison Wesley Publishing Company, 2002.

Reference Books:

1. Introduction to expert systems, Peter Jackson, 3rd Edition, Addison-Wesley Publishing Company, 1986.
2. Artificial Intelligence, E. Rich, K. K. Knight,2nd Edition, Tata McGraw Hill, New Delhi, 1991.
3. LISP-The language of Artificial Intelligence, F. Holtz, TAB Books Inc. 1985.
4. Principles of Artificial Intelligence & Expert Systems Development, D. W. Rolston, McGraw Hill, 1988.
5. First Course In Artificial Intelligence Artificial Intelligence: Concepts and Applications, Deepak Khemani, 1st Edition, McGraw Hill, 2017.
6. Artificial Intelligence: A Modern Approach (AIMA) - Stuart Russell and Peter Norvig, 4th Edition, Pearson Education, 2022.
7. Artificial Intelligence, Rajiv Chopra, 1st Edition, S. Chand Publication, 2012.

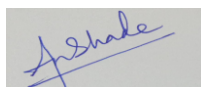**Course Outcomes:**

Students will be able to;

IT1503.1   Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
IT1503.2   Apply basic principles of AI in solutions that require problem solving, inference, perception.
IT1503.3   Apply basic principles of AI in knowledge representation, and learning.
IT1503.4   Demonstrate proficiency in applying scientific method to models of machine learning.
IT1503.5   Apply AI techniques to real-world problems to develop intelligent systems

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1503.1	3	2	0	2	0	0	1	0	0	2	2	2	1	3	1
IT1503.2	3	2	3	2	1	0	2	2	0	1	1	2	2	3	3
IT1503.3	3	2	0	2	0	0	1	0	0	2	2	2	1	3	1
IT1503.4	3	2	0	2	0	0	1	0	0	2	2	3	1	3	2
IT1503.5	3	3	3	2	2	2	2	1	1	1	2	3	3	3	3

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0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated
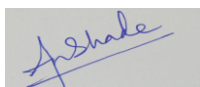
CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1503.1	3	2	0	2	0	0	1	0	0	2	2	1	3	1
IT1503.2	3	2	3	2	1	0	2	2	0	1	1	2	3	3
IT1503.3	3	2	0	2	0	0	1	0	0	2	2	1	3	1
IT1503.4	3	2	0	2	0	0	1	0	0	2	2	1	3	2
IT1503.5	3	3	3	2	2	2	2	1	1	1	2	3	3	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1504 (A)						Course category			PE	
Course Name	**SOFTWARE ENGINEERING (PROGRAM ELECTIVE – I (A))**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

Course Objectives

Aim of the subject is to;

1. Introduce advanced principles, methods and tools for software project management in realistic engineering context.
2. Improve students' ability to manage complex product and system development projects.
3. Imbibe a sense of role of IT in addressing the issues of real-life problems.
4. Introduce a systemic environment of team-work and influential leadership.
5. Give students an appreciation of inter and intra-company cross-functional coordination necessary to deliver successful projects.

Introduction: Software Project Management in a perspective of software industry, Organization and management of large software projects, modernizing project management: Introducing agile project management.

The communication in project: Managing Team Dynamics and Communication, Organization and team structures, choosing the right project team members, Influential leadership: concept and understanding, Ethics for IT professionals and IT users.

Project Planning and Project Scheduling: Project monitoring and control.

Software project evaluation and program management: Risk management and software quality, software reliability.
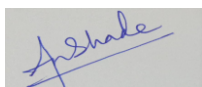
The impact of IT: on the quality of human life, standards of human living and productivity, health care, education, agriculture, environmental factors, digital divide, mobile and internet, case studies on various topics.

Text Books:

1. Software Engineering: A Practitioner's Approach, Roger Pressman, 6th Edition, Tata Mc. Hill Publication, 2011.

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2. Software Engineering, Ian Summerville, 10th Edition, Pearson Education, 2015.

Reference Books:

1. Schaum's Outline of Software Engineering, David Gustafson, 1st Edition, Tata Mc. Hill Publication, 2002.
2. Software Project Management, Sanjay Mohapatra, 1st Edition, Cengage Learning India Pvt Ltd, 2011.
3. Ethics in information Technology, George Reynolds, 5th Edition, Cengage Learning, 2017.
4. A Gift of Fire: Social, Legal and Ethical Issues, for Computing and the Internet, Sara Baase, PHI Publications,2012.
5. An integrated approach to Software Engineering, Pankaj Jalote, 1st Edition, Springer/Narosa, 2005.
6. Fundamentals of Software Engineering, Rajib Mall, 5th Edition, Prentice Hall India,2018.

Course Outcomes:

Students will be able to;

IT504(A).1. Decompose the given project in various phases of a lifecycle.

IT504(A).2. Choose appropriate process model depending on the user requirements.

IT504(A).3. Perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.

IT504(A).4 Know various processes used in all the phases of the product.

IT504(A).5 Apply the knowledge, techniques, and skills in the development of a software product.

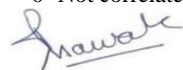**CO-PO-PSO Mapping as per NBA Jan-2016 Format:**

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1504(A).1	2	2	1	2	1	0	0	0	1	2	1	2	1	2	2
IT1504(A).2	1	2	3	2	3	0	0	1	2	1	1	3	2	3	3
IT1504(A).3	3	2	2	2	3	0	1	1	1	1	1	2	2	3	3
IT1504(A).4	2	2	0	2	3	1	0	0	1	1	2	3	3	3	3
IT1504(A).5	3	1	3	2	3	1	2	3	2	2	2	3	3	3	2

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated
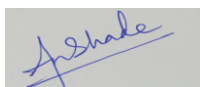
CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1504(A).1	2	2	1	2	1	0	0	0	1	2	1	1	2	2
IT1504(A).2	1	2	3	2	3	0	0	1	2	1	1	2	3	3
IT1504(A).3	3	2	2	2	3	0	1	1	1	1	1	2	3	3
IT1504(A).4	2	2	0	2	3	1	0	0	1	1	2	3	3	3
IT1504(A).5	3	1	3	2	3	1	2	3	2	2	2	3	3	2

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1504 (B)						Course category			PE	
Course Name	**FOUNDATION OF CRYPTOGRAPHY (PROGRAM ELECTIVE – I (B))**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

Course Objectives

Aim of the subject is to;

1. Understand the principles and practices of cryptographic techniques.
2. Understand information security goals for designing secure systems.
3. Apply security algorithms in solving real-life security problems in communicating systems.
4. Apply security to information over the network and world wide web.

Network and System Security: Understanding of Worms, Virus, Trojan Horse, Malwares, IP and Network Security, Web security Email Security, System Security, tools

Basics of Cryptography: Information Security understanding, Security goals, Security attacks, Security services, security mechanisms. Cryptographic Mathematics: Modular arithmetic, linear congruence, Algebraic structure, checking of primness, quadratic congruence

Classical Ciphers: Symmetric cipher model, substitution ciphers, transposition ciphers, steganography. Modern symmetric key ciphers: Modern block ciphers, modern stream ciphers, Data Encryption standard, advanced encryption standard, electronic code book mode, CBC, cipher feedback mode, output feedback mode

Public key cryptography: RSA, RSA proof, RSA attacks, ECC, Rabin cryptosystem, Key management: Diffie Hellman Key Exchange Algorithm

Message Authentication and Hash functions: Authentication requirements, functions, Message authentication codes (MAC), Hash functions, security of Hash functions. Hash algorithms, Digital Signatures: SHA- 512, Basics, digital signature standards

Secure Communication Protocols: SSL, TLS and IPSec.

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Text Books:

1. Cryptography and Network Security – Principles and Practice, 7th Edition, William Stallings, Pearson Education, 2017.
2. Cryptography and Network Security, Atul Kahate, 3rd Edition, Mc Graw Hill, 2017.

Reference Books:

1. Applied Cryptography, Bruce Scheneir, 20th Edition, John Wiley, 1996
2. Cryptography & Network Security, Behrouz Forouzan, 1st Edition, Mc-Graw Hill, 2007.

Course Outcomes:

Students will be able to;

IT1504(B).1. Apply security to information over the network and world wide web.

IT1504(B).2. Understand a variety of generic security threats and vulnerabilities.

IT1504(B).3. Identify & analyse particular security problems for given applications.

IT1504(B).4. Apply security algorithms in solving real-life security problems in communicating systems.

IT1504(B).5. Understand the principles and practices of cryptographic techniques.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1504(B).1	3	3	1	0	3	1	0	2	0	0	2	2	3	3	3
IT1504(B).2	0	0	0	0	0	0	3	0	0	0	0	2	2	1	2
IT1504(B).3	3	3	0	2	2	2	1	0	0	2	2	0	2	2	3
IT1504(B).4	2	2	2	0	3	3	0	2	0	1	2	2	2	3	3
IT1504(B).5	0	0	0	0	0	0	3	0	0	0	0	2	2	1	2

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1504(B).1	3	3	1	0	3	1	0	2	0	0	2	3	3	3
IT1504(B).2	0	0	0	0	0	0	3	0	0	0	0	2	1	2
IT1504(B).3	3	3	0	2	2	2	1	0	0	2	2	2	2	3
IT1504(B).4	2	2	2	0	3	3	0	2	0	1	2	2	3	3
IT1504(B).5	0	0	0	0	0	0	3	0	0	0	0	2	1	2

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1504 (C)						Course category			PE	
Course Name	**DATA ANALYTICS (PROGRAM ELECTIVE – I (C))**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

Course Objectives

Aim of the subject is to;

1. Explore the fundamental concepts of data analytics.
2. Understand descriptive, inferential and predictive data analytic techniques.
3. Find meaningful patterns in data.
4. Understand prescriptive data analytic techniques
5. Implement analytical algorithms.

Descriptive Statistics: Introduction to data analytics, Descriptive Statistics, Probability Distributions, Inferential Statistics through hypothesis tests Permutation & Randomization Test.

Regression and ANOVA: Regression, ANOVA (Analysis of Variance).

Machine Learning: Introduction and Concepts, differentiating algorithmic and model-based frameworks, Regression, Ordinary Least Squares, Ridge Regression, Lasso Regression, K Nearest Neighbours.

Unsupervised Learning and Challenges for Big Data Analytics: Clustering, Associative Rule Mining, Introduction to big data analytics, Challenges for big data analytics.

Prescriptive analytics: Creating data for analytics through designed experiments, creating data for analytics through Active learning, creating data for analytics through Reinforcement learning.
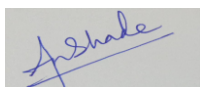
Data Visualization: Principles of Effective Data Visualization, Data Visualization Tools (Tableau, Power BI, Google Looker Studio, Qlik Sense) and creating Dashboards and Reports.

Text Books:

1. The elements of statistical learning, Hastie, Trevor, et al, Vol. 2. No. 1 New York: Springer, 2009.
2. Applied statistics and probability for engineers, Montgomery, Douglas C., and George C. Runger, John Wiley & Sons, 2010

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Reference Books:

1. Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series), Bart Baesens, John Wiley & Sons, 2014.

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

Course Outcomes:

Students will be able to;

IT1504(C).1. Understand the essentials of data analytics and the corresponding terminologies.
IT1504(C).2. Analyse the steps involved in the Analytics process.
IT1504(C).3. Identify meaningful patterns in data.
IT1504(C).4. Understand use of descriptive, predictive and prescriptive analytics.
IT1504(C).5. Simulate algorithms for data analytics.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1504(C).1	0	0	0	0	0	0	3	0	0	0	0	2	2	1	2
IT1504(C).2	3	3	0	2	2	2	1	0	0	2	2	0	2	2	3
IT1504(C).3	1	3	0	2	2	1	0	1	0	1	1	1	2	2	3
IT1504(C).4	0	0	0	0	0	0	3	0	0	0	0	2	2	1	2
IT1504(C).5	2	2	3	1	3	0	0	0	0	2	1	2	3	3	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated
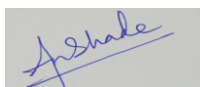
CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1504(C).1	0	0	0	0	0	0	3	0	0	0	0	2	1	2
IT1504(C).2	3	3	0	2	2	2	1	0	0	2	2	2	2	3
IT1504(C).3	1	3	0	2	2	1	0	1	0	1	1	2	2	3
IT1504(C).4	0	0	0	0	0	0	3	0	0	0	0	2	1	2
IT1504(C).5	2	2	3	1	3	0	0	0	0	2	1	3	3	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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Course Code	IT1505								Course category		PC	
Course Name	**ARTIFICIAL INTELLIGENCE LAB**											
Teaching Scheme				**Examination Scheme**								**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
--	--	02	02	--	--	--	--	--	25	25	50	01

Course Objectives

Aim of the subject is to;

1. Develop skills for designing and analysing AI based algorithms.
2. Enable students to work on various AI tools.
3. Provide skills to work towards solution of real-life problems

Minimum Eight Experiments to be performed to achieve course outcomes.

It is a representative list of practical/exercises. The instructor may choose experiments to fulfil the course outcomes.

List of Experiments:

1. Installation and working on various AI tools like: Python, R tool, GATE, etc.
2. Data preprocessing and annotation.
3. Learn existing datasets and Treebanks.
4. Searching techniques in AI.
5. Classification of linearly separable data with a perceptron
6. Classification of a 4-class problem with a perceptron
7. AI with Python – Supervised Learning: Classification
8. Support Vector Machines (SVM) Classifier.
9. Back propagation Algorithm
10. Case Study (Mini Project)

ICA – The Internal Continuous Assessment shall be based on practical record and knowledge or skills acquired. The performance shall be assessed experiment wise by using continuous assessment format, A & B.

ESE- The End Semester Exam for Practical shall be based on performance in one of the experiments and may be followed by sample questions.

Course Outcomes:

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Students will be able to;

IT1505.1. Simulate given problem scenario and analyse its performance.

IT1505.2. Develop programming solutions for given problem scenario.

IT1505.3. Apply AI based algorithms to solve real life problems.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1505.1	2	2	3	1	3	0	0	0	0	2	1	2	3	3	3
IT1505.2	2	2	3	0	3	0	2	0	0	0	2	3	2	3	3
IT1505.3	2	1	3	1	3	1	2	0	2	0	1	2	2	3	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1505.1	2	2	3	1	3	0	0	0	0	2	1	3	3	3
IT1505.2	2	2	3	0	3	0	2	0	0	0	2	2	3	3
IT1505.3	2	1	3	1	3	1	2	0	2	0	1	2	3	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1506								Course category		VSE
Course Name	**INTERNET OF THINGS LAB**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
--	--	02	02	--	--	--	--	--	25	25	50	01

Course Objectives

Aim of the subject is to;

1. Use Arduino Software (IDE).
2. Understand interfacing with Arduino.
3. Implement the various sensors applications.
4. Implement IoT applications for real life scenario.

Minimum Six Experiments to be performed to achieve course outcomes.

It is a representative list of practical/exercises. The instructor may choose experiments to fulfil the course outcomes.

1. Study and Installation of Arduino Software (IDE)
2. Controlling the Light Emitting Diode (LED) with a push button.
3. Interfacing the RGB LED with the Arduino.
4. Controlling the LED blink rate with the potentiometer interfacing with Arduino
5. Detection of the light using photo resistor
6. Interfacing of temperature sensor LM35 with Arduino
7. Interfacing Servo Motor with the Arduino
8. Interfacing of the Active Buzzer with Arduino.
9. Mini Project on Applications of IoT. Developing real-world IoT applications in chosen domains (e.g., Smart Agriculture, Smart Healthcare).

ICA – The Internal Continuous Assessment shall be based on practical record and knowledge or skills acquired. The performance shall be assessed experiment wise by using continuous assessment format, A & B.

ESE- The End Semester Exam for Practical shall be based on performance in one of the experiments and may be followed by sample questions.

Course Outcomes:

Students will be able to;
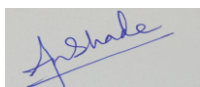
IT1506.1. Understand interfacing with Arduino.

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IT1506.2. Implement the various sensors applications.

IT1506.3. Implement IoT applications for real life scenario.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1506.1	0	0	0	0	0	0	3	0	0	0	0	2	2	1	2
IT1506.2	2	2	3	0	3	0	2	0	0	0	2	3	2	3	3
IT1506.3	2	1	3	1	3	1	2	0	2	0	1	2	2	3	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated
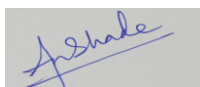
CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1506.1	0	0	0	0	0	0	3	0	0	0	0	2	1	2
IT1506.2	2	2	3	0	3	0	2	0	0	0	2	2	3	3
IT1506.3	2	1	3	1	3	1	2	0	2	0	1	2	3	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1507(A)							Course category			PE	
Course Name	**SOFTWARE ENGINEERING LAB (PROGRAM ELECTIVE – I LAB (A))**											
Teaching Scheme				**Examination Scheme**								**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
--	--	02	02	--	--	--	--	--	25	25	50	01

Course Objectives

Aim of the subject is to;

1. Study object-oriented analysis features.
2. Study CASE tools
3. Study the design of test cases
4. Study the understanding of agile techniques

Minimum Eight Experiments to be performed to achieve course outcomes.
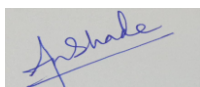
It is a representative list of practical/exercises. The instructor may choose experiments to fulfil the course outcomes.

List of Experiments:

1. Draw one or more Use Case diagrams for capturing and representing requirements of the system. Use case diagrams must include template showing description and steps of the Use Case for various scenarios.
2. A. Draw Package diagram to organize and manage your large and complex systems as well as their complex models. OR
   B. Draw activity diagrams to display either business flows or like flow charts.
3. A. Draw basic class diagrams to identify and describe key concepts like classes, types in your system and their relationships. OR
   B. Draw advanced class diagrams to depict advanced relationships and interfaces.
4. A. Draw sequence diagrams OR
   B. Communication diagrams with advanced notation for your system to show objects and their message exchanges.
5. A. Draw component diagrams assuming that you will build your system reusing existing components along with a few new ones. OR
   B. Draw deployment diagrams to model the runtime architecture of your system.
6. Case study and use of appropriate CASE tools in Software engineering.
7. Case study and use of program analysis tools in the software life cycle.
8. Case study and use of test case design in software development.
9. Case study of Agile development scenario of software development.
10. Case study and use of JIRA in software development
11. Mini-project on a brief problem statement (to be decided by students)

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ICA – The Internal Continuous Assessment shall be based on practical record and knowledge or skills acquired. The performance shall be assessed experiment wise by using continuous assessment format, A & B.

ESE- The End Semester Exam for Practical shall be based on performance in one of the experiments and may be followed by sample questions.

Course Outcomes:

Students will be able to;

IT1507(A).1. Design object-oriented analysis features in SE program development

IT1507(A).2. Implement program analysis tools in SE-Life Cycle

IT1507(A).3. Develop test cases for effective software development

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1507(A).1	2	2	3	0	2	0	0	2	0	0	1	2	2	3	3
IT1507(A).2	2	2	3	0	3	0	2	0	0	0	2	3	2	3	3
IT1507(A).3	2	2	3	0	3	0	2	0	0	0	2	3	2	3	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1507(A).1	2	2	3	0	2	0	0	2	0	0	1	2	3	3
IT1507(A).2	2	2	3	0	3	0	2	0	0	0	2	2	3	3
IT1507(A).3	2	2	3	0	3	0	2	0	0	0	2	2	3	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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Course Code	IT1507(B)							Course category		PE
Course Name	**FOUNDATION OF CRYPTOGRAPHY LAB (PROGRAM ELECTIVE – I LAB (B))**									
Teaching Scheme				**Examination Scheme**						**Credits**
Th	Tu	Pr	Total	Theory					Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
--	--	02	02	--	--	--	--	--	25	25	50	01

Aim of the subject is to;

1. Learn different cipher techniques
2. Implement the algorithms DES, RSA, MD5, SHA-1
3. Use network security tools and vulnerability assessment tools

Minimum Eight Experiments to be performed to achieve course outcomes.

It is a representative list of practical/exercises. The instructor may choose experiments to fulfil the course outcomes.

List of Experiments:

1. Design a program to encrypt and decrypt string object using Applet in java according to cryptography (User C want to send message "welcome to IT" to user D by using AES algorithms encrypt it and decrypt it at receiver end).
2. Design a program to demonstrate configurable access control using permission property in Java.
3. Study of KERBEROS security model application.
4. Write a program to calculate message digest (MD).
5. Write a program to perform encryption using RSA algorithm.
6. Write a program to demonstrate asymmetric cryptography.
7. Write a program to encrypt message by using simple columnar transposition technique.
8. Write a program to implement mono alphabetic cipher. implement Ceaser cipher.
9. Write a program to implement Playfair cipher, implement Rail fence Cipher technique.
10. User C want to send message "welcome to IT" to user D by using AES algorithms encrypt it and decrypt it at receiver end.
11. User A want to communicate with user B but it should be confidential by using Blowfish Algorithms send encrypt message.
12. Write a program to implement Secure Hash Algorithm. implement digital Signature.
13. Mini Project.

Useful Link: Following link is useful for students to solve various problems on basic cryptanalytic techniques: https://www.hackerrank.com/challenges/basiccryptanalysis/problem?isFullScreen=true

ICA – The Internal Continuous Assessment shall be based on practical record and knowledge or skills acquired. The performance shall be assessed experiment wise by using continuous assessment format, A & B.

ESE- The End Semester Exam for Practical shall be based on performance in one of the experiments

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and may be followed by sample questions.

Course Outcomes:

Students will be able to;

IT1507(B).1. Understand security concepts and type of attacks and network security algorithms.

IT1507(B).2. Apply symmetric and asymmetric key cryptography technique to encrypt and decrypt text.

IT1507(B).3. Understand the concept of security with different key management things.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1507(B).1	1	2	3	2	0	0	0	0	0	0	0	0	2	2	1
IT1507(B).2	0	0	0	2	3	0	1	0	0	0	1	0	2	2	1
IT1507(B).3	0	0	2	1	2	1	0	0	1	0	1	2	2	3	2

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated
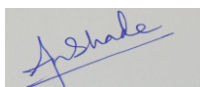
CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1507(B).1	1	2	3	2	0	0	0	0	0	0	0	2	2	1
IT1507(B).2	0	0	0	2	3	0	1	0	0	0	1	2	2	1
IT1507(B).3	0	0	2	1	2	1	0	0	1	0	1	2	3	2

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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GOVERNMENT COLLEGE OF ENGINEERING, AMRAVATI
(An Autonomous Institute of Government of Maharashtra)

Course Code	IT1507(C)			Course category			PE
Course Name	**DATA ANALYTICS LAB (PROGRAM ELECTIVE – I LAB (C))**						
Teaching Scheme				**Examination Scheme**			**Credits**
Th	Tu	Pr	Total	Theory		Practical	Total	

Th	Tu	Pr	Total	CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	Total	Credits
--	--	02	02	--	--	--	--	--	25	25	50	01

Course Objectives

Aim of the subject is to;

1. Implement MapReduce programs for processing big data.
2. Realize storage of big data using MongoDB.
3. Analyse big data using machine learning techniques such as Decision tree classification and clustering.

Minimum Eight Experiments to be performed to achieve course outcomes.

It is a representative list of practical/exercises. The instructor may choose experiments to fulfil the course outcomes.

List of Experiments:
1. Implement the following Data structures in Java
   a) Linked Lists b) Stacks c) Queues d) Set e) Map
2. Perform setting up and Installing Hadoop in its three operating modes:
   a) Standalone b) Pseudo distributed c) fully distributed.
3. Implement the following file management tasks in Hadoop:
   a) Adding files and directories b) Retrieving files c) Deleting files
   Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.
4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
5. Write a Map Reduce program that mines weather data. Weather Report POC- Map Reduce Program to analyse time-temperature statistics and generate report with max/min temperature.
6. Implement Matrix Multiplication with Hadoop Map Reduce
7. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.
8. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.
9. Install and visualize data using Data Visualization tools like Tableau, Power BI and Excel.
10. Solve some real-life big data problems (Mini Project).

Useful Link: Following link is useful for students for use of various datasets for Data Analytics Experiments: https://www.kaggle.com/datasets?tags=13215-Data+Analytics

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ICA – The Internal Continuous Assessment shall be based on practical record and knowledge or skills acquired. The performance shall be assessed experiment wise by using continuous assessment format, A & B.

ESE- The End Semester Exam for Practical shall be based on performance in one of the experiments and may be followed by sample questions.

Course Outcomes:

Students will be able to;

IT1507(C).1. Apply various inferential statistical analysis techniques to describe data sets and withdraw useful conclusions from acquired data set.

IT1507(C).2. Implement the data analytics techniques using various tools

IT1507(C).3. Apply data science concept and methods to solve problems in real world context

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1507(C).1	3	0	2	0	3	3	0	3	0	0	0	0	2	2	2
IT1507(C).2	2	2	3	0	3	0	2	0	0	0	2	3	2	3	3
IT1507(C).3	3	0	2	0	3	3	0	3	0	0	0	0	2	2	2

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1507(C).1	3	0	2	0	3	3	0	3	0	0	0	2	2	2
IT1507(C).2	2	2	3	0	3	0	2	0	0	0	2	2	3	3
IT1507(C).3	3	0	2	0	3	3	0	3	0	0	0	2	2	2

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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Course Code	IT1521								Course category		PEH
Course Name	QUALITATIVE RESEARCH METHODS AND RESEARCH WRITING										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

Course Objectives:

Aim of the subject is to;

1. Gain an understanding of the theoretical, historical, and philosophical traditions of qualitative research in Communication Studies.
2. Develop skills and methods to engage in independent qualitative research, including the ability to design a study, collect data, and analyse materials
3. Familiar with how to read, interpret, write, and present qualitative research

Qualitative & Quantitative Research: Introduction to qualitative research, Introduction to Qualitative Researcher, Quantitative vs. qualitative research, History of qualitative research, the process of qualitative research, Major paradigms & perspectives, Dominant paradigms of qualitative research, Interpretivist thinking, Verstehen.

Constructivism: Properties of constructions, Constructivism: Sub paradigms, Criticisms of interpretivism & constructivism.

Critical Theory: Characteristics of critical theory, Critiques of critical theory. Strategies of inquiry: Introduction to qualitative inquiry, Qualitative research design, Ethnography, Autoethnography, Case studies, Analysing interpretive practice.

Grounded Theory: Participatory Action Research, Methods of collecting & analysing empirical materials, Observations, Interviewing, Interpretation of documents & material culture, Images & visual methods, Autoethnography, personal narrative & reflexivity.

Analysing talk & text: Data management & analysis methods, Software & qualitative research Interpretation, evaluation & presentation, The problem of criteria, Interpretation, Writing, Evaluation and social programs, Qualitative research and social policy, Conclusion.
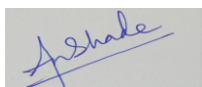
Technical and research writing: Literature review, writing about methods, results, and discussion of results, Referencing, academic integrity, and writing for different types of readers (Research proposals, Dissertations, Journal articles, Magazine articles).

Text Books:

1. Handbook of qualitative research, Denzin, N. K., & Lincoln, Y. S. ,2nd Edition, Thousand Oaks, CA: Sage Publications Inc., 2000.

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Reference Books:

1. Qualitative Research: A Guide to Design and Implementation, Sharan B. Merriam & Elizabeth J. Tisdell, 4th Edition, Jossey-Bass Publication, 2015.
2. Research Writing: A Handbook for Writers in the Social Sciences, Stuart C. Brown, 1st Edition, University of Chicago Press, 2006.

NPTEL Course Link:

Qualitative Research Methods and Research Writing, Prof. Aradhna Malik, IIT Kharagpur

Link: https://onlinecourses.nptel.ac.in/noc20_ge01/preview

Course Outcomes:

Students will be able to;

IT11521.1. Identify and select appropriate qualitative research designs based on specific research questions.

IT11521.2. Develop skills in collecting and analysing qualitative data through methods such as interviews, focus groups, and observation.

IT11521.3. Understand and apply ethical guidelines to ensure responsible conduct in qualitative research.

IT11521.4. Evaluate qualitative research studies, assessing methodology and findings for rigor and validity.

IT11521.5. Write and present qualitative research findings clearly and effectively, using appropriate methods of analysis.
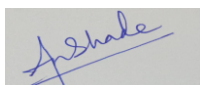
CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1521.1	3	0	0	0	0	2	0	1	0	0	0	0	0	2	0
IT1521.2	2	2	0	0	0	2	0	0	0	0	0	0	0	3	1
IT1521.3	2	0	3	0	2	0	0	2	0	0	0	0	0	3	1
IT1521.4	0	3	0	0	3	3	0	0	0	0	0	0	0	2	2
IT1521.5	0	2	0	0	2	2	0	3	0	0	0	0	0	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1521.1	3	0	0	0	0	2	0	1	0	0	0	0	2	0
IT1521.2	2	2	0	0	0	2	0	0	0	0	0	0	3	1
IT1521.3	2	0	3	0	2	0	0	2	0	0	0	0	3	1
IT1521.4	0	3	0	0	3	3	0	0	0	0	0	0	2	2
IT1521.5	0	2	0	0	2	2	0	3	0	0	0	0	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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Course Code	IT1522								Course category			PEH
Course Name	**SOCIAL NETWORK**											

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

Course Objectives:

Aim of the subject is to;

1. Understand the theoretical underpinnings of social networks and their behaviour.
2. Gain experience in handling real-world network datasets.
3. Analyse the role of weak and strong ties in network dynamics.
4. Study the impact of homophily and relationship types in network behaviour.
5. Learn the principles of link analysis, power laws, and cascading behaviour.

Introduction to Social Networks: Overview of social networks and network analysis
Importance of networks in various fields (social, economic, biological, etc.) Basic terminology: nodes, edges, degree, graph theory.

Handling Real-world Network Datasets: Types of network data: directed vs. undirected, weighted vs. unweighted, Data collection methods: web scraping, APIs, surveys

Handling missing data and preprocessing real-world datasets

Strength of Weak Ties: Theoretical foundation of weak ties: Granovetter's Strength of Weak Ties theory**,** the role of weak ties in information spread and social capital**,** Weak ties in online networks (e.g., social media), Comparing strong and weak relationships in network structure.

Homophily: the tendency of similar nodes to connect, The effects of homophily on network formation and diffusion, Positive/Negative Relationships, Further exploration of homophily in network behaviour, Positive vs. negative relationships in networks and their impact on network dynamics
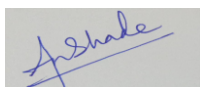
Text Books:

1. Networks, Crowds and Markets, David Easley and Jon Kleinberg, 1st Edition. Cambridge University Press, 2010
2. Social and Economic Networks, Matthew O. Jackson, 1st Edition, Princeton University Press, 2010.

Reference Books:

1. Social Network Analysis: Methods and Applications, Stanley Wasserman & Katherine Faust, 1st Edition, Cambridge University Press,1994.
2. Social Network Theory and Education: Theory and Applications, Bruce A. Bakken & Melvin J. L.

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H., 1st Edition, Springer, 2014.

NPTEL Course Link:

Social Network, Prof. Sudarshan Iyengar (IIT Ropar), Prof. Yayati Gupta (Mahindra University, Hyderabad)

Link: https://onlinecourses.nptel.ac.in/noc22_cs30/preview

Course Outcomes:

Students will be able to;

IT11522.1. Understand and describe the structure of various network types, focusing on nodes, edges, and topology.
IT11522.2. Process and analyse real-world network datasets using tools like NetworkX and Gephi.
IT11522.3. Apply network theories to understand social and relational dynamics.
IT11522.4. Use algorithms like PageRank and HITS to analyse key influencers and network link structures.
IT11522.5. Apply network phenomena to practical problems like viral marketing and epidemic modelling.
.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1522.1	3	0	0	0	0	2	0	1	0	0	0	0	0	2	0
IT1522.2	2	2	0	0	0	2	0	0	0	0	0	0	0	3	1
IT1522.3	2	0	3	0	2	0	0	2	0	0	0	0	0	3	1
IT1522.4	0	3	0	0	3	3	0	0	0	0	0	0	0	2	2
IT1522.5	0	2	0	0	2	2	0	3	0	0	0	0	0	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated
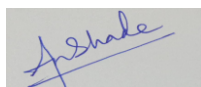
CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1522.1	3	0	0	0	0	2	0	1	0	0	0	0	2	0
IT1522.2	2	2	0	0	0	2	0	0	0	0	0	0	3	1
IT1522.3	2	0	3	0	2	0	0	2	0	0	0	0	3	1
IT1522.4	0	3	0	0	3	3	0	0	0	0	0	0	2	2
IT1522.5	0	2	0	0	2	2	0	3	0	0	0	0	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1531			Course Category		PER
Course Name	RESEARCH PROJECT STAGE - I					

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT-I	CT-II	TA	ESE	ESE Duration	ICA	ESE		
--	--	08	08	--	--	--	--	--	100	--	100	04

Course Objectives:

To make the students aware and understand:

1. Gain domain specific knowledge by completing the specific course
2. Collecting information on novel and latest development in the specific area of the Electrical Engineering.
3. Formulating specific problem statement and design a suitable solution methodology for the problem

Course Contents:

At the beginning of V-semester, just before the commencement of classes, eligible students can register for the B. Tech. with Honours in Research. The research topic/area selected should have relevance to social needs of society and needs of the industry.

Registered Student will have to discuss with his/her respective guide about the specific area for carrying out the research work. He/she will have to complete the theory courses through online platform such as MOOCs, NPTEL etc. as prescribed by the guide/supervisor. Student will have to

(i)   Formulate the specific problem statement,
(ii)   Carry out the research literature survey for acquiring in depth knowledge in the chosen domain.
(ii)   Design a suitable solution methodology for the problem,
(iv)   Share the details of literature survey, hypothesis, etc. with the guide.

Student will be required to deliver the seminar on the literature survey and proposed research topic at the end of V-semester.

Internal Continuous Assessment (ICA): Student will be required to deliver a seminar based on the work carried out. The ICA includes the assessment on the basis of seminar to be evaluated by the three-member committee constituted by the Head of Department.
Course Outcomes:

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

IT1531.1   Plan an investigative research problem

IT1531.2   Apply the in-depth knowledge gained in the domain area such as existing methods and their limitations, etc. through literature survey and course attended.

IT1531.3   Formulate suitable solution methodology for the research problem

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1531.1	2	3	3	0	0	0	0	0	0	0	2	0	0	2	0
IT1531.2	2	0	0	2	3	0	0	0	3	0	0	2	0	0	0
IT1531.3	3	0	3	3	0	2	2	0	0	0	0	0	0	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1531.1	2	3	3	0	0	0	0	0	0	2	0	3	2	0
IT1531.2	2	0	0	2	3	0	0	3	0	0	2	0	0	0
IT1531.3	3	0	3	3	0	2	0	0	0	0	0	2	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1541				Course category		MN
Course Name	**INFORMATION THEORY FOR CYBER SECURITY**						
Teaching Scheme				**Examination Scheme**			**Credits**
Th	Tu	Pr	Total	Theory		Practical	Total	

Th	Tu	Pr	Total	CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	Total	Credits
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

Course Objectives

Aim of the subject is to;

1. provide an insight to information coding techniques,
2. provide an insight to error correction mechanism for cyber security.

Module 1:

Shannon's foundation of Information theory, Random variables, Probability distribution factors, Uncertainty/entropy information measures, Leakage, Quantifying Leakage and Partitions, Lower bounds on key size: secrecy, authentication and secret sharing. provable security, computationally-secure, symmetric cipher.

Module 2:

Secrecy, Authentication, Secret sharing, Optimistic results on perfect secrecy, Secret key agreement, Unconditional Security, Quantum Cryptography, Randomized Ciphers, Types of codes: block codes, Hamming and Lee metrics, description of linear block codes, parity check Codes, cyclic code, Masking techniques.

Module 3:

Information-theoretic security and cryptograph, basic introduction to Diffie-Hellman, AES, and side-channel attacks.

Module 4:

Secrecy metrics: strong, weak, semantic security, partial secrecy, Secure source coding: rate-distortion theory for secrecy systems, side information at receivers, Differential privacy, Distributed channel synthesis.

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Module 5:

Digital and network forensics, Public Key Infrastructure, Light weight cryptography, Elliptic Curve Cryptography and applications.

Text Books:

1. Information Theory and Coding, Muralidhar Kulkarni, K S Shivaprakasha,1st Edition, John Wiley & Sons, 2014.
2. Communication Systems: Analog and digital, Singh and Sapre, 3rd Edition, Tata McGraw Hill,
   2017.

Reference Book:

1. Fundamentals in information theory and coding, Monica Borda, 1st Edition, Springer, 2017.
2. Information Theory, Coding and Cryptography, R Bose, 2nd Edition, 2008.
3. Multi-media System Design, Prabhat K Ardleigh and Kiran Thakrar, 1st Edition, Pearson Education, 2015.

Course Outcomes:

Students will be able to;

IT1541.1. Introduce the principles and applications of information theory.
IT1541.2. Justify how information is measured in terms of probability and entropy.
IT1541.3. Learn coding schemes, including error correcting codes.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1541.1	3	2	0	2	0	0	1	0	0	2	2	2	1	3	1
IT1541.2	3	2	3	2	1	0	2	2	0	1	1	2	2	3	3
IT1541.3	3	2	0	2	0	0	1	0	0	2	2	2	1	3	1

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated
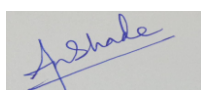
CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1541.1	3	2	0	2	0	0	1	0	0	2	2	1	3	1
IT1541.2	3	2	3	2	1	0	2	2	0	1	1	2	3	3
IT1541.3	3	2	0	2	0	0	1	0	0	2	2	1	3	1

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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Course Code	IT1542							Course category			MN
Course Name	**DATA ENCRYPTION AND COMPRESSION**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

Course Objectives

Aim of the subject is to;

1. Introduce concept of security, types of attack experienced.
2. Describe encryption and authentication for deal with attacks.
3. Explain data compression, need and techniques of data compression.

Module 1:

Introduction to Security: Need for security, Security approaches, Principles of security, Types of attacks. Encryption Techniques: Plaintext, Cipher text, Substitution & Transposition techniques, Encryption & Decryption, Types of attacks, Key range & Size.

Module 2:

Symmetric & Asymmetric Key Cryptography: Algorithm types & Modes, DES, IDEA, Differential & Linear Cryptanalysis, RSA, Symmetric & Asymmetric key together, Digital signature, Knapsack algorithm.

Module 3:

Case Studies of Cryptography: Denial of service attacks, IP spoofing attacks, Conventional Encryption and Message Confidentiality, Conventional Encryption Algorithms, Key Distribution.
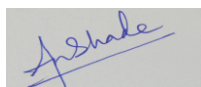
Public Key Cryptography and Message Authentication: Approaches to Message Authentication, SHA-1, MD5, Public-Key Cryptography Principles, RSA, Digital, Signatures, Key Management, Firewall.

Module 4:

Introduction: Need for data compression, Fundamental concept of data compression & coding, Communication model, Compression ratio, Requirements of data compression, Classification.

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Methods of Data Compression: Data compression-- Loss less & Lossy.

Module 5:

Entropy encoding-- Repetitive character encoding, Run length encoding, Zero/Blank encoding; Statistical encoding-- Huffman, Arithmetic & Lempel-Ziv coding; Source encoding-- Vector quantization (Simple vector quantization & with error term).

Module 6:

Recent trends in encryption and data compression techniques.

Text Books:

1. Information Theory and Coding, Muralidhar Kulkarni, K S Shivaprakash, 1st Edition, John Wiley & Sons.
2. Communication Systems: Analog and digital, Singh and Sapre, 1st Edition, Tata McGraw Hill.

Reference Book:

1. Fundamentals in information theory and coding, Monica Borda, 1st Edition, Springer,2011.
2. Information Theory, Coding and Cryptography, R Bose., 3rd Edition, 2017.
3. Multi-media System Design, Prabhat K Ardleigh and Kiran Thakrar, 1st Edition, Pearson,2015.

Course Outcomes:

Students will be able to;

IT1541.1. Introduce the principles and applications of information theory.
IT1541.2. Justify how information is measured in terms of probability and entropy.
IT1541.3. Learn coding schemes, including error correcting codes.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1542.1	3	2	0	2	0	0	1	0	0	2	2	2	1	3	1
IT1542.2	3	2	3	2	1	0	2	2	0	1	1	2	2	3	3
IT1542.3	3	2	0	2	0	0	1	0	0	2	2	2	1	3	1

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1542.1	3	2	0	2	0	0	1	0	0	2	2	1	3	1
IT1542.2	3	2	3	2	1	0	2	2	0	1	1	2	3	3
IT1542.3	3	2	0	2	0	0	1	0	0	2	2	1	3	1

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1601						Course category		PC	
Course Name	**MACHINE LEARNING**									
Teaching Scheme				**Examination Scheme**						**Credits**
Th	Tu	Pr	Total	Theory					Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

Course Objectives:

Aim of the subject is to;

1. Understanding Human learning aspects.
2. Understanding primitives in learning process by computer.
3. Understanding nature of problems solved with Machine Learning.

Introduction to Machine Learning: Introduction to Machine learning, Examples of Machine Learning Problems, Structure of Learning, learning versus Designing, Training versus Testing, Characteristics of Machine learning tasks, Predictive and descriptive tasks, Machine learning Models: Geometric Models, Logical Models, Probabilistic Models. Features: Feature types, Feature Construction and Transformation, Feature Selection.

Classification and Regression Classification: Binary Classification- Assessing Classification performance, Class probability Estimation Assessing class probability Estimates, Multiclass Classification. Regression: Assessing performance of Regression- Error measures, Overfitting- Catalysts for Overfitting, Case study of Polynomial Regression.
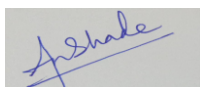
Evaluating Hypothesis: Training and test splits, K- fold cross validation, confusion matrix, estimating hypothesis accuracy, sampled and true error.

Theory of Generalization: Effective number of hypotheses, Bounding the Growth function, VC Dimensions, Regularization theory. Linear Models: Least Squares method, Multivariate Linear Regression, Regularized Regression, Perceptron, Support Vector Machines, Soft Margin SVM, Obtaining probabilities from Linear classifiers, Kernel methods for non- Linearity.

Distance Based Models: Neighbours and Examples, Nearest Neighbours Classification, Distance based clustering-K means Algorithm, Hierarchical clustering, Rule Based Models: Rule learning for subgroup discovery, Association rule mining. Tree Based Models: Decision Trees, Ranking and

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Probability estimation Trees, Regression trees, Clustering Trees.

Trends in Machine Learning: Model and Symbols- Bagging and Boosting, Multitask learning, Online learning and Sequence Prediction, Data Streams and Active Learning, Deep Learning, Reinforcement Learning.

Text Books:
1. Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Peter Flach, Cambridge University Press, Edition 2012.
2. Introduction to Statistical Machine Learning with Applications in R, Hastie, Tibshirani, Friedman, Springer, 2nd Edition-2012.

Reference Books:
1. Pattern Recognition and Machine Learning, C. M. Bishop, Springer 1st Edition-2013.
2. Introduction to Machine Learning, Ethem Alpaydin, PHI 2nd Edition-2013.
3. Reinforcement and Systematic Machine Learning for Decision Making, Parag Kulkarni, Wiley IEEE Press, Edition July 2012.

Course Outcomes:

Students will be able to;

IT1601.1. Understand and apply fundamental concepts of Machine Learning.

IT1601.2. Demonstrate various regression Technique.

IT1601.3. Understand Ensemble Learning Methods.

IT1601.4. Illustrate Clustering Techniques.

IT1601.5. Illustrate Dimensionality Reduction Models in Machine Learning.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

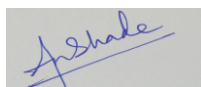| CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1601.1	2	0	0	0	2	2	2	1	1	0	1	3	2	2	3
IT1601.2	3	2	3	0	3	2	0	0	0	0	1	2	2	3	3
IT1601.3	2	0	0	0	2	2	2	1	1	0	1	3	2	2	3
IT1601.4	3	2	2	2	0	0	0	0	0	0	0	0	1	2	2
IT1601.5	3	2	2	2	0	0	0	0	0	0	0	0	1	2	2

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1601.1	2	0	0	0	2	2	2	1	1	0	1	2	2	3
IT1601.2	3	2	3	0	3	2	0	0	0	0	1	2	3	3

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IT1601.3	2	0	0	0	2	2	2	1	1	0	1	2	2	3
IT1601.4	3	2	2	2	0	0	0	0	0	0	0	1	2	2
IT1601.5	3	2	2	2	0	0	0	0	0	0	0	1	2	2

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

Course Code	IT1602(A)						Course category		PE
Course Name	**DEEP LEARNING (PROGRAM ELECTIVE – II (A))**								
Teaching Scheme				**Examination Scheme**					**Credits**
Th	Tu	Pr	Total	Theory					Practical	Total	

Th	Tu	Pr	Total	CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	Total	
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

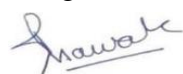**Course Objectives:**

Aim of the subject is to;

1. Understand the basic concepts and techniques of Deep Learning and the need of Deep Learning techniques in real-world problems
2. Understand CNN algorithms and the way to evaluate performance of the CNN architectures.
3. Apply RNN and LSTM to learn, predict and classify the real-world problems in the paradigms of Deep Learning.
4. Understand, learn and design GANs for the selected problems.
5. Understand the concept of Auto-encoders and enhancing GANs using auto-encoders.

Introduction to Deep Learning: Historical Trends in Deep Learning, Factors driving the growth of deep learning, Artificial Neural Network, Non-linear classification example using Neural Networks: XOR/XNOR, Single/Multiple Layer Perceptron, Feed Forward Network, Deep Feed- forward networks, Stochastic Gradient –Based learning, Hidden Units, Architecture Design, Back-Propagation.
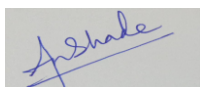
Convolution Neural Network (CNN): Introduction to CNNs and their applications in computer vision, CNN basic architecture, Activation functions-sigmoid, tanh, ReLU, Leaky ReLU, Softmax layer, Types of pooling layers, Training of CNN in TensorFlow, various popular CNN architectures: VGG, Google Net, ResNet etc, Dropout, Normalization, Data augmentation.

Recurrent Neural Network (RNN): Introduction to RNNs and their applications in sequential data analysis, Back propagation through time (BPTT), Vanishing Gradient Problem, gradient clipping Long Short-Term Memory (LSTM) Networks, Gated Recurrent Units, Bidirectional LSTMs, Bidirectional RNNs.

Generative Adversarial Networks (GANS): Generative models, Concept and principles of GANs, Architecture of GANs (generator and discriminator networks), Comparison between discriminative and generative models, Generative Adversarial Networks (GANs), Applications of GANs

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Applications: Detection and Segmentation: Discussion on detection, segmentation problem definition, challenges, Evaluation, Datasets and Localization by regression. Discussion on detection as classification, region proposals, RCNN and YOLO architectures, fully convolutional segmentations, Mask-RCNNs.

Text Books:
1. Deep Learning: An MIT Press Book by Ian Goodfellow and Yoshua Bengio Aaron Courville.
2. Michael Nielson, Neural Networks and Deep Learning, Determination Press,2015.
3. Satish Kumar, Neural networks: A classroom Approach, Tata McGraw-Hill Education,2004

Reference Books:
1. Deep Learning with Python, Francois Chollet, Manning publications 2018
2. Advanced Deep Learning with Keras, Rowel Atienza, PACKT Publications 2018

Course Outcomes:

Students will be able to;

IT1602(A).1. Identify the features of deep learning models that are helpful in resolving practical issues.

IT1602(A).2. Choose and use the best deep learning algorithms to analyse the data for a range of issues.

IT1602(A).3. Use various deep learning algorithms

IT1602(A).4. Create the test protocols to evaluate the developed model's effectiveness.

IT1602(A).5. Integrate many models to achieve superior outcomes.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

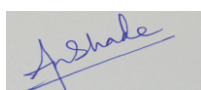| CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1602(A).1	2	2	0	0	3	0	0	0	0	0	0	0	2	3	3
IT1602(A).2	2	2	1	0	3	0	0	0	0	0	0	0	2	3	2
IT1602(A).3	2	3	3	2	3	2	0	0	0	0	0	0	2	3	3
IT1602(A).4	2	2	0	0	3	0	0	0	0	0	0	0	2	3	3
IT1602(A).5	2	2	1	0	3	0	0	0	0	0	0	0	2	3	2

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1602(A).1	2	2	0	0	3	0	0	0	0	0	0	2	3	3
IT1602(A).2	2	2	1	0	3	0	0	0	0	0	0	2	3	2
IT1602(A).3	2	3	3	2	3	2	0	0	0	0	0	2	3	3
IT1602(A).4	2	2	0	0	3	0	0	0	0	0	0	2	3	3
IT1602(A).5	2	2	1	0	3	0	0	0	0	0	0	2	3	2

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1602(B)							Course category		PE	
Course Name	**WIRELESS & MOBILE COMPUTING (PROGRAM ELECTIVE – II (B))**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

Course Objectives:

Aim of the subject is to;

1. Demonstrate the fundamentals of wireless technology.
2. Apply the layered protocols and fundamentals for the design of wireless.
3. Analyse and apply resource optimization techniques for better performance
4. Apply the working of different wireless networks.
5. Demonstrate knowledge of the mobile network.

Introduction: History of wireless communication, Frequency spectrum, Applications

Wireless Transmission: Frequency for radio transmission, Signals, Antennas, Signal propagation, Multiplexing, modulation, Spread spectrum, Cellular systems.

Medium Access Control: Motivation for a specialized MAC: Hidden and Exposed terminals. Near and Far terminals, multiplexing techniques.

Wireless LAN: Infrared vs. Radio transmission, Infrastructure and Ad hoc Networks, IEEE 802.11: System architecture, Protocol architecture, Physical layer, medium access control layer, MAC management, Future development; Brief Overview of HIPERLAN, Bluetooth.

Mobile Network Layer: Mobile IP: Goals, assumptions and requirements, Entities and Terminology, IP packet delivery, Agent advertisement and discovery, Registration, Tunnelling and Encapsulation, Optimizations, Reverse tunnelling, Ipv6; Dynamic host configuration protocol, Ad hoc networks: Routing, Destination sequence distance vector, Dynamic source routing, Hierarchical algorithms, Alternative metrics.
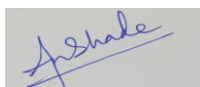
Mobile Transport Layer: Traditional TCP, indirect TCP, Snooping TCP, fast retransmit/fast recovery, transmission/time out freezing, selective retransmission, transaction-oriented TCP.

Support for Mobility: File system, World Wide Web, Wireless application protocol.
Text Books:

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1. Mobile communications, Jochen Schiller, Addison Wesley, Pearson education, 2nd Edition, 2002.

Reference Books:
1. Wireless Communications and Networks, Wiiliam Stallings, Prentice Hall, 2nd edition, 2005.
2. Wireless Communications Principals and Practices, Rappaport, 2nd Edition, Pearson Education Pvt. Ltd, 2003.

Course Outcomes:

Students will be able to;

IT1602(B).1. Demonstrate the fundamentals of wireless technology.
IT1602(B).2. Apply the layered protocols and fundamentals for the design of wireless communication.
IT1602(B).3. Analyse and apply resource optimization techniques for better performance.
IT1602(B).4. Apply the working of different wireless networks.
IT1602(B).5. Demonstrate knowledge of the mobile network.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1602(B).1	3	0	0	0	0	2	0	0	0	0	0	3	3	2	0
IT1602(B).2	2	3	0	0	0	1	0	0	0	0	0	0	3	3	1
IT1602(B).3	1	0	3	0	2	0	0	0	0	0	0	0	2	3	1
IT1602(B).4	0	1	0	3	3	3	0	0	0	0	0	0	2	2	2
IT1602(B).5	2	0	3	2	3	0	0	0	1	0	1	3	2	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1602(B).1	3	0	0	0	0	2	0	0	0	0	0	3	2	0
IT1602(B).2	2	3	0	0	0	1	0	0	0	0	0	3	3	1
IT1602(B).3	1	0	3	0	2	0	0	0	0	0	0	2	3	1
IT1602(B).4	0	1	0	3	3	3	0	0	0	0	0	2	2	2
IT1602(B).5	2	0	3	2	3	0	0	0	1	0	1	2	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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Member Secretary	BoS Chairperson	Dean Academics	Principal

(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1602(C)						Course category			PE	
Course Name	**CLOUD COMPUTING (PROGRAM ELECTIVE – II (C))**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

Course Objectives:

Aim of the subject is to;

1. Understand the concepts of Cloud Computing.
2. Learn Taxonomy of Virtualization Techniques.
3. Learn Cloud Computing Architecture.
4. Acquire knowledge on Aneka Cloud Application Platform.
5. Learn Industry Cloud Platforms

Introduction to Cloud: Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model. Characteristics and Benefits, Challenges Ahead, Historical Developments.

Virtualization: Introduction, Characteristics of Virtualized Environment, Taxonomy of Virtualization Techniques, Virtualization and Cloud computing, Pros and Cons of Virtualization, Technology Examples- VMware and Microsoft Hyper-V. Before the Move into the Cloud: Know Your Software Licenses, The Shift to a Cloud Cost Model, Service Levels for Cloud Applications

Cloud Computing Architecture: Introduction, Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Interoperability and Standards, Scalability and Fault Tolerance. Ready for the Cloud: Web Application Design, Machine Image Design, Privacy Design, Database Management, Data Security, Network Security, Host Security, Compromise Response.

Defining the Clouds for Enterprise: Storage as a service, Database as a service, Process as a service, Information as a service, Integration as a service and Testing as a service. Scaling a cloud infrastructure - Capacity Planning, Cloud Scale.

Disaster Recovery: Disaster Recovery Planning, Disasters in the Cloud, Disaster Management.

Aneka: Cloud Application Platform Framework Overview, Anatomy of the Aneka Container, From

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the Ground Up: Platform Abstraction Layer, Fabric Services, Foundation Services, Application Services, Building Aneka Clouds, Infrastructure Organization, Logical Organization, Private Cloud Deployment Mode, Public Cloud Deployment Mode, Hybrid Cloud Deployment Mode, Cloud Programming and Management, Aneka SDK, Management Tools.

Cloud Applications: Scientific Applications – Health care, Geoscience and Biology. Business and Consumer Applications- CRM and ERP, Social Networking, Media Applications and Multiplayer Online Gaming. Cloud Platforms in Industry: Amazon Web Services- Compute Services, Storage Services, Communication Services and Additional Services. Google AppEngine - Architecture and Core Concepts, Application Life-Cycle, cost model. Microsoft Azure- Azure Core Concepts, SQL Azure. Oracle Cloud- Core concepts.

Case Study: Netflix, HSBC etc.

Text Books:
1. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi from TMH 2013.
2. Cloud Application Architectures, George Reese, First Edition, O'Reilly Media 2009.

Reference Books:
1. Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide, David S. Linthicum, Pearson 2010.
2. Cloud Computing, Dr. Kumar Saurabh, 2nd Edition, Wiley India 2012.
3. Cloud Computing, web-based Applications that change the way you work and collaborate Online, Micheal Miller Pearson Education.

Course Outcomes:

Students will be able to;

IT1602(C).1. Understand the concept of virtualization and how this has enabled the development of Cloud Computing

IT1602(C).2. Know the fundamentals of cloud, cloud Architectures and types of services in cloud
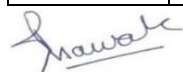
IT1602(C).3. Understand scaling, cloud security and disaster management

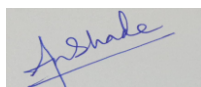IT1602(C).4. Design different Applications in cloud

IT1602(C).5. Explore some important cloud computing driven commercial systems

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1602(C).1	3	0	0	0	0	2	0	1	0	0	0	0	0	2	0
IT1602(C).2	2	2	0	0	0	2	0	0	0	0	0	0	0	3	1
IT1602(C).3	2	0	3	0	2	0	0	2	0	0	0	0	0	3	1
IT1602(C).4	0	3	0	0	3	3	0	0	0	0	0	0	0	2	2
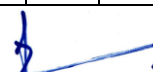
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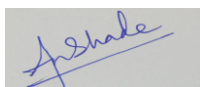
IT1602(C).5	0	2	0	0	2	2	0	3	0	0	0	0	0	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1602(C).1	3	0	0	0	0	2	0	1	0	0	0	0	2	0
IT1602(C).2	2	2	0	0	0	2	0	0	0	0	0	0	3	1
IT1602(C).3	2	0	3	0	2	0	0	2	0	0	0	0	3	1
IT1602(C).4	0	3	0	0	3	3	0	0	0	0	0	0	2	2
IT1602(C).5	0	2	0	0	2	2	0	3	0	0	0	0	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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Course Code	IT1603(A)						Course category		PE	
Course Name	SOFTWARE CONSTRUCTION & DEVELOPMENT STRATEGY (PROGRAM ELECTIVE – III (A))									
Teaching Scheme				**Examination Scheme**						**Credits**
Th	Tu	Pr	Total	Theory					ESE Duration	Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
04	--	--	04	15	15	10	60	02 hrs 30 min	--	--	100	04

Course Objectives:

Aim of the subject is to;

1. Understand the principles and practices of software construction
2. Apply development strategies in various project settings
3. Analyse different software development methodologies
4. Understand the importance of code quality, maintainability, and scalability
5. Explore modern development tools, testing, and version control systems

Introduction to Software Development: Overview of software development lifecycle (SDLC), Phases: Requirements gathering, Design, Implementation, Testing, Deployment, Maintenance Introduction to software construction, Key concepts: Abstraction, Modularity, Reusability, Maintainability

Software Development Methodologies: Waterfall Model, Agile Development (Scrum, Kanban), DevOps and Continuous Integration/Continuous Deployment (CI/CD), Comparison of methodologies and selecting the right approach.

Software Construction Tools and Technologies: Integrated Development Environments (IDEs), Version control systems (Git, SVN), Build automation tools (Maven, Gradle, Jenkins), Testing frameworks (JUnit, TestNG)

Software Testing Strategies: Types of testing: Unit testing, Integration testing, System testing, Test-driven development (TDD) and Behaviour-driven development (BDD), Writing effective test cases, Test automation tools (Selenium, JUnit)

Debugging and Performance Optimization: Debugging techniques and tools (e.g., gdb, IDE debuggers), Identifying and resolving performance bottlenecks, Profiling and optimizing code (e.g.,

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memory usage, CPU usage), Code review strategies for performance

Software Project Management and Strategy: Project planning and estimation techniques, Resource management and task prioritization, Risk management in software projects, Agile project management tools (Jira, Trello, Asana)

Software Design Principles: Design Patterns (Singleton, Factory, Observer, etc.), SOLID principles of object-oriented design, High-level system architecture and low-level design, UML diagrams: Class diagrams, Sequence diagrams. Code Quality and Best Practices: Writing clean, readable code (e.g., naming conventions, commenting), Refactoring techniques, Code reviews and pair programming, Introduction to static code analysis tools, Modularization and Code Reusability.

Text Books:

1. Clean Code: A Handbook of Agile Software Craftsmanship, Robert C. Martin, PHI, First Edition, 2017.
2. Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, Addison-Wesley Professional, First Edition. 1994.

Reference Books:
1. "The Pragmatic Programmer: Your Journey to Mastery", Andrew Hunt, David Thomas, Addison-Wesley Professional, Second Edition,2019.
2. "Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation", Jez Humble, David Farley, Addison-Wesley Professional, First Edition, 2010.
3. Software Engineering (Ninth Edition) Ian Summerville (Pearson Education)

Course Outcomes:
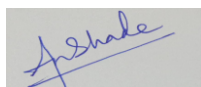
Students will be able to;

IT603(A).1. Design and construct software following best practices and clean code principles.

IT603(A).2. Apply software development methodologies such as Agile and DevOps to real-world projects.

IT603(A).3. Utilize development tools (e.g., Git, Jenkins, JUnit) for efficient version control, testing, and CI/CD.

IT603(A).4. Develop scalable, maintainable, and optimized software systems.

IT603(A).5. Understand current trends in software development, such as microservices and cloud technologies.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1603(A).1	2	2	0	0	3	0	0	0	0	0	0	0	0	3	0
IT1603(A).2	2	3	0	1	3	1	0	0	0	0	0	0	0	3	1
IT1603(A).3	2	2	1	0	3	2	0	1	0	0	0	0	0	3	2

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IT1603(A).4	2	3	0	1	3	1	0	0	0	0	0	0	0	3	1
IT1603(A).5	2	3	2	1	3	2	0	1	0	0	0	0	1	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated
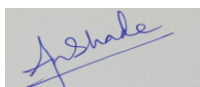
CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1603(A).1	2	2	0	0	3	0	0	0	0	0	0	0	3	0
IT1603(A).2	2	3	0	1	3	1	0	0	0	0	0	0	3	1
IT1603(A).3	2	2	1	0	3	2	0	1	0	0	0	0	3	2
IT1603(A).4	2	3	0	1	3	1	0	0	0	0	0	0	3	1
IT1603(A).5	2	3	2	1	3	2	0	1	0	0	0	1	2	3

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1603(B)						Course category		PE	
Course Name	NETWORK ARCHITECTURE & WIRELESS PROTOCOL (PROGRAM ELECTIVE – III (B))									
Teaching Scheme				**Examination Scheme**						**Credits**
Th	Tu	Pr	Total	Theory					Practical	Total
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE
04	--	--	04	15	15	10	60	02 hrs 30 min	--	--	100	04

Course Objectives:

Aim of the subject is to;

1. Understand the network addressing.
2. Explain the functions of the routing protocols.
3. Identify the elements of wireless networks and its functioning.
4. Impart the knowledge of mobile Internet protocols.

Network Layer Addressing: Network layer services, IPv4, Problems with IPv4, strategies to bridge the limitations (IP subnetting, CIDR, DHCP, NAT), Network design with CIDR, IPv6.

Network Layer Protocols: Routing algorithms: Unicast protocols: RIP, OSPF, BGP and multicast routing protocols, ICMP, IGMP, DHCP

Transport Layer Protocols: Services, Transport layer protocols, UDP, TCP: State Transition diagram, flow control, error control, TCP Timers, Queuing disciplines, TCP Congestion control, Quality of Service
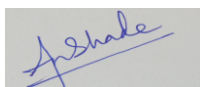
Wireless Networks and Protocols: Link Layer: IEEE 802.11 WLAN protocols, CSMA/CA, Wireless Application Protocol, Routing Protocols & Location Awareness Strategies in Wireless Networks, Resource Allocation and management in Wireless Networks, TCP over wireless network.

Mobile IP: Mobile IPv4 and Mobile IPv6. Problems with routing, Quality of Service and security Applications: Traditional Applications (WWW, HTTP, FTP, Email, Telnet, SSH, DNS), Peer-to-Peer Networks, Socket programming.

NFC (Near Field Communication): Operating principles and short-range communication. Applications in payment systems and access control.

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Text Books:

1. Computer Networks, A Top-Down Approach, B. A. Forouzan and Firouz Mosharraf, Tata McGraw-Hill, 2012.
2. IPv6: Theory, Protocol, and Practice, Pete Lushan, , 1st Edition Elsevier, 2004.
3. TCP/IP and Network Security: Attacks and Defence Mechanisms with Open-Source Tools, Dr. B. B. Meshram, K. A. Sharath, 1st Edition, Shroff Publishers,2017.
4. Near Field Communications Handbook: 13 (Internet and Communications), Syed A. Ahson & Mohammad Ilyas, Syed A. Ahson, Mohammad Ilyas, 1st Edition, Auerbach Publications,2011.

Reference Books:

1. Wireless Communications and Networking, Morgan Kaufmann, Vijay K Garg, 1st Edition, 2008.
2. Computer Networks: A Systems Approach, Larry L Peterson and B S Davie, 1st Edition, Elsevier, 2012.
3. TCP/IP Illustrated Vol. 1: The Protocols, W. Richard Stevens, 2nd Edition, Pearson, 2012.

Course Outcomes:

Students will be able to;

IT1603(B).1. Describes fundamental concepts of computer networking and functionality of layered network architecture

IT1603(B).2. Understand and apply various routing protocols.

IT1603(B).3. Analyse the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.

IT1603(B).4. Describe wireless and mobile networking concepts.

IT1603(B).5. Apply networking concepts to various situations, classifying networks, analysing performance and implementing new technologies.
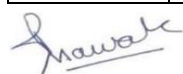
CO-PO-PSO Mapping as per NBA Jan-2016 Format:

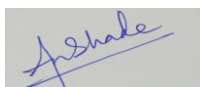| CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1603(B).1	2	2	0	0	3	0	0	0	0	0	0	0	0	3	0
IT1603(B).2	2	3	0	1	3	1	0	0	0	0	0	0	0	3	1
IT1603(B).3	2	2	1	0	3	2	0	1	0	0	0	0	0	3	2
IT1603(B).4	2	3	0	1	3	1	0	0	0	0	0	0	0	3	1
IT1603(B).5	2	3	2	1	3	2	0	1	0	0	0	0	1	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1603(B).1	2	2	0	0	3	0	0	0	0	0	0	0	3	0
IT1603(B).2	2	3	0	1	3	1	0	0	0	0	0	0	3	1
IT1603(B).3	2	2	1	0	3	2	0	1	0	0	0	0	3	2
IT1603(B).4	2	3	0	1	3	1	0	0	0	0	0	0	3	1
IT1603(B).5	2	3	2	1	3	2	0	1	0	0	0	1	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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Course Code	IT1603(C)							Course category		PE	
Course Name	**DATA MINING (PROGRAM ELECTIVE – III (C))**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
04	--	--	04	15	15	10	60	02 hrs 30 min	--	--	100	04

Course Objectives:

Aim of the subject is to;

1. Introduce the concepts, techniques, design and applications of data warehousing and data mining.
2. Understand and implement classical algorithms in data mining and data warehousing.
3. Learn to analyse the data, identify the problems, and choose the relevant algorithms to apply.
4. Assess the strengths and weaknesses of the algorithms and analyse their behaviour on real datasets.

Data ware house and OLAP Technology for data mining: Data ware house, multidimensional data model, data ware house architecture, data warehouse storage, data ware house implementation.

Data mining: Data mining functions, classification and major issues. Data Preprocessing Data cleaning, data integration and transformation, data reduction, discrimination & concept hierarchy generation.

Data mining primitives: Concept, Data mining query language. Concept description: data generalization, Analytical characterization, mining class comparison.

Data Mining Functions: Mining frequent patterns, Market Basket Analysis, Frequent Pattern Mining, The Apriori Algorithm, Introduction to Classification and prediction, Issues regarding classification and prediction, Classification by decision tree induction, Bayesian classification, Introduction to cluster analysis, types of data in clustering analysis, a categorization of major clustering methods, partitioning methods, hierarchical methods, outlier analysis.
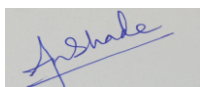
Application and Advances in data mining: Data mining applications, Social Network Analysis, Text Mining.

Text Books:

1. Data Mining Concepts and Technique's, Han and M. Kamber, 1st edition, Elsevier Pub. Indian Reprint, 2004.

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2. Data Ware Housing, Data Mining and OLAP, Berson, 2nd Edition, Tata McGraw- Hill, 2004.

Reference Books:
1. The Data Ware House Life Cycle Tool Kit, R. Kimball, 1st Edition, Wiley Press, John Wiley and Sons (ASIA) Pvt. Ltd., 2001.
2. Data Mining Techniques, Arun K. Pujari, 2nd Edition, University Press (Orient Longman), 2003.

Course Outcomes:

Students will be able to;

IT1603(C).1. Identify and apply the data warehouse and OLAP technology for data mining.
IT1603(C).2. Understand the data preprocessing issues and data mining functions.
IT1603(C).3. Analyse different data mining primitives for the functions.
IT1603(C).4. Implement the different algorithms of classification and prediction.
IT1603(C).5. Implement the different algorithms for data clustering.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1603(C).1	3	2	0	0	3	0	0	0	0	0	0	0	0	2	1
IT1603(C).2	2	2	0	0	3	0	0	0	0	0	0	0	1	2	1
IT1603(C).3	2	2	0	2	3	0	0	0	0	0	0	0	0	2	2
IT1603(C).4	2	2	2	2	3	0	0	0	0	0	0	0	2	2	3
IT1603(C).5	2	2	3	2	3	0	0	0	0	0	3	0	1	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1603(C).1	3	2	0	0	3	0	0	0	0	0	0	0	2	1
IT1603(C).2	2	2	0	0	3	0	0	0	0	0	0	1	2	1
IT1603(C).3	2	2	0	2	3	0	0	0	0	0	0	0	2	2
IT1603(C).4	2	2	2	2	3	0	0	0	0	0	0	2	2	3
IT1603(C).5	2	2	3	2	3	0	0	0	0	0	3	1	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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Course Code	IT1604								Course category			VSE
Course Name	**MACHINE LEARNING LAB**											
Teaching Scheme				**Examination Scheme**								**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
--	--	02	02	--	--	--	--	--	25	25	50	01

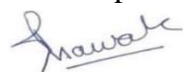**Course Objectives:**

Aim of the subject is to;

1. Make use of Data sets in implementing the machine learning algorithms
2. Implement the machine learning concepts and algorithms in any suitable language of choice.
3. Impart knowledge on the basic concepts underlying machine learning.
4. Acquaint with the process of selecting features for model construction.
5. Familiarize different types of machine learning techniques.

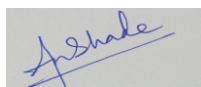**Minimum Eight Experiments to be performed to achieve course outcomes.**

It is a representative list of practical/exercises. The instructor may choose experiments to fulfil the course outcomes.

List of Experiments:

1. Introduction to various datasets provided with sklearn and keras: Structured Vs unstructured data, iris dataset, olivetti faces dataset, MNIST dataset, CIFAR-10 dataset and <any other datasets being used in the labs>, Feature extraction, using sklearn for train-test split, standardization and normalization
2. Implementation of Linear regression.
3. Implementation of Logistic regression.
4. Write a program to implement k-Nearest Neighbour algorithm to classify the object. Use an appropriate data set for classification.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set.
6. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.
8. Write a program to calculate the distance between objects using any one distance calculation method.
9. Write a program to implement K-Means algorithm. Use an appropriate data set for clustering.
10. Implementation of SVM (Weather forecasting/Image segmentation etc)
11. Write a program for association rule mining.
12. Write a program to calculate the Information Gain (for Decision Tree Induction).
13. Implementation of Rule-Based Classification.

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14. Students have to try for ongoing competitions on the websites like Kaggle and submit the report (e.g. this project https://www.kaggle.com/c/digit-recognizer/overview)
15. Mini project.

Software: Students have to use any open-source software like R/Python, TensorFlow, Scikit-learn for implementation of above practical

ICA – The Internal Continuous Assessment shall be based on practical record and knowledge or skills acquired. The performance shall be assessed experiment wise by using continuous assessment format, A & B.

ESE- The End Semester Exam for Practical shall be based on performance in one of the experiments and may be followed by sample questions.

Course Outcomes:

Students will be able to;

IT1604.1. Understand Machine Learning concepts in solving problems of regression, clustering, classification and SVMs nature
IT1604.2. Understand the use of various open-source/free-to-use global datasets being used for Machine Learning concepts and its implementation.
IT1604.3. Apply appropriate Machine Learning algorithms in tackling real life problems.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1604.1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IT1604.2	0	3	0	0	3	0	0	0	0	0	0	0	0	0	1
IT1604.3	0	0	0	0	3	0	0	0	0	0	0	0	0	3	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1604.1	3	0	0	0	0	0	0	0	0	0	0	0	0	0
IT1604.2	0	3	0	0	3	0	0	0	0	0	0	0	0	1
IT1604.3	0	0	0	0	3	0	0	0	0	0	0	0	3	3

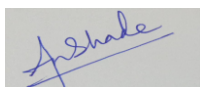0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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Course Code	IT1605(A)					Course category		PE
Course Name	**DEEP LEARNING LAB (PROGRAM ELECTIVE – II LAB (A))**							
Teaching Scheme				**Examination Scheme**				**Credits**
Th	Tu	Pr	Total	Theory			Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
--	--	02	02	--	--	--	--	--	50	--	50	01

Course Objectives:

Aim of the subject is to;

1. Introduce the basic concepts and techniques of Deep Learning and the need of Deep Learning techniques in real-world problems.
2. Provide understanding of various Deep Learning algorithms and the way to evaluate performance of the Deep Learning algorithms.
3. Understand, learn and design Artificial Neural Networks of Supervised Learning for the selected problems and very the different parameters.
4. Understand the concept of CNN, RNN, GANs, Auto-encoders.

Minimum Eight Experiments to be performed to achieve course outcomes.
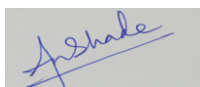
It is a representative list of practical/exercises. The instructor may choose experiments to fulfil the course outcomes.

List of Experiments:

1. (a). Design a single unit perceptron for classification of a linearly separable binary dataset without using pre-defined models. Use the Perceptron () from sklearn.

   b) Identify the problem with single unit Perceptron. Classify using Or-, And- and Xor-ed data and analyse the result.

2. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets. Vary the activation functions used and compare the results.

3. Build a Deep Feed Forward ANN by implementing the Backpropagation algorithm and test the same using appropriate data sets. Use the number of hidden layers >=4.

4. Design and implement an Image classification model to classify a dataset of images using Deep Feed Forward NN. Record the accuracy corresponding to the number of epochs. Use the MNIST, CIFAR-10 datasets.

5. Design and implement a CNN model (with 2 layers of convolutions) to classify multi category image datasets. Record the accuracy corresponding to the number of epochs. Use the MNIST, CIFAR-10 datasets.

6. Design and implement a CNN model (with 4+ layers of convolutions) to classify multi category image datasets. Use the MNIST, Fashion MNIST, CIFAR-10 datasets. Set the No. of Epoch as 5, 10 and 20. Make the necessary changes whenever required. Record the accuracy corresponding to the number of epochs. Record the time required to run the program, using CPU as well as using

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GPU in Colab.

7. Design and implement a CNN model (with 2+ layers of convolutions) to classify multi category image datasets. Use the concept of padding and Batch Normalization while designing the CNN model. Record the accuracy corresponding to the number of epochs. Use the Fashion MNIST / MNIST / CIFAR10 datasets.

8. Design and implement a CNN model (with 4+ layers of convolutions) to classify multi category image datasets. Use the concept of regularization and dropout while designing the CNN model. Use the Fashion MNIST datasets. Record the Training accuracy and Test accuracy corresponding to the following architectures:

   a) Base Model b) Model with L1 Regularization c) Model with L2 Regularization

   d)Model with Dropout e) Model with both L2 (or L1) and Dropout

9. Use the concept of Data Augmentation to increase the data size from a single image.

10. Design and implement a CNN model to classify CIFAR10 image dataset. Use the concept of Data Augmentation while designing the CNN model. Record the accuracy corresponding to the number of epochs.

11. Implement the standard LeNet-5 CNN architecture model to classify multi category image dataset (MNIST, Fashion MNIST) and check the accuracy.

12. Implement the standard VGG-16 & 19 CNN architecture model to classify multi category image dataset and check the accuracy.

13. Implement RNN for sentiment analysis on movie reviews.

14. Implement Bidirectional LSTM for sentiment analysis on movie reviews.

15. Implement Generative Adversarial Networks to generate realistic Images. Use MNIST, Fashion MNIST or any human face datasets.

16. Mini Project.

ICA – The Internal Continuous Assessment shall be based on practical record and knowledge or skills acquired. The performance shall be assessed experiment wise by using continuous assessment format, A & B.

ESE- The End Semester Exam for Practical shall be based on performance in one of the experiments and may be followed by sample questions.

Course Outcomes:

Students will be able to;

IT1605(A).1. Understand the basic concepts and techniques of Deep Learning and the need of Deep Learning techniques in real-world problems.

IT1605(A).2. Apply CNN, RNN and LSTM to learn, predict and classify the real-world problems in the paradigms of Deep Learning.

IT1605(A).3. Understand, learn and design GANs for the selected problems.

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CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1605(A).1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IT1605(A).2	0	0	3	0	3	0	0	0	0	0	0	2	2	0	2
IT1605(A).3	0	0	0	0	3	0	0	0	0	0	0	0	0	3	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1605(A).1	3	0	0	0	0	0	0	0	0	0	0	0	0	0
IT1605(A).2	0	0	3	0	3	0	0	0	0	0	0	2	0	2
IT1605(A).3	0	0	0	0	3	0	0	0	0	0	0	0	3	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1605(B)			Course category			PE
Course Name	WIRELESS & MOBILE COMPUTING LAB (PROGRAM ELECTIVE – II LAB (B))						
Teaching Scheme				Examination Scheme			Credits
Th	Tu	Pr	Total	Theory		Practical	Total	

Th	Tu	Pr	Total	CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	Total	Credits
--	--	02	02	--	--	--	--	--	50	--	50	01

Course Objectives:

Aim of the subject is to;

1. Develop and demonstrate mobile applications using various tools.
2. Articulate the knowledge of GSM.
3. Carry out simulation frequency reuse, hidden/exposed terminal problem.
4. Implement security Algorithms for mobile communication network.

Minimum Eight Experiments to be performed to achieve course outcomes.

It is a representative list of practical/exercises. The instructor may choose experiments to fulfil the course outcomes.
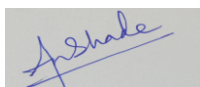
List of Experiments:

1. Implementation a Bluetooth network with application as transfer of a file from one device to another.
2. To implement a basic function of Code Division Multiple Access (CDMA).
3. Implementation of GSM security algorithms (A3/A5/A8).
4. Illustration of Hidden Terminal Problem (NS-2)
5. To setup & configuration of Wireless Access Point (AP) using NS3. communication range in the presence of the access point (AP) and the base station (BS).
6. Implement an application that creates an alert upon receiving a message.
7. Develop an application that uses GUI components.
8. To make an application that draws basic graphical primitives on the screen.
9. Develop an application that makes use of database.
10. Develop a native application that uses GPS location information.
11. To study wireless Security Protocols (WPA2/WPA3 in Wi-Fi networks).
12. Mini Project.

ICA – The Internal Continuous Assessment shall be based on practical record and knowledge or skills acquired. The performance shall be assessed experiment wise by using continuous assessment format, A & B.

ESE- The End Semester Exam for Practical shall be based on performance in one of the experiments

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and may be followed by sample questions.

Course Outcomes:

Students will be able to;

IT1605(B).1. Articulate the knowledge of GSM.

IT1605(B).2. Carry out simulation frequency reuse, hidden/exposed terminal problem.

IT1605(B).3. Implement security Algorithms for mobile communication network.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1605(B).1	0	3	0	0	3	0	0	0	0	0	0	0	0	0	1
IT1605(B).2	0	0	3	0	3	0	0	0	0	0	0	2	2	0	2
IT1605(B).3	0	0	0	0	3	0	0	0	0	0	0	0	0	3	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1605(B).1	0	3	0	0	3	0	0	0	0	0	0	0	0	1
IT1605(B).2	0	0	3	0	3	0	0	0	0	0	0	2	0	2
IT1605(B).3	0	0	0	0	3	0	0	0	0	0	0	0	3	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1605(C)						Course category			PE	
Course Name	**CLOUD COMPUTING LAB (PROGRAM ELECTIVE – II LAB (C))**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
--	--	02	02	--	--	--	--	--	50	--	50	01

Course Objectives:

Aim of the subject is to;

1. Understand the concepts of Cloud Computing.
2. Learn Taxonomy of Virtualization Techniques.
3. Learn launching Web application on Cloud.
4. Acquire knowledge on Aneka Cloud Application Platform.
5. Learn Industry Cloud Platforms

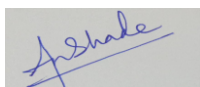**Minimum Eight Experiments to be performed to achieve course outcomes.**

It is a representative list of practical/exercises. The instructor may choose experiments to fulfil the course outcomes.

List of Experiments:

1. Install VirtualBox /VMware Workstation with different flavours of Linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs.
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. To study and use Aneka Cloud Application platform for development of cloud applications.
8. Use AWS Cloud for service for secure storage.
9. Implement file upload/download functionality using Amazon S3
10. Create an application via the AWS Elastic Beanstalk Dashboard. Choose a platform (e.g., Python, Node.js). Deploy your application code using the AWS Management Console, CLI, or an IDE plugin.
11. Deploy your application via GitHub, Azure CLI, or the portal.
12. To study and use Oracle Cloud Application platform for development of cloud applications.
13. To study and develop an application using services of from one of the hyperscalers (AWS, Azure or GCP)
14. To study and apply Sustainability in cloud(Green cloud computing practices).
15. Mini Project.

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ICA – The Internal Continuous Assessment shall be based on practical record and knowledge or skills acquired. The performance shall be assessed experiment wise by using continuous assessment format, A & B.

ESE- The End Semester Exam for Practical shall be based on performance in one of the experiments and may be followed by sample questions.

Course Outcomes:

Students will be able to;

IT1605(C).1. Learn Taxonomy of Virtualization Techniques
IT1605(C). 2. Acquire knowledge on Aneka Cloud Application Platform
IT1605(C).3. Learn Industry Cloud Platforms.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1605(C).1	3	2	0	0	2	0	0	0	0	0	0	0	1	2	0
IT1605(C).2	2	2	0	0	2	0	0	0	0	0	0	0	2	2	1
IT1605(C).3	2	2	3	3	3	0	0	0	0	0	0	0	0	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated
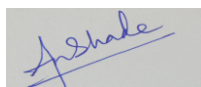
CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1605(C).1	3	2	0	0	2	0	0	0	0	0	0	1	2	0
IT1605(C).2	2	2	0	0	2	0	0	0	0	0	0	2	2	1
IT1605(C).3	2	2	3	3	3	0	0	0	0	0	0	0	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1606							Course category			FP
Course Name	**MINOR PROJECT**										

Teaching Scheme				**Examination Scheme**								**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
--	--	04	04	--	--	--	--	--	50	--	50	02

Course Objectives:

Aim of the subject is to;

1. Offer glimpse into real world problems and challenges that need IT based solutions
2. Enable to create very precise specifications of the IT solution to be designed and use all concepts of IT in creating a solution for a problem.
3. Introduce the vast array of literature available of the various research challenges in the field of IT and create awareness among the students of the characteristics of several domain areas where IT can be effectively used.
4. Improve the team building, communication and management skills of the students.

Minor Project Each batch consists of maximum 2-3 students.
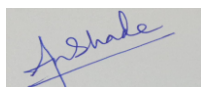Students can refer following domain list for developing minor project.
 1. Web server, DNS Server, Proxy Server, Mail Server.
 2. Database connectivity.
 3. Cyber Security
 4. Client-server Architecture.
 5. Networking.
 6. Data mining and Data Ware housing.
 7. Data Science.
 8. Machine Learning, Deep Learning.
 9. Internet of Things.
 10. Cloud Computing.
 11. Artificial Intelligence.
 12. Block chain.
 13. Network Security.
 14. Big Data Analytics.

Workflow to be carried out by the students to develop Minor Project
 1. Understand the full background of project study and identify the statement of the problem.
 2. A comprehensive literature review supporting your project study.
 3. Data collection, analysis and project design should be carried out.
 4. Actual Implementation of project modules should be carried out.

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5. The final evaluation and interpretation of your project results.

ICA – Participating in project competitions and hackathons/Start up events offers numerous benefits like, gain hands-on experience with coding, design, and problem-solving, Improve Soft Skills, learn to work under pressure and meet deadlines, Networking Opportunities, Real-World Experience, Resume and Career Boost, Confidence and Exposure. The Internal Continuous Assessment shall be based on.

S.N	Activity	Marks allotted
1.	Idea pitching competition	10
2.	Participation of students in Project Competition/Hackathon etc. in current semester	10
3.	Minor Project evaluation	30
	Total Marks	50

Course Outcomes:

Students will be able to;

IT1606.1. Conduct a survey of several available literature in the preferred field of study and Formulate and propose a plan for creating a solution for the research plan identified

IT1606.2. Compare and contrast the several existing solutions for research challenge and demonstrate an ability to work in teams and manage the conduct of the research study.

IT1606.3. To report and present the findings of the study conducted in the preferred domain

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1606.1	0	3	2	0	0	0	0	0	0	0	0	0	3	0	1
IT1606.2	2	0	0	0	0	0	0	0	3	3	0	0	3	0	2
IT1606.3	0	0	0	0	0	0	0	0	0	0	3	3	0	3	2

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1606.1	0	3	2	0	0	0	0	0	0	0	0	3	0	1
IT1606.2	2	0	0	0	0	0	0	0	3	3	0	3	0	2
IT1606.3	0	0	0	0	0	0	0	0	0	0	3	0	3	2

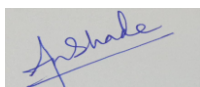0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1607					Course category		MNC	
Course Name	**ENTREPRENEURSHIP AND SUSTAINABLE DEVELOPMENT**								
Teaching Scheme				**Examination Scheme**					**Credits**
Th	Tu	Pr	Total	Theory				Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
02	--	--	02	15	15	20	--	--	--	--	50	0

Course Objectives:

Aim of the subject is to;

1. Understand the principles of entrepreneurship and its associated features
2. Understand the features of sustainable development
3. Analyse the applications of entrepreneurship in real-life environment
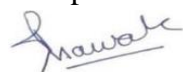4. Understand the importance of sustainable development in modern world

Introduction to Entrepreneurship: Overview of general concept and definition of entrepreneurship, Entrepreneurial culture, Entrepreneurial traits, Woman Entrepreneur, Entrepreneurial environment in India, Problems in institutional framework and its remedies,

Environment and Entrepreneurial Development: Entrepreneurial Development Programmes (EDPs) Role in social context, Entrepreneurial mind-set and its concept and impact, Entrepreneurial growth strategies, bringing about social stability and balanced regional development of industries,
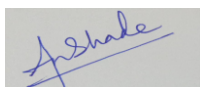
Role of Entrepreneur: Entrepreneur in economic growth as an innovator, Generation of employment opportunities, Entrepreneurship education and research: need, obstacles, opportunities and developments, Ideal and successful entrepreneurship, Search for business ideas, Project identification and formulation, planning, execution, and real-world applicability of business applications.

Introduction of Sustainable Development: Sustainable development goals United Nations: details and purposes, Understanding sustainable development and the Education for sustainable development (ESD) approach, Sustainable lifestyle

Sustainable Entrepreneurship: Latest century competencies for global & decent jobs, Inclusive education & social transformation, Responsible consumption & production, Sustainable cities & communities, Sustainable health practices & social wellbeing, Ethics and social impact of sustainable entrepreneurship, Corporate social responsibility and its impact on future of entrepreneurship thinking.

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Text Books:

1. Green to Gold: How Smart Companies Use Environmental Strategy to Innovate, Create Value and Build Competitive Advantage, Daniel C. Esty, Andrew S. Winston
2. Business and Sustainability, Michael Blowfield, OxFord Press,2019
3. The Triple Bottom Line: How Today's Best-Run Companies Are Achieving Economic, Social and Environmental Success - and How You Can Too, by Andrew Savitz
4. The New Sustainability Advantage: Seven Business Case Benefits of a Triple Bottom Line, Bob Willard

Reference Books:

1. Issues and Trends in Education for Sustainable Development: UNESCO Publication
2. Digital Pedagogy for Building Peaceful & Sustainable Societies: Blue Dot Publication

Course Outcomes:

Students will be able to;

IT1607 1. Understand the best practices of entrepreneurship and its applications
IT1607 2. Apply entrepreneurship principles to real-world projects.
IT1607 3. Understand the concept of sustainable development
IT1607 4. Develop reliable sustainable development practices
IT1607 5. Understand current trends in entrepreneurship and sustainable development

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1607.1	2	2	0	0	3	0	0	0	0	0	0	0	0	3	0
IT1607.2	2	3	0	1	3	1	0	0	0	0	0	0	0	3	1
IT1607.3	2	2	1	0	3	2	0	1	0	0	0	0	0	3	2
IT1607.4	2	3	0	1	3	1	0	0	0	0	0	0	0	3	1
IT1607.5	2	3	2	1	3	2	0	1	0	0	0	0	1	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1607.1	2	2	0	0	3	0	0	0	0	0	0	0	3	0
IT1607.2	2	3	0	1	3	1	0	0	0	0	0	0	3	1
IT1607.3	2	2	1	0	3	2	0	1	0	0	0	0	3	2
IT1607.4	2	3	0	1	3	1	0	0	0	0	0	0	3	1
IT1607.5	2	3	2	1	3	2	0	1	0	0	0	1	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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GOVERNMENT COLLEGE OF ENGINEERING, AMRAVATI
(An Autonomous Institute of Government of Maharashtra)

Course Code	IT1611							Course category			EX
Course Name	**DATA ANALYSIS ASSISTANT**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
--	--	08	--	--	--	--	--	50	--	50	04

Course Objectives:

Aim of the subject is to;

1. Equip students with practical skills in data collection, cleaning, and preprocessing.
2. Develop proficiency in using data analysis tools and software for statistical and exploratory data analysis.
3. Enable students to visualize, interpret, and present data insights effectively.

List of Practical's:

Module 1: Introduction to Data Analysis Tools

- Introduction to spreadsheet software (Excel, Google Sheets)
- Basics of Python/R for data analysis
- Understanding databases and SQL basics

Module 2: Data Collection and Preprocessing

- Importing data from different sources (CSV, JSON, Databases)
- Handling missing values, duplicates, and outliers
- Data cleaning using Python (Pandas) or Excel

Module 3: Exploratory Data Analysis (EDA)

- Descriptive statistics (mean, median, mode, standard deviation)
- Data summarization techniques
- Correlation and trend analysis

Module 4: Data Visualization

- Creating charts and graphs using Excel, Python (Matplotlib, Seaborn)
- Dashboard creation in Power BI/Tableau

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- Storytelling with data

Module 5: Basic Statistical and Predictive Analysis

- Hypothesis testing and probability distribution

- Regression analysis (Linear, Logistic)

- Time-series analysis basics

Module 6: Report Generation and Presentation

- Automating reports using Python/R

- Creating business intelligence reports

- Presenting findings using PowerPoint/Tableau

ICA –Internal Continuous Assessment shall be based on the practical record and knowledge/skills acquired. The performance shall be assessed experiment wise using continuous assessment formats, A and B.

Course Outcomes:

Students will be able to;

IT1611.1	Apply data collection, cleaning, and preprocessing techniques using relevant tools.
IT1611.2	Perform statistical and exploratory data analysis to derive meaningful insights.
IT1611.3	Create visualizations and reports to effectively communicate data findings.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1611.1	2	3	1	0	0	0	0	0	0	0	0	1	2	3	1
IT1611.2	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
IT1611.3	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1

0 - Not correlated   1 - Weakly Correlated   2 - Moderately Correlated   3 - Strongly Correlated

CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1611.1	2	3	1	0	0	0	0	0	0	0	1	2	3	1
IT1611.2	3	3	3	0	0	0	0	0	0	0	1	3	3	1
IT1611.3	3	3	3	0	0	0	0	0	0	0	1	3	3	1

0 - Not correlated   1 - Weakly Correlated   2 - Moderately Correlated   3 - Strongly Correla

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1612							Course category		EX	
Course Name	**CYBER SECURITY ASSISTANT**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
--	--	08	--	--	--	--	---	50	--	50	04

Course Objectives:

Aim of the subject is to;

1. Provide hands-on experience in identifying and mitigating cybersecurity threats.
2. Develop proficiency in using cybersecurity tools for network and system security.
3. Equip students with skills in ethical hacking, penetration testing, and security incident response.

Module 1: Introduction to Cybersecurity

- Basics of Cybersecurity and Ethical Hacking
- Understanding Threats, Attacks, and Vulnerabilities
- Setting up a Virtual Lab (VMware, VirtualBox, Kali Linux, Windows)

Module 2: Network Security & Monitoring

- Basics of Networking & Packet Analysis using Wireshark
- Configuring Firewalls and Intrusion Detection Systems (IDS)
- Secure Network Configurations and VPN Setup

Module 3: System Security & Hardening

- Securing Windows and Linux OS (User Management, File Permissions)
- Malware Analysis and Antivirus Tools
- Patch Management and System Updates

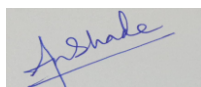**Module 4: Web Security & Ethical Hacking Basics**

- Web Application Vulnerabilities (SQL Injection, XSS, CSRF)
- Introduction to Penetration Testing (Nmap, Metasploit, Burp Suite)
- Password Cracking and Security Best Practices

Module 5: Cryptography & Data Security

- Basics of Encryption and Decryption (AES, RSA, Hashing)

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- Implementing Digital Signatures & SSL/TLS
- Secure Data Storage and File Encryption Tools

Module 6: Cyber Incident Response & Case Studies

- Identifying and Analysing Cyber Attacks
- Incident Response and Forensic Investigation Basics
- Report Writing and Cybersecurity Compliance (GDPR, ISO 27001).

ICA –Internal Continuous Assessment shall be based on the practical record and knowledge/skills acquired. The performance shall be assessed experiment wise using continuous assessment formats, A and B.

Course Outcomes:

Students will be able to;

IT1612.1 Identify cybersecurity vulnerabilities and apply appropriate countermeasures.

IT1612.2 Use cybersecurity tools for securing networks, systems, and data.

IT1612.3 Analyse and respond to cybersecurity incidents effectively.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1612.1	2	3	1	0	0	0	0	0	0	0	0	1	2	3	1
IT1612.2	3	3	1	0	0	0	0	0	0	0	0	1	3	3	1
IT1612.3	3	3	1	0	0	0	0	0	0	0	0	1	3	3	1

0 - Not correlated   1 - Weakly Correlated   2 - Moderately Correlated   3 - Strongly Correlated
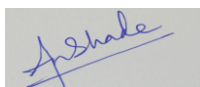
CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1612.1	2	3	1	1	0	0	0	0	0	0	1	2	3	1
IT1612.2	2	3	3	1	0	0	0	0	0	0	1	3	3	1
IT1612.3	2	3	3	1	0	0	0	0	0	0	1	3	3	1

0 - Not correlated 1 - Weakly Correlated   2 - Moderately Correlated   3 - Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1613							Course category			EX
Course Name	**INTERNSHIP/TECHNICAL PROJECT**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
--	--	16	16	--	--	--	--	100	--	100	08

Course Objectives:

Aim of the subject is to;

1. Carry out industry internship / Technical Projects
2. Prepare report of industry internship / Technical Projects

Course Contents:

Industry internship

Students must complete Internship for a duration of minimum sixteen weeks, after completion of fourth semester of second year. The company/organization for Internship must be approved by the DFB. All the official formalities to be completed by the student.

The students should undergo related trainings and perform tasks assigned to him in the industry, under the guidance of Industry personnel.
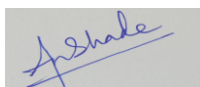
The students shall submit the report based on the Industry Internship along with the Completion Certificate given by Industry.

At the end of internship, student should submit the report based on training received during internship and also give presentation for the same to the panel of examiners / Evaluation Committee comprising of Experts appointed by the Program Head.

ICA –Internal Continuous Assessment shall be based on the practical record and knowledge/skills acquired. The performance shall be assessed experiment wise using continuous assessment formats, A and B.

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Course Outcome:

Students will be able to;

- **IT1613.1**   Demonstrate work carried out in industry.
- **IT1613.2**   Prepare report based on Industry internship
- **IT1613.3**   Give presentation based on Industry internship

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1613.1	3	0	0	0	0	0	1	0	2	3	3	1	2	3	1
IT1613.2	3	0	3	0	0	0	0	0	2	3	3	1	3	3	1
IT1613.3	3	0	0	0	0	0	1	0	2	3	3	1	2	3	1

0- Not correlated 1 - Weakly Correlated   2- Moderately Correlated 3- Strongly Correlated
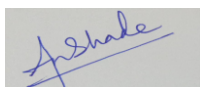
CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025:

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1613.1	3	1	1	1	0	0	0	0	2	3	1	2	3	1
IT1613.2	2	1	3	1	0	0	0	0	2	3	1	3	3	1
IT1613.3	3	0	0	0	0	0	1	0	2	3	3	2	3	1

0- Not correlated   1 - Weakly Correlated   2 - Moderately Correlated   3 - Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1621					Course category			PEH
Course Name	PRIVACY AND SECURITY IN ONLINE SOCIAL MEDIA								
Teaching Scheme				Examination Scheme					Credits
Th	Tu	Pr	Total	Theory				Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

Course Objectives:

Aim of the subject is to;

1. Introduce students to online social networks (OSNs) and the methods for data collection from various OSN platforms using APIs.
2. Understand the challenges and opportunities in analysing data from OSNs.
3. Study the concepts of trust, credibility, and reputations in social systems and their application in OSNs.
4. Explore the role of online social media in law enforcement and online policing.
5. Address critical issues like information privacy, phishing, and identifying fraudulent entities in OSNs.

Online Social Networks: Introduction to OSNs and their significance in modern communication and business, Overview of data collection methods from OSNs using APIs, Common challenges and opportunities in analysing OSN data, Pitfalls and ethical considerations in OSN data collection.

Collecting Data from Online social media: In-depth exploration of data collection techniques using social media APIs (e.g., Twitter API, Facebook Graph API).

Trust, Credibility, and Reputations in Social Systems: Understanding trust, credibility, and reputation concepts in OSNs, how trust and reputation affect social interactions and information spread in OSNs, Case studies of trust systems in OSNs (e.g., peer reviews, ratings, endorsements), Analysing the role of credibility and trust in user behaviour.

Online social media and Policing: Role of OSNs in policing, surveillance, and law enforcement. Case studies of social media being used in investigations and security monitoring.

Information Privacy Disclosure, Revelation, and Its Effects in OSNs: Privacy concerns in OSNs: data disclosure, control, and user consent. The impact of privacy violations and over-sharing on personal and societal levels.

Phishing in OSN & Identifying Fraudulent Entities in OSNs: Overview of phishing techniques used in social networks, Methods for detecting fraudulent accounts and behaviours.

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Text Books:
1. Social Media Mining: An Introduction, Reza Zafarani, Mohammad Ali Abbasi, Huan Liu, 1st Edition, Cambridge University Press, 2014,
2. Mining the Web: Discovering Knowledge from Hypertext Data, Soumen Chakrabarti, 1st Edition, Morgan Kaufmann, 2003.

Reference Books:
1. The Social Media Handbook: The Essential Guide for Managers, Executives, and Professional, Michael D. White, 1st Edition, Wiley, 2011.
2. Trust and Reputation Systems, Fabio Massimo Zanzotto, Roberto Basili, 1st Edition, Springer, 2008.

NPTEL Course Link:

Privacy and Security in Online social media, Prof. Ponnurangam Kumaraguru, IIIT Hyderabad

Link: https://onlinecourses.nptel.ac.in/noc23_cs13/preview

Course Outcomes:

Students will be able to;

IT11621.1. Define and explain key concepts related to online social networks, their structure, and functions.
IT11621.2. Analysing collected data from online social media platforms using APIs.
IT11621.3. Understand the dynamics of trust, credibility, and reputation in social media systems and their impact on online interactions.
IT11621.4. Assess the impact of privacy issues and fraudulent behaviours such as phishing in OSNs.
IT11621.5. Apply their knowledge to analyse real-world research papers and discuss trends and emerging issues in online social networks.
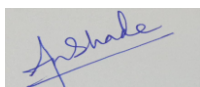
CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1621.1	3	0	0	0	0	2	0	1	0	0	0	0	0	2	0
IT1621.2	2	2	0	0	0	2	0	0	0	0	0	0	0	3	1
IT1621.3	2	0	3	0	2	0	0	2	0	0	0	0	0	3	1
IT1621.4	0	3	0	0	3	3	0	0	0	0	0	0	0	2	2
IT1621.5	0	2	0	0	2	2	0	3	0	0	0	0	0	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1621.1	3	0	0	0	0	2	0	1	0	0	0	0	2	0
IT1621.2	2	2	0	0	0	2	0	0	0	0	0	0	3	1
IT1621.3	2	0	3	0	2	0	0	2	0	0	0	0	3	1
IT1621.4	0	3	0	0	3	3	0	0	0	0	0	0	2	2
IT1621.5	0	2	0	0	2	2	0	3	0	0	0	0	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1622						Course category			PEH
Course Name	**RESEARCH METHODOLOGY IN NATURAL SCIENCES**									
Teaching Scheme				**Examination Scheme**						**Credits**
Th	Tu	Pr	Total	Theory					Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

Course Objectives:

Aim of the subject is to;

1. Develop critical thinking and logical reasoning skills, including inductive, deductive, and syllogistic logic.
2. Understand the historical development of science and the influence of philosophy on scientific thought and methodologies.
3. Gain practical skills in forming hypotheses, conducting scientific measurements, testing hypotheses, and applying theoretical methods.
4. Develop Scientific Communication Skills.

Philosophy of Science: Subjective vs. Objective, Materialism vs. Idealism, Causality**.** The role of philosophical concepts in scientific inquiry. Logical Reasoning: Inductive, Deductive, and Syllogistic Logic Applying logic in hypothesis formation and scientific argumentation.

History of the Development of Science: Key historical developments in science and their philosophical influences Influence of thinkers like Aristotle, Galileo, Newton, and Darwin. Work of scientist: The scientific method in practice: observation, experimentation, theory-building. Interdisciplinary nature of modern scientific work.

Forming a Hypothesis: Characteristics of a good hypothesis: testability, falsifiability. Techniques for formulating research hypotheses in natural sciences.

Techniques of Scientific Measurement: Methods of measurement in scientific research: quantitative vs. qualitative data. Accuracy, precision, and reliability in scientific measurements.

Testing of Hypotheses: Experimental design: control groups, randomization, variable manipulation. Statistical methods for hypothesis testing.

Methods of Theoretical Research: Role of theory in scientific research. Developing and testing theoretical models and frameworks.

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The Art of Scientific Communication: Writing scientific papers: structure, clarity, and style. Communicating complex scientific ideas to both expert and non-expert audiences.

Presentation in Seminars and Conferences: Preparing for oral presentations: structure, delivery, handling questions. Design of scientific posters for conferences.

Sponsored Research: Understanding research funding and grants. Writing proposals and managing sponsored research projects.

Ethical Conduct in Science: Ethical principles: honesty, transparency, and integrity in research. Addressing plagiarism, data manipulation, and ethical treatment of research subjects.

Text Books:
1. Research Methodology for Natural Sciences, Soumitro Banerjee,1st edition, IISc Press, 2022.
2. The Philosophy of Science: A Very Short Introduction, Samir Okasha, 2nd Edition, Oxford University Press, 2016

Reference Books:
1. The Structure of Scientific Revolutions, Thomas S. Kuhn, 4th Edition, University of Chicago Press,2012
2. The Philosophy of Science: A Companion Stephen P. Stich, Ted A. Warfield, 1st Edition, Blackwell Publishing, 1994

NPTEL Course Link:

Research Methodology in Natural Sciences, Prof. Soumitro Banerjee, IISER Kolkata

Link: https://onlinecourses.nptel.ac.in/noc23_ge06/preview

Course Outcomes:

Students will be able to;

IT1622.1. Understand and apply key philosophical ideas (subjectivity, objectivity, materialism, idealism, and causality) to scientific practices and theories.
IT1622.2. Utilize inductive, deductive, and syllogistic reasoning in formulating and testing scientific hypotheses.
IT1622.3. Evaluate the role of philosophy in the historical development of science and its impact on modern scientific practices.
IT1622.4. Formulate testable hypotheses, measure variables accurately, and test hypotheses through appropriate scientific methods.
IT1622.5. Communicate research findings clearly through scientific writing, conference

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presentations, and research papers, ensuring adherence to ethical standards in research.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1622.1	3	0	0	0	0	2	0	1	0	0	0	0	0	2	0
IT1622.2	2	2	0	0	0	2	0	0	0	0	0	0	0	3	1
IT1622.3	2	0	3	0	2	0	0	2	0	0	0	0	0	3	1
IT1622.4	0	3	0	0	3	3	0	0	0	0	0	0	0	2	2
IT1622.5	0	2	0	0	2	2	0	3	0	0	0	0	0	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated
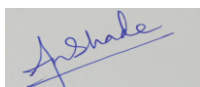
CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1622.1	3	0	0	0	0	2	0	1	0	0	0	0	2	0
IT1622.2	2	2	0	0	0	2	0	0	0	0	0	0	3	1
IT1622.3	2	0	3	0	2	0	0	2	0	0	0	0	3	1
IT1622.4	0	3	0	0	3	3	0	0	0	0	0	0	2	2
IT1622.5	0	2	0	0	2	2	0	3	0	0	0	0	2	3

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1631						Course Category			PER
Course Name	**RESEARCH PROJECT STAGE - II**									

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT-I	CT-II	TA	ESE	ESE Duration	ICA	ESE		
--	--	12	12	--	--	--	--	--	100	100	200	06

Course Objectives:

To make the students aware and understand:

1. Research design, including the sampling size and techniques
2. Relevant data and analyze it using modern data processing tools/Carry out experimentation.
3. Improving the ability of presentation skill and communication techniques

Course Contents:

Prepare the research design, including the sampling size and techniques and the statistical tools for the analysis of for the research topic decided in Stage-I (V Semester).

Collect the relevant data, analyze and interpret the same using modern data processing tool, and test the hypotheses if necessary.

Develop a plan for preparing a report. Publish review paper in peer view journal/Scopus indexed journal.

The faculty supervisor will assess the method and procedures used by the learner.

Internal Continuous Assessment (ICA):
At the end of semester, the work carried shall be evaluated by three-member committee constituted by Head of Department.

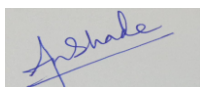**End Semester Examination (ESE):**
The internal and external examiner appointed by the competent authority will assess the research work carried out by the student through oral presentation and demonstration (if any).
Course Outcomes:

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

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IT1631.1   Analyze and interpret data to produce useful information.

IT1631.2   Show in-depth skill to use some laboratory, modern tools and techniques.

IT1631.3   Communicate results, concepts, analyses and ideas in written and oral form.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1631.1	0	3	3	3	0	0	2	3	0	0	2	2	0	2	0
IT1631.2	3	0	0	0	3	0	0	0	0	0	0	3	3	0	0
IT1631.3	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3

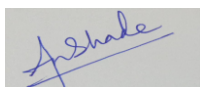0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1631.1	2	1	0	0	0	0	0	0	0	0	0	2	2	0
IT1631.2	2	2	1	0	2	0	2	0	0	0	0	3	2	0
IT1631.3	2	2	1	1	2	1	0	0	0	0	0	3	1	0

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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(B. Tech. Information Technology Curriculum w.e.f 2025-26 Batch)

Course Code	IT1641							Course category			MN
Course Name	**STEGANOGRAPHY AND DIGITAL WATERMARKING**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE	
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

Course Objectives

Aim of the subject is to;

1. Provide an insight to steganography techniques.
2. Describe Watermarking techniques.
3. Provide an insight to attacks on data hiding and integrity of data.

Module 1:

Steganography: Overview, History, Methods for hiding (text, images, audio, video, speech etc.).

Steganalysis: Active and Malicious Attackers, Active and passive Steganalysis.

Module 2:

Frameworks for secret communication (pure steganography, secret key, public key steganography), Steganography algorithms (adaptive and non-adaptive).

Module 3:

Steganography techniques: Substitution systems, Spatial Domain, transform domain techniques, Spread spectrum, Statistical steganography.
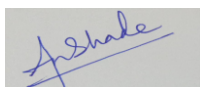
Module 4:

Detection, Distortion, Techniques: LSB Embedding, LSB Steganalysis using primary sets.

Module 5:

Digital Watermarking: Introduction, Difference between Watermarking and Steganography, Classification (Characteristics and Applications), types and techniques (Spatial-domain, Frequency-domain, and Vector quantization-based watermarking), Watermark security & authentication.

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Module 6:

Recent trends in Steganography and digital watermarking techniques. Case study of LSB Embedding, LSB Steganalysis using primary sets.

Text Books:

1. Disappearing Cryptography – Information Hiding: Steganography & Watermarking, Peter Wayner, Morgan Kaufmann Publishers, New York, 2002.
2. Digital Watermarking and Steganography", Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, Ton Kalker, Margan Kaufmann Publishers, New York, 2008.

Reference Book:

1. Information Hiding: Steganography and Watermarking-Attacks and Countermeasures, Neil F. Johnson, Zoran Duric, Sushil Jajodia, Springer, 2000.
2. Information Hiding Techniques for Steganography and Digital Watermarking, Stefan Katzenbeisser, Fabien A. P. Petitcolas. Artech House Publishers, 1999.

Corresponding Online Resources:
1. Cyber Security, https://swayam.gov.in/nd2_cec20_cs09/preview.
2. Introduction to Cyber Security, https://swayam.gov.in/nd2_nou20_cs01/preview

Course Outcomes:

Students will be able to;

IT1641.1. Learn the concept of information hiding.
IT1641.2. Survey of current techniques of steganography and learn how to detect and extract hidden information.
IT1641.3. Learn watermarking techniques and through examples understand the concept.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1641.1	3	2	0	2	0	0	1	0	0	2	2	2	1	3	1
IT1641.2	3	2	3	2	1	0	2	2	0	1	1	2	2	3	3
IT1641.3	3	2	0	2	0	0	1	0	0	2	2	2	1	3	1

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

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CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1641.1	3	2	0	2	0	0	1	0	0	2	2	1	3	1
IT1641.2	3	2	3	2	1	0	2	2	0	1	1	2	3	3
IT1641.3	3	2	0	2	0	0	1	0	0	2	2	1	3	1

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Course Code	IT1642						Course category			MN	
Course Name	**SECURITY ASSESSMENT AND RISK ANALYSIS**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	15	15	10	60	02 hrs 30 min	--	--	100	03

Course Objectives

Aim of the subject is to;

1. Describe the concepts of risk management in information security.
2. Define and differentiate various Contingency Planning components.
3. Define and be able to discuss incident response options.
4. Design an Incident Response Plan for sustained organizational operations.

Module 1:

SECURITY BASICS: Information Security (INFOSEC) Overview: critical information characteristics – availability information states – processing security countermeasures-education, training and awareness, critical information characteristics – confidentiality critical information characteristics – integrity, information states – storage, information states – transmission, security countermeasures-policy, procedures and practices, threats, vulnerabilities.

Module 2:

Threats to and Vulnerabilities of Systems: Threats, major categories of threats (e.g., fraud, Hostile Intelligence Service (HOIS). Countermeasures: assessments (e.g., surveys, inspections).

Concepts of Risk Management: consequences (e.g., corrective action, risk assessment), cost/benefit analysis and implementation of controls, monitoring the efficiency and effectiveness of controls (e.g., unauthorized or inadvertent disclosure of information).
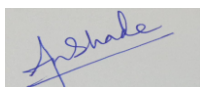
Module 3:

Security Planning: directives and procedures for policy mechanism. Contingency Planning/Disaster Recovery: agency response procedures and continuity of operations, contingency plan components, determination of backup requirements, development of plans for recovery actions after a disruptive event.

Module 4:

Personnel Security Practices and Procedures: access authorization/verification (need-to-know),

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contractors, employee clearances, position sensitivity, security training and awareness, systems maintenance personnel. Auditing and Monitoring: conducting security reviews, effectiveness of security programs, investigation of security breaches, privacy review of accountability controls, review of audit trails and logs.

Module 5:

Operations Security (OPSEC): OPSEC surveys/OPSEC planning INFOSEC: computer security – audit, cryptography-encryption (e.g., point-to-point, network, link).

Module 6:

Case study of threat and vulnerability assessment.

Text Books:

1. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices, Nina Godbole, 2nd Edition, John Wiley & Sons, 2017.

Reference Book:

1. Principles of Incident Response and Disaster Recovery, Whitman & Mattord, 1sr Edition, Course Technology Publication, 2006.

Corresponding Online Resources:

1. Introduction to Cyber Security, https://swayam.gov.in/nd2_nou20_cs01/preview
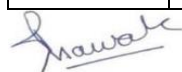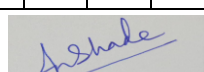2. (Web Link) http://www.cnss.gov/Assets/pdf/nstissi_4011.pdf

Course Outcomes:

Students will be able to;

IT1642.1. Apply contingency strategies including data backup and recovery and alternate site selection for business resumption planning
IT1642.2. Describe the escalation process from incident to disaster in case of security disaster.
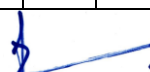IT1642.3. Design a Disaster Recovery Plan for sustained organizational operations.

CO-PO-PSO Mapping as per NBA Jan-2016 Format:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1642.1	3	2	0	2	0	0	1	0	0	2	2	2	1	3	1
IT1642.2	3	2	3	2	1	0	2	2	0	1	1	2	2	3	3

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IT1642.3	3	2	0	2	0	0	1	0	0	2	2	2	1	3	1

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CO-PO-PSO Mapping as per NBA Jul-2024 Format [w.e.f. from 01 Jan 2025]:

CO	PO / PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IT1642.1	3	2	0	2	0	0	1	0	0	2	2	1	3	1
IT1642.2	3	2	3	2	1	0	2	2	0	1	1	2	3	3
IT1642.3	3	2	0	2	0	0	1	0	0	2	2	1	3	1

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