

Nagarjuna College of Engineering & Technology, Bengaluru

An Autonomous Institute, Affiliated to VTU Belagavi

Scheme & Syllabus of V Semester ISE

As per the NEP 2020 Guidelines, Choice-Based Credit System & Outcome-Based Education

Information Science & Engineering

w.e.f.

Academic Year 2023-2024

VISION

To disseminate the IT knowledge among the students for achieving excellence in education and to irradiate budding engineers as leaders in information technology.

MISSION

M1: To maintain leadership and excellence in Information Technology.

M2: Achieving excellence in IT through analysis, design, development of software products

M3: Developing communication skills, leadership qualities and team work among students' community by providing opportunities to work on various projects through internship with industry partners

M4: To inculcate Ethics and Human values for solving societal problems and environmental protection.

M5: Promoting research, higher studies and entrepreneurship among the students through outside world interaction

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The graduates of Information Science and Engineering are expected to fulfil the following PEOs after a few years of their graduation.

PEO1: Pursue a successful career in the field of Information Science & Engineering or a related field utilizing his/her education and contribute to the profession as an excellent employee, or as an entrepreneur.

PEO2: Be able to work effectively in multidisciplinary environments and be responsible members/leaders of their communities

PEO3: The graduates of Information Science and Engineering Program should be able to establish an understanding of professionalism, teamwork, ethics, public policy that allows them to become good professional Engineers

PEO4: The graduates of Information Science and Engineering Program should be able to provide novel engineering solutions and efficient software designs with legal and ethical responsibility.

PEO5: Continuously improve by pursuing advanced degrees in engineering, business, or other professional fields through formal means or through informal self-study.

PROGRAM OUTCOMES (POs)

Graduates of the Information Science and Engineering Programmee will be able to achieve the following POs:

PO1: Engineering Knowledge

Apply the knowledge of mathematics, science, engineering fundamentals, and Information Science and Engineering principles to the solution of complex problems in Information Science and Engineering.

PO2: Problem Analysis

Identify, formulate, research literature, and analyze complex Information Science and Engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.

PO3: Design/Development of Solutions

Design solutions for complex Information Science and Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the publichealth and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of Complex problems

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions related to Information Science and Engineering problems.

PO5: Modern Tool Usage

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex Information Science and Engineering activities with an understanding of the limitations.

PO6: The Engineer and Society

Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Information Science and Engineering practice.

PO7: Environment and Sustainability

Understand the impact of the professional **Information Science and Engineering** solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics

Apply ethical principles and commit to professional ethics and responsibilities and norms of the Information Science and Engineering practice.

PO9: Individual and Team work

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication

Communicate effectively on complex Information Science and Engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance

Demonstrate knowledge and understanding of the engineering and management principles and applythese to one's own work, as a member and leader in a team, to manage Information Science and Engineering projects and in multidisciplinary environments.

PO12: Life Long Learning

Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Program Specific Outcomes (PSOs) are what the graduates of a specific undergraduate engineering program should be able to do at the time of graduation.

PSO1: Professional Skills

The ability to understand, analyze and develop algorithms and write Information application programs in the areas related to information technology

PSO2: Problem-Solving Skills

Ability to understand the ethics, human values for solving societal problems and environmental protection

PSO3: Foundation of mathematical concepts

Ability to understand the software development skills and practical knowledge for promoting research, higher studies and entrepreneurship.

NAGARJUNA COLLEGE OF ENGINEERING & TECHNOLOGY, BENGALURU B.E. in Information Science & Engineering

Scheme of Teaching and Examination 2021-22

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the academic year 2021-22)

V SEMESTER

						nt	Те	acł	ning H Week	ours /		Exa	minat	tion	
ି Course and ଅ Course Code		Course Title		Teaching Departmen	Theory / Lecture	Tutorial	Practical / Drawing	Self-study Component	Duration in Hours	CIE Marks	SEE Marks	Total Marks	Credits		
			Softy	ware Engine	aring and		L	Т	Р	S					
1	BSC	21IST51	Proje	ect Management	t and	CSEB	3	-	-	-	3	50	50	100	3
2	IPCC	21ISI52	Data Ware	Mining & Data ehousing (IC)		CSEB	3	-	2	-	5	50	50	100	4
3	PCC	21IST53	Inter	rnet of Things		CSEB	3	-	-	-	3	50	50	100	3
4	PCC	21IST54	Artif Mach	ficial Intelligenco hine Learning	e and	CSEB	3	-	-	-	3	50	50	100	3
5	PCC	21ISL55	Inter	rnet of Things La	ab	CSEB	-	-	1	-	2	50	50	100	1
6	AEC	21IST56	Rese	earch Methodolo	gy and IPR	Any Dept.	2	-	-	-	2	50	50	100	2
7	HSMC	21ENV57	Envi	ronmental Scier	nce	нѕмс	1	-	-	-	2	50	50	100	1
8	AEC	21ISL58X	Abili	ity Enhancemen	t Course-V	Any Dept.	-	-	2	-	1	50	50	100	1
	TOTAL 15 - 5 - 21 400 400 800 18										18				
				Ability	Enhancemei	nt Cour	se-	V							
21	21ISL581 C# and Dot Net 21ISL582 Web Designing using PHP and Microcontroller										Micı Proş	rocon gram	trolle ming		

SOFTWARE ENGIN	NEERING AND P	ROJECT MANAGEMI	ENT
Course Code	21IST51	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Prerequisites: Software Development	L t Life Cycle (SDLC)	Scripting Language, Version	Control Tool
Database	<u> </u>	<u>····································</u>	<u> </u>
Course Learning Objectives			
CLO 1.Outline software engineerin	ng principles and activ	vities involved in building la	arge software
programs. Identify ethical a	and professional issues	s and explain why they are of	of concern to
CIO 2 Describe the process of the	requirement gathering	requirement classification	requirement
specification and requireme	ents validation	, requirement classification,	requirement
CLO 3. Infer the fundamentals of o	object oriented concept	ts. differentiate system mode	els. use UML
diagrams and apply design	patterns.	,	
CLO 4. Explain the role of DevOps	in Agile Implementation	on.	
CLO 5. Discuss various types of sof	ftware testing practices	and software evolution proce	esses.
Teaching-Learning Process (General	l Instructions)	1	
These are sample Strategies; which to	eachers can use to acc	celerate the attainment of th	e various course
1 Lecturer methods (L) need not to b	e only a traditional lect	ture method but alternative e	offective teaching
methods could be adopted to attain	n the outcomes.	ture method, but alternative e	meetive teaching
2. Use of Video/Animation to explain	n functioning of variou	s concepts.	
3. Encourage collaborative (Group L	earning) Learning in th	ne class.	
4. Ask at least three HOT (Higher	order Thinking) que	stions in the class, which p	promotes critical
thinking.			
5. Adopt Problem Based Learning	(PBL), which fosters	students' Analytical skills,	develop design
thinking skills such as the ability	to design, evaluate, ge	neralize, and analyze inform	ation rather than
simply recall it.	acontationa		
7 Show the different ways to solve	the same problem w	ith different circuits/logic ar	nd encourage the
students to come up with their ow	n creative ways to solv	e them.	la cheodrage the
8. Discuss how every concept can	be applied to the real	l world - and when that's p	oossible, it helps
improve the students understanding	5.	1	, 1
	 Module - I		
Introduction: The evolving role of	software, Software, 7	The changing nature of sof	tware. Software
engineering, A Process Framework, P	rocess Patterns, Proce	ess Assessment, Personal an	d Team Process
Models, Process Technology, Product a	nd Process.(Textbook	1: Chapter 1: 1.1 to 1.3)	
Process Models: Prescriptive models,	Waterfall model, Incre	mental process models, Evol	utionary process
models, Specialized process models.(T	extbook 1: Chapter 2	2: 2.1, 2.2, 2.4 to 2.7)	
			08 Hours
	Module - I	I	
Introduction, Modelling Concepts	and Class Modelling	: What is Object orientatio	n? What is OO
development? OO Themes; Evidence	ce for usefulness of	OO development; OO mo	odelling history.
Modelling as Design technique: Mode	lling, abstraction, The	Three models. Class Model	ling: Object and
(Taytheoly 2: Charter 1 2 2)	concepts, Generalizatio	on and Inneritance.	
(1 extruor 2: Chapter 1,2,3) Building the Analysis Models: A a	ample class model N	Javigation of class models	Introduction to
RUP(Textbook: 5 Sec 2.4) and UML	diagrams Requirement	Analysis, Analysis Model A	Approaches, Data

modeling Concepts, (Textbook 1: Chapter 8: 8.1 to 8.8)

Module - III

Software Testing: A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object -Oriented Software, Validation Testing, System Testing, The Art of Debugging.(**Textbook 1: Chapter 13: 13.1 to 13.7**)

Agile Methodology & DevOps: Before Agile – Waterfall, Agile Development,

Self-Learning Section: What is DevOps?, DevOps Importance and Benefits, DevOps Principles and Practices, 7 C's of DevOps Lifecycle for Business Agility, DevOps and Continuous Testing, How to Choose Right DevOps Tools?, Challenges with DevOps Implementation.(**Textbook 4: Chapter 2: 2.1 to 2.9**)

08 Hours

Module - IV

Introduction to Project Management:

Introduction, Project and Importance of Project Management, Contract Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some ways of categorizing Software Projects, Stakeholders, Setting Objectives, Business Case, Project Success and Failure, Management and Management Control, Project Management life cycle, (Textbook 3: Chapter 1: 1.1 to 1.17)

08 Hours

Module - V

Activity Planning:

Objectives of Activity Planning, When to Plan, Project Schedules, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass– Backward Pass(**Textbook 3: Chapter 6: 6.1 to 6.16**)

Software Quality: Introduction, The place of software quality in project planning, Importance of software quality, software quality models, ISO 9126, quality management systems, process capability models, techniques to enhance software quality, quality plans. (**Textbook 3: Chapter 13: (13.1 to 13.6 , 13.9, 13.11, 13.14**))

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ocess	Chalk and board, Active Learning, Demonstration

Teaching-Learning Pr Course Outcomes

At the end of the course the student will be able to:

- CO 1. Understand the activities involved in software engineering and analyze the role of various process models
- CO 2. Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques
- CO 3. Describe various software testing methods and to understand the importance of agile methodology and DevOps
- CO 4. Illustrate the role of project planning and quality management in software development
- CO 5. Understand the importance of activity planning and different planning models

Assessment Details (both CIE and SEE

	Component	Weight	age (%)							
	CIE 1 5 th week	20								
CIE!»	CIE 2 10 th week	20	60							
CIES	CIE 3 15 th week 20									
AAT's AAT-1 10 th week 10										
	AAT-2	10								
	AAT-3 20									
Continuous Internal Evaluation Total Marks: 100. Reduced to 50 Marks										
Semester End Examination (SEE) Total Marks: 100. Reduced to 50 Marks										

Suggested Learning Resources:

Textbooks

- 1. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill.
- 2. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML, 2nd Edition, Pearson Education, 2005.
- 3. Bob Hughes, Mike Cotterell, Rajib Mall: Software Project Management, 6th Edition, McGraw Hill Education, 2018.
- 4. Deepak Gaikwad, Viral Thakkar, DevOps Tools from Practitioner's Viewpoint, Wiley.
- 5. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012.

Reference:

1. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India.

Weblinks and Video Lectures (e-Resources):

- 1. https://onlinecourses.nptel.ac.in/noc20_cs68/preview
- 2. https://www.youtube.com/watch?v=WxkP5KR Emk&list=PLrjkTql3jnm9b5nrggx7Pt1G4UAHeFlJ http://elearning.vtu.ac.in/econtent/CSE.php
- 3.
- 4. http://elearning.vtu.ac.in/econtent/courses/video/CSE/15CS42.html
- 5. https://nptel.ac.in/courses/128/106/128106012/ (DevOps)

							CO-P	O maj	pping						
	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO						
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	-	-	-	-	2	2	-	1	2	-	2
CO2	2	2	2	2	3	-	-	-	2	2	-	1	2	-	2
CO3	2	-	3	2	3	-	-	-	3	3	-	2	2	-	2
CO4	1	2	2	2	3	2	2	2	3	3	3	3	2	-	2
CO5	3	3	3	2	3	2	2	-	-	2	3	2	-	3	2
	•		•	•	•	•	•			•	•	•	•	•	

DATA MINING	G AND DAT	A WAREHOUSIN	G (IC)
Course Code	21ISI52	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	04	Exam Hours	03
 Course Learning Objectives CLO 1. Identify the scope and necessity CLO 2. Describe various Data Models solve the root problems. CLO 3. Understand various Tools of D problems. CLO 4. Learn how to analyze the data, apply. CLO 5. Assess the Pros and Cons of va Data Mining: Introduction - Steps functionalities - Classification of data warehouse - Issues - Data Preprocessity Data Warehousing: Data warehousi Data Model - OLAP Operation in 	y of Data Minin and Design Me ata Mining and identify the pro- rious algorithm Modu in KDD - Sys mining system ng - Data Minin Modul ng components the Multi- Di	ng and Warehousing for thodologies of Data Wa their Techniques to sol oblems, and choose the as and analyze their beh le - I stem Architecture – T as - Integration of a data ang Application. e - II - Building a data ware mensional Model - T	the society. arehousing destined to ve the real time relevant algorithms to avior on real datasets. ypes of data -Data mining a mining system with a data 08 Hours ehouse - Multi Dimensional hree Tier Data Warehouse
OLAP Vs OLTP Integrated OLAM an	nd OLAP Archi	tecture.	08 Hours
Association Rule Mining: Mining fr Finding Frequent itemset using Cano Item sets - Mining Frequent itemset v rules - Mining Multi-Level Associa Correlation analysis - Constraint based	requent patterns lidate Generati without Candida ation Rule-Mir d association m	s - Associations and con on - Generating Assoc ate Generation Mining hing Multidimensional ining.	rrelations - Mining methods iation Rules from Frequent various kinds of association Association Rule- Mining 08 Hours
	Modul	e - IV	
Classification and Prediction: Classification - Classification by Decision Naïve Bayesian Classification - Bayes Back propagation - Support vector mat	ssification and on Tree Induct sian Belief Net chines - Predic	prediction - Issues Ro ion - Bayesian classifi work - Rule based class tion -Linear Regression	egarding Classification and cation – Bayes' Theorem - sification - Classification by 08 Hours
	Modu	e - V	
Clustering, Applications and Trend Analysis - Categorization of major cl Density-based methods - Grid-based cluster analysis - Outlier analysis - Mining Text Database- Mining Spatial	ds In Data M ustering metho methods - M Social Impacts Databases.	ining: Cluster analysis ds - Partitioning metho odel based clustering s of Data Mining- Cas	- Types of data in Cluster ds – Hierarchical methods - methods -Constraint Based se Studies: Mining WWW- 08 Hours
Teaching-Learning Process	(Chalk and board, Active	Learning, Demonstration

Lab Programs

- 1. Installation of WEKA Tool
- 2. Creating new Arff File
- 3. Pre-Processes Techniques on Data Set and Pre-process a given dataset based on Handling Missing Values
- 4. Generate Association Rules using the Apriori Algorithm
- 5. Generating association rules using fp-growth algorithm
- 6. Build a Decision Tree by using J48algorithm
- 7. Naïve bayes classification on a given data set
- 8. Applying k-means clustering on a given data set
- 9. Calculating Information gains measures
- 10. OLAP Cube and its different operations

Course Outcomes

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

CO1: Assess Raw Input Data and process it to provide suitable input for a range of data mining algorithm

CO2: Design and Modelling of Data Warehouse

- CO3: Discover interesting pattern from large amount of data
- CO4: Design and Deploy appropriate Classification Techniques
- CO5: Able to cluster high dimensional data

Assessment Details (both CIE and SEE)

	Component		Weightage (%)							
	CIE 1 5 th week	20								
CIE?~	CIE 2 10 th week	20	20							
CIES	CIE 3 15 th week	20								
AAT's	AAT's AAT-1 4 th week 10									
	Lab Test		10							
	Lab Records 10									
Continuo	Continuous Internal Evaluation Total Marks: 60 Reduced to 20 Marks									
Semester E	Semester End Examination (SEE) Total Marks: Reduced to 30 Marks									

Suggested Learning Resources:

Textbooks

 Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", 2ndEdition, Elsevier, 2007, ISBN-10

9789380931913, ISBN-13-978-9380931913.

- 2. Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", Published by Tata McGraw-Hill Education Pvt. Ltd., 2004, ISBN 10: 0070587418 / ISBN 13: 9780070587410.
- 3. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Person Education, 2007.ISBN-13-9788131714720, ISBN-10-8131714720.
- 4. G. K. Gupta, "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006, ISBN-13:9788120350021, ISBN 10 :8120350022.
- 5. Daniel T. Larose, "Data Mining Methods and Models", Publisher-John Wiley & Sons, 2006, 2006, ISBN 8126507764, 9788126507764.

Reference:

- 1. Pieter Adriagus, Dolf Zantinge, "Data Mining", Addison-Wesley Publisher, Pearson education, 2007, ISBN 978-81-317-0717-3.
- 2. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World", Pearson education, ISBN 978-81-317-0459-2, 2009.

Weblinks and Video Lectures (e-Resources):

- 1. https://study.com/academy/lesson/data-warehousing-and-data-mining-information-for-business-intelligence.html
- 2. http://myweb.sabanciuniv.edu/rdehkharghani/files/2016/02/The-Morgan-Kaufmann-Series-in-Data-Management-Systems-Jiawei-Han-Micheline-Kamber-Jian-Pei-Data-Mining.-Concepts-and Techniques -3rd-Edition-Morgan-Kaufmann-2011.pdf
- 3. https://www-users.cs.umn.edu/~kumar001/dmbook/index.php

						CO	- PO-	PSO N	Ларрі	ng					
			Program Specific Outcomes												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	_	-	2	3	-	-	-	-	-	-	-	-	2	-	-
CO4	_	-	-	3	-	-	-	-	_	-	I	2	3	-	-
CO5	2	2	-	_	-	-	-	-	_	-	-	-	-	2	-
AVG	2.5	2.5	2	3	0	-	-	-	-	-	_	2	3.5	2	0

IN	TERNET OF THING	S								
Course Code	21IST53	CIE Marks	50							
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50							
Total Hours of Pedagogy	40	Total Marks	100							
Credits	03	Exam Hours	03							
Prerequisite: Networking, Sensors.			•							
Course Learning Objectives										
 CLO 1. Understand about the fundament their characteristics. CLO 2. Understand the recent application CLO 3. Understand the protocols and state CLO 4. Understand the other associated IoT. CLO 5. Improve their knowledge about machine learning applications. 	ntals of Internet of Thin n domains of IoT in even indards designed for IoT l technologies like clou nt the various cutting-e	ngs and its building bl ryday life. T and the current researd and fog computing i dge technologies in th	ocks along with ch on it. n the domain of le field IoT and							
Teaching-Learning Process (General Ins	structions)									
These are sample Strategies; which teacher	rs can use to accelerate t	he attainment of the va	rious course							
outcomes.										
1. Lecturer method (L) need not to	o be only a traditional le	cture method, but alter	nativeeffective							
teaching methods could be ado	pted to attain the outcor	nes.								
2. Use of Video/Animation to exp	plain functioning of varie	ous concepts.								
3. Encourage collaborative (Grou	p Learning) Learning in	the class.								
 Ask at least three HOT (Higher thinking. 	order Thinking) question	ons in the class, which	promotescritical							
 Adopt Problem Based Learning thinking skills such as the abili than simply recall it. 	g (PBL), which fosters s ty to design, evaluate, g	students' Analytical ski eneralize, andanalyze i	lls, develop design nformation rather							
6. Introduce Topics in manifold re	epresentations.									
7. Show the different ways to solv	7. Show the different ways to solve the same problem with different circuits/logic and encourage									
the students to come up with th	eir own creative ways to	o solve them.								
8. Discuss how every concept can helps improve the students' und	t be applied to the real w lerstanding	orld - and when that's	possible, it							
	Module - I									
Emergence of IoT: Introduction, Interdependence of Technologies, IoT N (Textbook 1: Chapter $4 - 4.1$ to 4.5)	Evolution of IoT, etworking Components,	Enabling IoT and Addressing Strategies	the Complex in IoT.							

08 Hours

Module - II

IoT Sensing and Actuation: Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics. (Textbook 1: Chapter 5 – 5.1 to 5.9)

08 Hours

Ior Processing Topologies and Types: Data Format, Importance of Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Offloading. (Textbook 1: Chapter 6 – 6.1 to 6.5) OB Hours Module - IV Ior Connectivity Technologies: Introduction, IEEE 802.15.4, Zigbee, Thread, ISA100.11A, Wireless HART, RFID, NFC, DASH7, Z-Wave, Weightless, Sigfox, LoRa, NB-IoT, Wi-Fi, Bluetooth (Textbook 1: Chapter 7 – 7.1 to 7.16) OB Hours Module - IV Ior Communication Technologies: Introduction, Infrastructure Protocols, Discovery Protocols, Data Protocols, Identification Protocols, Device Management, Semantic Protocols OB Hours Module - V Ior Communication Technologies: Introduction, Infrastructure Protocols, Discovery Protocols, Data Protocols, Identification Protocols, Device Management, Semantic Protocols OB Hours Ior Interoperability: Introduction, Taxonomy of interoperability, Standards, Frameworks (Textbook 1: Chapter 9 – 9.1, 9.2, 9.3) OB Hours Course Outcomes At the end of the course the student will be able to: CO1. Understand the evolution of IoT, IoT networking components, and addressing strategies in IoT. CO2 Analyze various sensing devices and actuator types. CO5. Understand the communication technologies, protocols and interoperability in IoT.		Mod	lule - III			
Module - IV IoT Connectivity Technologies: Introduction, IEEE 802.15.4, Zigbee, Thread, ISA100.11A, Wireless HART, RFID, NFC, DASH7, Z-Wave, Weightless, Sigfox, LoRa, NB-IoT, Wi-Fi, Bluetooth (Textbook 1: Chapter 7 – 7.1 to 7.16) Module - V IoT Communication Technologies: Introduction, Infrastructure Protocols, Discovery Protocols, Data Protocols, Identification Protocols, Device Management, Semantic Protocols IoT Interoperability: Introduction, Taxonomy of interoperability, Standards, Frameworks (Textbook 1: Chapter 9 – 9.1, 9.2, 9.3) O8 Hours Teaching-Learning Process for allmodules Chalk & board, Problem based learning, MOOC, Demonstration Course Outcomes At the end of the course the student will be able to: CO 1. Understand the evolution of IoT, IoT networking components, and addressing strategies in IoT. CO 2. Analyze various sensing devices and actuator types. Co 5. Understand the communication technologies, protocols and interoperability in IoT. COE Sensent Details (both CIE and SEE) CitE 1 5 th week 20 60 60 60 60 60 61 61 61 61 61 61 61 61 61 61 61 61	IoT Processing Topologie Topologies, IoT Device De (Textbook 1: Chapter 6 – 6	s and Types: Data For sign and Selection Con 0.1 to 6.5)	mat, Importar siderations, P	nce of Processing Processing Offload	in IoT, Processin ling.	g
Module - IV IoT Connectivity Technologies: Introduction, IEEE 802.15.4, Zigbee, Thread, ISA100.11A, Wireless HART, RFID, NFC, DASH7, Z-Wave, Weightless, Sigfox, LoRa, NB-IoT, Wi-Fi, Bluetooth (Textbook 1: Chapter 7 – 7.1 to 7.16) Module - V IoT Communication Technologies: Introduction, Infrastructure Protocols, Discovery Protocols, Data Protocols, Identification Protocols, Device Management, Semantic Protocols IoT Interoperability: Introduction, Taxonomy of interoperability, Standards, Frameworks (Textbook 1: Chapter 9 – 9.1, 9.2, 9.3) O8 Hours Teaching-Learning Process for allmodules Chalk & board, Problem based learning, MOOC, Demonstration Course Outcomes At the end of the course the student will be able to: CO 3. Demonstrate the processing in IoT. CO 4. Apply different connectivity technologies. Co 5. Understand the communication technologies, protocols and interoperability in IoT. Component Weightage (%) CIE's CIE 1 5 ^m week Cie 1 5 ^m week 20 AT the adards in Total Marker: 100 Address and actuator types. CO 3. Demonstrate the processing in IoT. Continuencon Ex					08 1	Hours
Ior Connectivity Technologies: Introduction, IEEE 802.15.4, Zigbee, Thread, ISA100.11A, Wireless HART, RFID, NFC, DASH7, Z-Wave, Weightless, Sigfox, LoRa, NB-IoT, Wi-Fi, Bluetooth (Textbook 1: Chapter 7 – 7.1 to 7.16) Module - V Ior Communication Technologies: Introduction, Infrastructure Protocols, Discovery Protocols, Data Protocols, Identification Protocols, Device Management, Semantic Protocols Ior Interoperability: Introduction, Taxonomy of interoperability, Standards, Frameworks (Textbook 1: Chapter 9 – 9.1, 9.2, 9.3) O8 Hours Teaching-Learning Process for allmodules Chalk & board, Problem based learning, MOOC, Demonstration Course Outcomes At the end of the course the student will be able to: CO 1. Understand the evolution of IoT, IoT networking components, and addressing strategies in IoT. Co 4. Apply different connectivity technologies. Co 5. Understand the communication technologies, protocols and interoperability in IoT. Component Weightage (%) CiE 1 5 ^m week Continueus Ital Sim Week Continueus Ital Ioth Continueus Ital Ioth Component Weightage (%) CiE 1 5 ^m week <td< td=""><td></td><td>Mod</td><td>lule - IV</td><td></td><td></td><td></td></td<>		Mod	lule - IV			
Module - V Ior Tommunication Technologies: Introduction, Infrastructure Protocols, Discovery Protocols, Data Protocols, Identification Protocols, Device Management, Semantic Protocols (Textbook 1: Chapter 8 – 8.1, 6.2, 8.3, 8.4, 8.5, 8.6, 8.7) Ior Interoperability: Introduction, Taxonomy of interoperability, Standards, Frameworks (Textbook 1: Chapter 9 – 9.1, 9.2, 9.3) OB Hours Chalk & board, Problem based learning, MOOC, Demonstration Course Outcomes At the end of the course the student will be able to: CO 1. Understand the evolution of IoT, IoT networking components, and addressing strategies in IoT. CO 2. Analyze various sensing devices and actuator types. CO 3. Demonstrate the processing in IoT. CO 4. Apply different connectivity technologies. CO 5. Understand the communication technologies, protocols and interoperability in IoT. Component Weightage (%) CIE 1 5 th week 20 Component Weightage (%) CIE 1 5 th week 20 6	IoT Connectivity Techno HART, RFID, NFC, DASH (Textbook 1: Chapter 7 – 7	logies : Introduction, IE H7, Z-Wave, Weightles 7.1 to 7.16)	EEE 802.15.4, ss, Sigfox, Lo	Zigbee, Thread, T Ra, NB-IoT, Wi-I	ISA100.11A, Wi Fi, Bluetooth	reless
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At the end of the course the student will be able to: CO 1. Understand the evolution of IoT, IoT networking components, and addressing strategies in IoT. CO 2. Analyze various sensing devices and actuator types. CO 3. Demonstrate the processing in IoT. CO 4. Apply different connectivity technologies. CO 5. Understand the communication technologies, protocols and interoperability in IoT. Assessment Details (both CIE and SEE) Component Weightage (%) CIE 1 5 th week 20 AAT's AAT'1 10 th week AAT-1 AAT-3 QO AAT-3 </td <td>Course Outcomes</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Course Outcomes					
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AAT-2 10 AAT-3 20 Continuous Internal Evaluation Total Marks: 100 Reduced to 50 Marks	AAT's	AAT-1 10 th week		1	0	
AAT-3 20 Continuous Internal Evaluation Total Marks: 100 Reduced to 50Marks		AAT-2		1	0	_
Continuous Internal Ryaluation Total Marks, 100 Reduced to 50Marks		AAT-3		2	0	_
Continuous Internal Evaluation Total Marks, 100, Reduced to Solvia Ks	Continuous	Internal Evaluation 'I	otal Marks:	100. Reduced to	50Marks	_
Semester End Examination (SEE) Total Marks: 100. Reduced to 50Marks	Semester End	1 Examination (SEE)	1 otal Marks	: 100. Reduced to	D SUMARKS	
 Textbook: 1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, "Introduction to IoT", Cambridge University Press 2021. 	Textbook: 1. Sudip Misra, Anandarup 2021.	Mukherjee, Arijit Roy,	"Introduction	n to IoT", Cambrid	dge University P	ress
Reference:	Reference:					
 S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT 	 S. Misra, C. Roy, and A. 4.0. CRC Press. Vijay Madisetti and Arsh 	Mukherjee, 2020. Intro deep Bahga, "Internet	oduction to Ind of Things (A 1	lustrial Internet of Hands-on-Approa	f Things and Indu	ıstry , VPT,

3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.

Weblinks and Video Lectures (e-Resources):

CO-PO Mapping															
CO/P O	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2	2	-	-	-	-	-	3	1	2	-	3
CO2	2	3	2	2	1	-	-	-	-	-	2	1	-	3	2
CO3	3	3	3	3	2	-	-	-	-	-	2	1	-	3	3
CO4	1	3	2	2	3	-	-	-	-	-	3	1	2	-	2
CO5	2	2	2	1	3	-	-	3	-	3	2	1	-	2	3
Avg	2.2	2.6	2	2	2.2	-	-	3	-	3	2.4	1	2	2.6	2.6

1. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-cs31/

ARTIFICIAL IN	TELLIGENCE A	ND MACHINE LEAD	RNING
Course Code	21IST54	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Pre-Requisites:			
1. Mathematics, Probability and stati	stics.		
2. Knowledge in programming Lang	uage.		
Fundamentals of AI and ML algor	ithms		
Course Learning Objectives			
CLO 1. Gain a historical perspective	of AI and its foun	dations	
CLO 2. Familiarize with the basics o	f Machine Learnir	ng & Machine Learning	process, basics of
Decision Tree, and probability learni	ng		
CLO 3 Understand the working of A	rtificial Neural Ne	tworks and basic conce	pts of clustering
algorithms $CLOA$ How to evaluate hypothesis f	for learning and B	wasian algorithms	
CLO 4. How to evaluate hypothesis h	or rearning and Da	iyesian argoritinis	
	Module	<u>- I</u>	
Introduction: What is Al? Foundation	s and History of A		
Problem-solving: Problem-solving ag	gents, Example p	roblems, Searching to	r Solutions, Uninformed
Search Strategies: Breadth First search,	Depth First Searc	n	00 II
		-	08 Hours
	Module - I		
Machine Learning pr	oblems, designing	g a learning system, P	erspective and issues in
Concept Learning: Concept learning t	ack Concept lear	ning as sourch Find S	algorithm Varsian space
Concept Learning. Concept learning t	ask, Concept lean	ning as search, rind-s	argorithm, version space,
Candidate Emiliation argoritim, induc	Luve Dias.		08 Hours
	Module -	Ш	00 11001 5
Decision Tree Learning: Decision tree	e representation.	Appropriate problems f	for decision tree learning.
Basic decision tree learning algorithm,	hypothesis space	search in decision tree l	learning, Inductive bias in
decision tree learning, Issues in decisio	n tree learning.		-
			08 Hours
	Module -	IV	
Artificial Neural Networks: Introduction	on, Neural Networ	k representation, Percep	ptron's
Bayesian Learning: Introduction, Bay	yes theorem, Bay	es theorem and conce	pt learning Naive Bayes
classifier, Bayesian belief networks.			
		*7	08 Hours
	Module -	V ia a a a a a a a a a a a a a a a a a a	amalia a the same C 1
Evaluating Hypotnesis: Motivation, Es	sumating hypothes	is accuracy, Basics of s	ampling theorem, General
approach for deriving confidence inter	vais, Difference 1	in error of two hypothe	eses, Comparing learning
algonunns. Instance Deged I eensinge Introduction	k noopost noisth	ourloaming	
Instance dased Learning: Introduction	, K-mearest neighb	our learning	00 11

08 Hours

Course outcomes:

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After studying this course, the students will be able to:

CO1: Choose the learning techniques and investigate concept learning.

CO2: Identify the characteristics of decision tree and solve problems associated with.

CO3: Apply effectively neural networks for appropriate applications.

CO4: Apply Bayesian techniques and derive effectively learning rules.

CO5: Evaluate hypothesis and investigate instant based learning and reinforced learning.

Assessment Details (both CIE and SEE)

	Component	Weightag	ge (%)				
	CIE 1 5 th week	20					
CIE's	CIE 2 10 th week	20	60				
	CIE 3 15 th week	20					
AAT's	AAT-1 10 th week		10				
	AAT-2		10				
	AAT-3		20				
Continuous In	nternal Evaluation Total Marks:	100. Reduced to 50	Marks				
Semester E	Semester End Examination (SEE) Total Marks: 100. Reduced to 50Marks						

Suggested Learning Resources:

Text Books

1. Tom M. Mitchell, "Machine Learning", (Chapters: 1.1–1.3, 2.1-2.5, 2.7, 3.1-3.7, 4.1–4.6, 6.1–6.6, 6.9, 6.11, 6.12, 5.1-5.6, 8.1-8.5, 13.1-13.3), India Edition, 2013, McGraw Hill Education.

Stuart J. Russell and Peter Norvig, Artificial Intelligence, 3rd Edition, Pearson,2015(Chapter 1- 1.1, 1.2, 1.3 Textbook 1: Chapter 3- 3.1, 3.2, 3.3, 3.4.1, 3.4.3)

Reference Books:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", 2nd Edition, Springer series in statistics.

2 Ethem Alpaydin, "Introduction to Machine Learning", 2nd Edition, MIT press

E - Resources:

- 1. https://www.kdnuggets.com/2019/11/10-free-must-read-books-ai.html
- 2. https://www.udacity.com/course/knowledge-based-ai-cognitive-systems--ud409
- 3. https://nptel.ac.in/courses/106/105/106105077/
- 4. https://www.javatpoint.com/history-of-artificial-intelligence
- 5. https://www.tutorialandexample.com/problem-solving-in-artificial-intelligence
- 6. https://techvidvan.com/tutorials/ai-heuristic-search/
- 7. https://www.analyticsvidhya.com/machine-learning/
- 8. https://www.javatpoint.com/decision-tree-induction
- 9.https://www.hackerearth.com/practice/machine-learning/machine-learning-algorithms/mldecisiontree/tutorial/

COs. POs and PSOs Manning

10. https://www.javatpoint.com/unsupervised-artificial-neural-networks

POs, PSOs COs	Р 01	PO 2	PO 3	РО 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	2	2	-	-	-	-	-	3	1	2	-	2
CO2	3	3	2	2	1	-	-	-	-	-	2	1	-	3	3
CO3	3	3	3	2	2	-	-	-	-	-	2	1	-	3	3
CO4	3	3	2	2	3	-	I	-	-	-	2	1	2	-	2
CO5	2	2	2	2	3	-	-	-	-	3	3	1	-	3	2

INTERNET OF THINGS LAB							
Course Code	21ISL55	CIE Marks	50				
Teaching Hours/Week	Credits	SFE Marks	50				
(L:T:P: S) (0:0:2:0)	1						
Total Hours of Pedagogy	-	Total Marks	100				
Credits	1	Exam Hours	03				

Course Objectives:

- 1. Introduce evolution of internet technology and need for IoT
- 2. Understand IoT architecture and various protocols and software.
- 3. Train the students to build IoT systems using sensors, single board computers and open source IoT platforms.

Note: Two hours tutorial is suggested for each laboratory sessions.

Prerequisite

- 1. Familiarization with concept of IOT, Arduino/Raspberry pi and perform necessary software Installation.
- 2. Study of different operating systems for Arduino Understanding the process of OS installation on Arduino.

Sl. No.	List of problems for which student should develop program and Build a model in							
	the Laboratory							
1	Aim: Introduction to fundamentals of IoT and Arduino Setting up an IoT laboratory requirements and Installation of an Arduino IDE.							
2	Aim: To know the Temperature and Humidity using DHT11 sensor. Program: Write a code and build a model for Interfacing DHT11 Humidity & Temperature Sensor with Arduino.							
3	Write a code and build a model to Controlling LED with Push Button.							
4	Write a code and build a model to Interfacing Soil Moisture Sensor with Arduino							
5	Write a code and build a model to know How does a Water Level Sensor Work and How to Interface it with Arduino?							
6	Write a code and build a model to Interfacing RFID Reader With Arduino							
7	Write a code and build a model to How Does MQ-3 Alcohol Detector Work with Arduino and detect Alcohol?							
8	Write a code and build a model to Building your own Sun Tracking Solar Panel using an Arduino							
9	Write a code and build a model to MQ-5 Combustible Gas Sensor Interfacing with Arduino							
10	Create a small dashboard application to be deployed on cloud. Different publisher devices can publish their information and interested application can subscribe							
11	Write a server application to be deployed on Raspberry-Pi. Write client applications to get services from the server application							
12	Optional Understanding and connectivity of Raspberry-Pi with a Zigbee module. Write a network application for communication between two devices using Zigbee							

Assessment Details (both CIE and SEE)

	Component	Weightag	e (%)				
	CIE 1 8 th week	10					
CIE's	CIE 2 14 th week	10	20				
	Lab Records 30						
Continuous Internal Evaluation Total Marks: 50							
Semester End Examination (SEE) Total Marks: 50							

Course Outcome (Course Skill Set)

At the end of the course the student will be able to:

CO1: Analyze IOT architectural components.

CO2: Interfacing Sensor and Actuator with Arduino development board.

CO3: Describe protocols of resource constraint network.

CO4: Compare and contrast the deployment of smart objects and the technologies to connect them to network.

CO5: Design and develop IOT applications.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

Continuous Internal Evaluation (CIE):

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio 60:40.

Each experiment to be evaluated for conduction with observation sheet and record write-up.

- Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write up will be evaluated for 10 marks.
- Total marks scored by the students are scaled downed to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14th week of the semester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce. The suitable rubrics can be designed to evaluate each student's performance and learning ability. Rubrics suggested in Annexure-II of Regulation book
- The average of 02 tests is scaled down to 20 marks (40% of the maximum marks).
- The Sum of scaled-down marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course is 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answerscript to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the internal

/external examiners jointly.

- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
- Students can pick one experiment from the questions lot of PART A with equal choice to all the students in a batch. For PART B examiners should frame a question for each batch, student should develop an algorithm, program, execute and demonstrate the results with appropriate output for the given problem.
- Weightage of marks for PART A is 80% and for PART B is 20%. General rubricssuggested to be followed for part A and part B.
- Change of experiment is allowed only once and Marks allotted to the procedure part to bemade zero (Not allowed for Part B).
- The duration of SEE is 03 hours
- Rubrics suggested in Annexure-II of Regulation book

Text Books:

- 1) "Internet of Things (A Hands-on-Approach)" byVijay Madisetti and ArshdeepBahga, 1st Edition, VPT, 2014. ISBN 13: 9780996025515
- 2) Srinivasa K G, "Internet of Things", CENGAGE Leaning India, 2017 ISBN: 9789386858955
- 3) David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IOT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1st Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743)

Reference Books:

- 1) Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014. (ISBN: 978-8173719547)
- 2) Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224)
- 3) "TheInternet of Things Key applications and Protocols" by Olivier Hersent, David Boswarthick, Omar Elloumi, , Wiley, 2012 ISBN: 978-1-119-99435-0

E-resources

- 1) www.coursera.org/specializations/IOT
- 2) www.futurelearn.com/courses/internet-of-things

	CO- PO Mapping :													
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	-	-	-	3	-	-	-	-	-	-	3	3	2
CO2	3	3	3	3	3	2	-	-	3	3	1	3	3	2
CO3	3	3	3	3	3	2	-	-	3	3	1	3	3	2
CO4	3	3	3	3	3	2	-	-	3	3	1	3	3	2
CO5	3	3	3	3	3	2	-	-	3	3	1	3	3	2
Avg	3	3	3	3	3	2	-	-	3	3	1	3	3	2

RESEARCH METHODOLOGY AND IPR							
Course Code	21IST56	CIE Marks	50				
Teaching Hours/Week (L:T:P: S)	2:0:0:0	SEE Marks	50				
Total Hours of Pedagogy	40	Total Marks	100				
Credits	02	Exam Hours	03				
Prerequisites: Literature survey, Requirement analysis							
Course objectives.							

- 1. To give an overview of the research methodology and explain the technique of defining a research problem
- 2. To explain the functions of the literature review in research.
- 3. To explain carrying out a literature search, its review, developing theoretical and conceptual frame works and writing a review and research reports.
- 4. To explain various forms of the intellectual property, its relevance and business impact in he changing global business environment.
- 5. To discuss leading International Instruments concerning Intellectual Property Rights.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

- 1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
- 2. Use of Video/Animation to explain functioning of various concepts.
- 3. Encourage collaborative (Group Learning) Learning in the class.
- 4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
- 5. Adopt Problem Based Learning (PBL), which fosters student's Analytical skills, develop design thinking skills such as the ability to design evaluate, generalize, and analyze information rather than simply recall it.
- 6. Introduce Topics in manifold representations.
- 7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
- 8. Discuss how every concept can be applied to the real world and when that's possible, it helps improve the students' understanding.

Module – I

Research Methodology: Introduction, Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Criteria of Good Research, Problems Encountered by Researchers inIndia.

Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration.(**Text Book 1 - Chapter 1, 2**)

08 Hours

Module – II

Reviewing the literature: Place of the literature review in research, bringing clarity and focus to research problem, improving research methodology, broadening knowledge base in research area, enabling contextual findings, Review of the literature, searching the existing literature, reviewing the selected literature, developing a theoretical framework, developing a conceptual framework, writing about the literature reviewed.(**Text Book 4 - Chapter 3.**)

Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs. (Text Book 1 - Chapter 3.)

Module – III

Data Collection: Introduction, Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.(**Text Book 1 - Chapter 6.**)

Ethics in Engineering Research- Ethics in Engineering Research Practice, Types of Research

Misconduct, Ethical Issues Related to Authorship. (Text Book 2 - Chapter 5.)

08 Hours

Module – IV

Interpretation and Report Writing- Meaning of Interpretation, Techniques of Interpretation, Precautions in Interpretation, Significance of Report writing, Different steps in writing report, Layout of the research report, Types of reports, Oral presentation, Mechanics of writing a research report, Precautions for writing research reports, Conclusion.(Text Book 1 - Chapter 19.)

Technical Writing and Publishing - Free Writing and Mining for Ideas, Attributes and Reasons of Technical Writing, Patent or Technical Paper —The Choice, Writing Strategies, Journal Paper:Structure and Approach, Language Skills, Writing Style, and Editing, Rules of Mathematical Writing, Publish Articles to Get Cited, or Perish. (**Text Book 2 - Chapter 6.**)

Communicating Research Work: Presentation Skills - Oral Presentations - Language Choices, Delivery, Poster Presentations, and Presentation Preparation Guidelines. (**Text Book 2 - Chapter 9.**)

08 Hours

Module – V

Intellectual property: an introduction - Intellectual property types, More patent basics. (Text Book 3 - Module 1 - 1, 2.)

Patents- Detailed overview of patents-what is a patent, what can be the subject of a patent, Why are patents important. Legal requirements for patentability - Novelty, Inventive step/non obviousness, Industrial application/utility, Patentable subject matter, Disclosure requirement.(**Text Book 3 - Module 2 - 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4, 2.5**)

Patent application preparation - Preparing patent applications - Obtaining invention disclosures from Inventors, identifying patentable inventions, Understanding the invention (core inventive concept), Inventor ship. Typical parts of the patent Application - Request, Description, Claims, Drawings, Abstract, and Application format.(**Text Book 3 - Module 3 - 1.1**, **1.2**, **1.3**, **1.4**, **2.1**, **2.2**, **2.3**, **2.4**, **2.5**, **2.6**).

08 Hours

Teaching-Learning Process for all modules	Chalk and board, Active Learning, PPT Based presentation, Video
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Course Outcomes (Course Skill Set)

At the end of the course the student will be able to:

CO1. Explain the meaning of engineering research.

CO2. Explore the procedure of Literature Review and Technical Reading.

CO3. Explain the fundamentals of patent laws and drafting procedure.

CO4. Explore the copyright laws and subject matters of copyrights and designs

CO5. Comprehend the basic principles of design rights.

		Component						
		CIE 1 5 th weel	κ –	20				
	CIE's	CIE 2 10 th wee	k	20	60			
		CIE 3 15 th wee	k	20	00			
	AAT's	AAT-1 10 th we	ek	1	10			
		AAT-2		1	10			
		AAT-3		2	20			
	Continuous Inte	ernal Evaluation Total N	/Iarks: 100. Reduc	ed to 5	0Marks			
	Semester End Ex	camination (SEE) Total	Marks: 100. Redu	ced to	50Marks			
		Textbook	s					
1	Research Methodology: Methods and Techniques	C. R. Kothari, Gaurav Garg	New Age International		4 th Edition,2019			
2	Engineering Research Methodology: A PracticalInsight for Researchers	Dipankar Deb, Rajeeb Dey, Valentina E. Balas	Intelligent Systems Reference Library	1 st Edition,20				
3	WIPO (2022), WIPO Patent Drafting Manual, 2nd edition. Geneva: WIPO.	DOI: 10.34667/tind.44 657 ISBN: 978- 92-805-3264-7	World Intellect Property Organization	orld Intellectual 2 nd perty ganization				
4	RESEARCH METHODOLOGY a step-by-step guide for beginners.	Ranjit Kumar	SAGE Publications India Pvt Ltd.		3 rd Edition, 20			
		Reference Bo	oks					
	"Research Methods for Engineers"	David V. Thiel	Cambridge University Press	5	2020			

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- https://onlinecourses.nptel.ac.in/noc22_ge08/preview
 https://archive.nptel.ac.in/courses/127/106/127106227/
 https://onlinecourses.swayam2.ac.in/cec20_hs17/preview
 https://archive.nptel.ac.in/courses/110/105/110105139/

	CO-PO Mapping														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	1	-	2	1	2	2	2	2
CO2	3	3	2	2	-	-	-	1	-	3	2	2	2	1	3
CO3	3	3	3	3	2	1	1	-	2	2	2	2	3	3	3
CO4	2	3	3	2	-	1	1	-	2	2	-	3	3	3	-
CO5	2	3	3	2	-	-	-	2	-	3	1	2	3	3	2
AVG	2.6	3	2.8	2.4	2	1	1	1.3	2	2.4	1.4	2.2	2.6	2.4	2.5

	ENVIRONMENTAL STUDIES							
Course Code	L-T-P-S (Hrs/wee k)	Credits	CIE Marks	SEE Marks	SEE Duratio n	Total Lecture Hours		
21ENV57	1-0-0-0	1	50	50	3 hours	15		
Course Object	ctives: To re	ecognize m	ajor concepts in en	vironmental science	es and demo	onstrate in-depth		
understanding	of the envir	onment. Th	ne industrial revolut	tion and developme	nt have led	to the stress on		
environment in	n the form of	of pollution	. Checking of the	pollution in all fror	nts at local a	and global level		
encompassing	the issues of	carbon cre	dit, ozone level dep	oletion, global warm	ing, desertifi	cation and polar		
ice cap melting	g. The main	objectives o	of the course is to e	xpose to students to	the problem	is and mitigation		
measures conc	erned to the e	environmen	tal components like i	resources, air, water	and land.			
			Syllabus	_				
Fcosystems (Structure on	d Function	NIOQUIE 1	Wetlands Riverin	e Oceanic	and Lake		
Biodiversity:	Types. Value	e: Hot-spots	: Threats and Conse	ervation of biodivers	sity. Forest V	Vealth. and		
Deforestation.	-) [, F	,		,, ,	3 Hours		
			Module 2	•				
Advances in E	Energy System	ms (Merits,	Demerits, Global St	tatus and Application	ns): Hydroge	n, Solar,OTEC,		
Tidal and Wine	l. urco Mana	amont (C	oncent and case_st	udies): Disaster M	anagement	Sustainable		
Mining, Cloud	Seeding, and	l Carbon Tr	ading.	uules). Disaster wi	anagement,	3 Hours		
			Module 3	:				
Environmenta	al Pollution	(Sources, Ir	npacts, Corrective a	nd Preventive measu	ures, Relevar	t Environmental		
Acts, Case-stud	dies): Surface	e and Grour	nd Water Pollution; N	Noise pollution; Soil	Pollution an	d Air Pollution.		
Waste Manag	gement & Pu	ublic Healt	h Aspects: Bio-med	dical Wastes; Solid	waste; Hazai	rdous wastes; E-		
wastes, muust		cipai Siuug	C. Module 4	:		5 110015		
Global Envir	onmental C	oncerns (Concept, policies a	nd case-studies): G	round water	depletion/		
recharging, Cl	imate Chang	e; Acid Ra	in; Ozone Depletior	i; Radon and Fluori	de problem	in drinking		
water; Resettle	ment and reh	abilitation	of people, Environme	ental Toxicology.		3 Hours		
Latast Davala	nmonto in E	nvironmor	NIOQUIE 5	: ration Tools (Cong	ont and An	lightions).		
GIS & Rer	pillents ill E	g Environ	ment Impact Asse	ssment Environme	ntal Manag	ement Systems		
ISO14001 · En	vironmental S	g, Environ Stewardshir	- NGOs	ssment, Environme	intar manag	ement Systems,		
Field work: V	visit to an En	vironmenta	l Engineering Labo	ratory or Green Buil	lding: Visit t	o a local area to		
document env	ironment ass	ets river /	forest / grassland /	hill / mountain. V	isit to a loc	al polluted site-		
urban/rural/ind	ustrial/agricu	ıltural/Wate	r Treatment Plant/	Waste water treatm	ent Plant. St	udy of common		
plants, insects	, birds. Stud	y of simpl	e ecosystems-pond,	river, hills lopes;	etc (field w	ork equal to 2		
lecture works) ought to	be Follow	wed by understand	ling of process an	nd its brief	documentation.		
						3 Hours		
Course outcor	nes: At the e	nd of the co	ourse, students will b	e able to: ·				
• CO1: U	Jnderstand th	e principle	s of ecology and env	vironmental issues the	hat apply to	air, land, and		
water is	ssues on a glo	obal scale, ·						
• CO2: I	Develop criti	cal thinkin	g and/or observatio	n skills, and apply	them to the	e analysis of a		
problem	n or question	related to t	he environment.					
• CO3: I	Jemonstrate	ecology kr	nowledge of a comp	plex relationship be	etween biotic	e and abiotic		
compoi	nents.		nominales (s. 111)	to and such 1	1			
• CO4: A	apply their e	cological k when dealin	nowledge to illustra	te and graph a prob	iem and des	cribe the realities		
ulat Illa	magers race v	viich ucalill	g with complex issue					

	Assessment Details (both CIE and	d SEE)			
	Component	Weigl	htage (%)		
	CIE 1 5 th week	20			
CIE's	CIE 2 10 th week	20	60		
	CIE 3 15 th week	20			
AAT's	AAT-1 10 th week	10)		
	AAT-2	AAT-2 10			
	AAT-3	20)		
Continuous Ir	ternal Evaluation Total Marks: 100). Reduced to 50	Marks		
Semester End	Examination (SEE) Total Marks: 10	0. Reduced to 5	0Marks		
 Text Books: Benny Joseph: "Environi S M Prakash: "Environition 	nental Studies". Tata Mc Graw – Hill, ental Studies", Pristine PublishingHor	, 2 nd Edition,2012 use, Mangalore, 3	2. 3 rd Edition,2018.		
R Rajagopalan: "Environ	imental Studies – From Crisis to Cure:	: Oxford Publishe	er, 2005.		
NCICICICC DUURS.		1	" G 1 .		

- Raman Sivakumar: "Principals of Environmental Science and Engineering", Cengage learning, Singapur, 2nd Edition, 2005. •
- M.Ayi Reddy Textbook of environmental science and Technology, BS publications 2007. Dr. B.S Chauhan, Environmental studies, university of science press 1st edition. •
- •

E-Resources

https://youtu.be/tqgo6PYfJLk?si=dd82TkdFKTu8D-zB

CO-PO Mapping

COs						Р	0					
-	1	2	3	4	5	6	s 7	8	9	10	11	12
CO1	-	-	-	-	-	3		1	-	-	-	2
CO2	-	-	-	-	-	2		1	-	-	-	2
CO3	-	-	-	-	-	3		1	-	-	-	2
CO4	-	-	-	-	-	3		1	-	-	-	2

C# & .Net Programming											
Course Code	21ISL581	CIEMarks	50								
Teaching Hours/Week(L:T:P:S)	3:0:0:0	SEEMarks	50								
Total Hours of Pedagogy	40	TotalMarks	100								
Credits	03	ExamHours	03								

OBJECTIVES: The main Objective of this course is student know about windows, Web and Console Applications.

Teaching-Learning Process(General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

- 1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
- 2. Use of Video/Animation to explain functioning of various concepts.
- 3. Encourage collaborative (Group Learning) Learning in the class.
- 4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
- 5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
- 6. Introduce Topics in manifold representations.
- 7. Show the different ways to solve the same problem with different circuits/ logic and encourage the students to come up with their own creative ways to solve them.
- 8. Discus shows every concept can be applied to the real world-and when that's possible, it helps improve the student's understanding.

EXPERIMENT 1 – BASIC C# PROGRAMS

To understand about basics of C# and execute simple c# programs to perform the following actions:

(a) Calculate Hypotenuse of triangle using dynamic initialization of variables

(b) To get input from the user and perform calculations

(c) Calculate the quadrant for the coordinates using if..else...ladder

(d) Check whether the alphabet is a vowel or not using switch..case...

(e) To understand about for. each loop and strings

EXPERIMENT 2 – CLASSES & OBJECTS

To develop a C# application to print the students list using classes and objects

EXPERIMENT 3 – INHERITANCE

To develop a C# application to implement inheritance concepts

(a) Single Inheritance (b) Multilevel Inheritance (c) Multiple Inheritance

EXPERIMENT 4 – OPERATOR OVERLOADING

To develop a console application to implement operator overloading concept in C# (a) Unary Operator Overloading (b) Binary Operator Overloading

EXPERIMENT 5 – THREADING

AIM To develop a C# console application to implement threading concepts

EXPERIMENT 6 – DELEGATES & EVENTS

AIM To develop a c# console application to implement the following concepts: (a) Delegates (b) Events

EXPERIMENT 7 – WINDOWS FORM CONTROL

To design a window-based application using C# code in VB.Net

EXPERIMENT 8 – VALIDATING DATA

To implement validating data entered in controls using

(a) Windows based application – Manual coding for validation

(b) Web based application – Validation Controls

EXPERIMENT 9 – CUSTOM DIALOG BOX & MDI APPLICATION

To design a notepad application to implement menus, custom dialog box and MDI concepts

EXPERIMENT 10 – RETRIEVING DATA FROM DATABASE & WORKING WITH DISCONNECTED ENVIRONMENT

To design windows-based application to retrieve data from SQL database and to work with disconnected environment in ADO.Net using C#

Assessment Details (both CIE and SEE)

	Component	Weightag	e (%)							
	Lab Test1 8 th week	15								
CIE's	Lab Test2 14 th week	15	30							
AAT's	Lab Record	20								
Continuous Int	Continuous Internal Evaluation Total Marks: Reduced to 30Marks									

Continuous Internal Evaluation 1 otal Marks: Reduced to 30Marks

Semester End Examination(SEE) Total Marks: Reduced to 20Marks

CO PO Mapping

	PO	PS	PS	PS											
	1	2	3	4	5	6	7	8	9	10	11	12	O1	O2	O3
CO1	2	2	-	-	-	-	-	-	-	-	-	-	2	-	3
CO2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	1
CO3	2	2	3	3	2	-	-	-	-	1	2	-	2	-	3
CO4	3	2	2	2	-	-	2	2	2	3	2	-	2	-	2
															-

WE	B DESIGNING USING	PHP AND MYSQL	
Course Code	21ISL582	CIE Marks	50
Teaching Hours / Week (L: T: P: S) (0:0:2:0)	Credits (0:0:1:0)	SEE Marks	50
Total Hours of Pedagogy	10 lab assignments	Total Marks	100
Credits	01	Exam Hours	03
Prerequisite: Web Development Basics - HTM	L, CSS, JavaScript		
Course objectives:			
1. Understanding the basic concep	ots of PHP and its applicat	ions.	
2. Understanding Cookies and Se	ssions.		
3. Understanding MySQL databas	se commands and queries.		
4. Designing interactive web appl	ications using PHP and M	ySQL.	
5. Developing applications to solv	ve real world problems.		
	Module-1		
Introduction to PHP: PHP featu	res, XAMPP & WAMP, Ir	stallation of XAMPP, Basic	PHP Syntax, Output
Statements- print, echo, Adding	comments in PHP. PHP	Variables and Operators:	Declaring Variables,
Operators in PHP. Conditional a	nd Looping Statements:	IfStatement, Switch, For,	For each, While, Do
while.			
Assignments:			
1. Write a program to check stude	nt grade based on the mar	ks using if-else statement.	
Conditions:			
• If marks are 60% or more,	, grade will be First Divisi	on.	
• If marks between 45% to :	59%, grade will be Second	Division.	
• If marks between 33% to 4	44%, grade will be Third I	Division.	
• If marks are less than 33%	, student will be Fail.		
			08 Hours
	Module-2		
Functions: User defined function Passing Argument by Value, Varia PHP. Arrays: Types of arrays in 1 Assignments:	ons, Function with Defau able Scope, Built-in funct PHP, Creation of arrays, A	It Arguments, Passing Arguons. Strings: Strings in PH rray functions.	ument by Reference, P, String functions in

- 2. Write a PHP program to display a digital clock which displays the current time of the server.
- 3. Write a simple calculator program in PHP using switch case

Description:

You need to write a simple calculator program in PHP using switch case. **Operations:** 1. Addition 2. Subtraction 3. Multiplication 4. Division

08 Hours

File Handling: File opening modes, File Open/Read, File Create/Write, Delete a File. **Pattern Matching:** String pattern matching using regular expressions. **PHP Form Handling:** Input Form Creation, GET and POST Methods, include () and require ().

Assignments:

4. Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.

08 Hours

Module-4

Cookies and Sessions: Cookies, PHP support for cookies. Starting a PHP Session, Storing and Accessing Session Data, Destroying Session Data.

MySQL: Introduction, Database creation, CREATE, ALTER, DELETE, DROP tables, INSERT, UPDATE, DELETE table data, WHERE clause AND, OR, IN, LIKE, DISTINCT, ORDER BY, GROUP BY, UNION Sub-queries LEFT JOIN, RIGHT JOIN, INNER JOIN.

Assignments:

- 5. Write a PHP program named states.py that declares variable states with value "Mississippi Alabama Texas Massachusetts Kansas". write a PHP program that does the following:
 - **a.** Search for a word in variable states that ends in xas. Store this word in element0 of a list named states List.
 - b. Search for a word in states that begins with k and ends in s. Perform a case-insensitive comparison. [Note: Passing re.Ias a second parameter to method compile performs a case-insensitive comparison.] Store this word in element1of states List.
 - **c.** Search for a word in states that begins with M and ends in s. Store this word in element 2 of the list.
 - **d.** Search for a word in states that ends in a. Store this word in element 3 of the list.

08 Hours

Module 5

Database Programming PHP & MySQL: PHP MySQL functions, Connecting database.

Assignments:

6. Write a PHP program to sort the student records which are stored in the database using selection sort.

08 Hours

Using the knowledge from the above programs prepare a mini project and demonstrate.

Assessment Details (both CIE and SEE)

	Component	Weightage (%)					
	Lab Test1 8 th week	15					
CIE's	Lab Test2 14 th week	15	30				
AAT's	Lab Record	2	20				
Continuous	Internal Evaluation Total Marks:	Reduced to 30N	Marks				
Semester E	nd Examination(SEE) Total Marl	s: Reduced to 2	20Marks				

Text Books:

1. Programming the World Wide Web, Robert W. Sebesta, Pearson Education, 8th Edition, 2014.

Reference Book:

- 1. Internet & World Wide Web How to program, M. Deitel, P.J.Deitel, A. B. Goldberg, Pearson Education / PHI, 3rd Edition, 2004.
- 2. Web Programming Building Internet Applications, Chris Bates, Wiley India.

Course Outcomes:

At the end of the course the student will be able to:

CO1. Develop dynamic webpages using basic concepts of PHP.

CO2. Apply Cookies and Sessions to control user sessions

CO3. Demonstrate various MySQL database queries.

CO4. Develop small applications using PHP/MySQL.

CO5. Develop applications to solve real-world problems.

POs	CO-PO Mapping														
COs	PO 1	PO 2	PO 3	РО 4	PO 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	-	3
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-	1
CO3	3	2	3	3	2	-	-	-	-	1	2	-	2	-	3
CO4	3	2	3	3	3	-	3	3	2	3	3	-	3	_	3
CO5	3	3	2	2	2	-	-	-	-	2	3	3	2	3	1

MIC	CROCONTROLLE	R PROGRAMMINO	J
Course Code	21ISL583	IA Marks	50
Number of Lecture Hours/Wee	k 01	Exam Marks	50
Total Number of Lecture Hour	rs 15	Exam Hours	03
	CREDIT	S – 01	
Course Learning	Objectives. This cou	rse 211SI 583 will en	able students to
1 Develop and test Assemble	by Longuage Program	m (ALP) using APM	7TDMI/I DC2148
2. Conduct the experiment	on on ADM7TDML	III (ALF) using AKM	heard using avaluation varian
2. Conduct the experiments	Unision 4 tool/comm	LPC2146 Evaluation	board using evaluation version
of Embedded C & Kell	Uvision-4 tool/comp	ller.	
	Modul	e – 1	
Introduction: Microprocessors v philosophy, The ARM Design Phil	osophy, Embedded S	ers, ARM Embedded ystem Hardware, Em	bedded System Software.
			03 Hours
	Module	$\frac{2}{2}$	
ARM Processor Fundamentals:	Registers, Current	Program Status Re	egister, Pipeline, Exceptions,
interrupts, and the vector Table, C	ore Extensions.		03 Hours
	Module	2-3	00 110013
Introduction to the ARM Instruction	on Set: Data Process	ing Instructions, Prog	gramme Instructions, Software
Interrupt Instructions		-	
			03 Hours
Drogram Status Desistan Instruction	NIODULE	e – 4 National Loading Con	atanta
ARM programming using Assembl	lis, Coprocessor filsu ly language	uctions, Loading Con	istants,
riddi programming asing rissemo.	ly lunguage		03 Hours
	Module	2-5	
Writing Assembly code, Profiling and	cycle counting, instruc	tion scheduling, Regist	er
Anocation, Conditional Execution, Lo	oping Constructs		03 Hours
A	ssessment Details (l	ooth CIE and SEE)	05 110015
		· · · · · · · · · · · · · · · · · · ·	
Col	nponent	Wei	ightage (%)
	ab Test 18 th week	15	
CIE's L	ab Test2 14 week	15	30
AAT's L	ab Record		20
Continuo	us Internal Evaluati	on Total Marks: 50	Marks
Semester I	End Examination(Sl	EE) Total Marks: 50	Marks
Course Outcomes: After studying t	this course, students	will be able to	
1. Differentiate between M	icroprocessor and Mi	crocontroller.	
2. Write and test Assembly	Language Program ((ALP) using ARM7T	DMI/LPC2148
3. Conduct the experiments	s on an ARM7TDMI	/LPC2148 evaluation	n board using Embedded 'C' &
Keil-U vision-4 tool/con	piler.		
4. Design and develop sma	ll scale embedded sys	stems.	
5. Understand about instruc	ction set and Architec	ture of 8051	

Text Books:

1. "The 8051 Microcontroller and Embedded Systems – using assembly and C", Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006.

2. "The 8051 Microcontroller", Kenneth J. Ayala, 3rd Edition, Thomson/Cengage Learning.

Reference Books:

1. "The 8051 Microcontroller Based Embedded Systems", Manish K Patel, McGraw Hill, 2014, ISBN: 978-93-329-0125-4.

2. "Microcontrollers: Architecture, Programming, Interfacing and System Design", Raj Kamal, Pearson Education, 2005.

The following Assembly Language Program (ALP) need to be executed using ARM7TDMI/LPC2148 using an evaluation board/simulator and the required software tool.

1. Write an ALP to Multiply two 16-bit binary numbers.

2. Write an ALP to find the sum of even/odd numbers from a given array of N numbers.

3. Write an ALP to check a given number is a prime number.

4. Write an ALP to add an array of 16-bit numbers and store the 32-bit result in internal RAM.

5. Write an ALP to transfer block of N numbers from internal memory to external memory and vice-versa.

6. Write an ALP to find the square of a number (1 to 10) using look-up table.

7. Write an ALP to find the largest/smallest number in an array of 32 numbers.

8. Write an ALP to arrange a series of 32-bit numbers in ascending/descending order.

9. Write an ALP to count the number of ones and zeros in two consecutive memory locations.

10. Write an ALP to search for a given key element using Binary Search algorithm.

	CO-PO Mapping														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	3	2	2	-	-	-	-	-	-	-	-	2	2	2
CO2	3	2	1	2	-	-	-	-	-	-	-	-	2	2	3
CO3	1	2	2	3	-	-	-	-	-	-	-	-	2	2	2
CO4	1	1	3	1	-	-	-	-	-	-	-	-	2	3	2
CO5	3	2	2	2	-	-	-	-	-	-	-	-	3	2	2
	•	•	•			•	•	•	•		•	•	•	•	