SHRI SHANKARACHARYA TECHNICAL CAMUS
BHILAI (C.G.)
(An Autonomous Institution)

SCHEME OF TEACHING AND EXAMINATION
B.Tech. (Sixth Semester) Computer Science & Engineering [AI, AIML, BDA, GT]

Sl. No.	Board of Studies (BOS)	Courses	Course Code	Period per Week			Scheme of Examination			Total Marks	Credit
							Theory/Lab				
				L	T	P	ESE	CT	TA		
1	Computer Science & Engineering	Compiler Design	CS102601	2	1	-	100	20	30	150	3
2	Computer Science & Engineering	Software Engineering and Project Management	CS102602	2	1	-	100	20	30	150	3
3	Computer Science & Engineering	IoT Development Boards	CS115603	2	1	-	100	20	30	150	3
4	Computer Science & Engineering	Professional Elective-II	Refer to Table-II	2	1	-	100	20	30	150	3
5	Computer Science & Engineering	Open Elective-I	Refer to Table-I	3	0	-	100	20	30	150	3
6	Computer Science & Engineering	Cloud Computing Lab	CS102691		-	2	25	-	25	50	1
7	Computer Science & Engineering	Software Engineering and Project Management Lab	CS102692		-	2	25	-	25	50	1
8	Computer Science & Engineering	IoT Board lab	CS115693		-	2	25	-	25	50	1
9	Computer Science & Engineering	Minor Project-II (React-JS)	CS102694		-	2	50	-	25	75	1
10	Computer Science & Engineering	Essence of Indian Knowledge and Tradition	CS100695		-	2	-	-	25	25	1
Total				**11**	**4**	**10**	**625**	**100**	**275**	**1000**	**20**

L-Lecture T- Tutorial P-Practical
CT- Class Test TA- Teachers Assessment ESE- End Semester Exam

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Table-II: (Professional Elective-II)

S.No.	Board of Studies (BOS)	Course(Subject)	Course Code	Credit
1.	Computer Science & Engineering	Smart Contract	CS116621	3
2.	Computer Science & Engineering	Cloud Computing	CS102622	3
3.	Computer Science & Engineering	Object Oriented Modeling And Design	CS102623	3
4.	Computer Science & Engineering	Mobile Computing	CS102624	3
5.	Computer Science & Engineering	Robotics and Automation	CS102625	3

Table--I: (Open Elective –I)

S.No	Board of Studies (BOS)	Course (Subject)	Course Code	Link
1.	Civil Engineering	Project Construction Planning and Control	CE100641	https://archive.nptel.ac.in/courses/105/106/105106149/
2.	Civil Engineering	Remote Sensing Principle & Application	CE100642	https://nptel.ac.in/courses/105101206
3.	Computer Science & Engineering	Enterprise Resource Planning	CS100643	
4.	Computer Science & Engineering	Quantum Computing	CS100644	
5.	Computer Science & Engineering	Digital Marketing	CS100645	
6.	Electrical & Electronics Engineering	Hybrid Electric Vehicle	EEE100647	
7.	Electrical & Electronics Engineering	Grid Integration of Renewable Energy Sources	EEE100648	
8.	Electrical Engineering	Renewable Energy Systems	EE100649	nptel.ac.in/courses/1031032061
9.	Electrical Engineering	Industrial Automation and PLC	EE100650	nptel.ac.in/courses/108105062
10.	Electronics &Telecommunication Engineering	Introduction to Wireless and Cellular Communications	ET100651	https://nptel.ac.in/courses/106106167
11.	Electronics &Telecommunication Engineering	Cryptography & Network Security	ET100652	https://nptel.ac.in/courses/106105162
12.	Information Technology	Human Computer Interaction	IT100653	https://nptel.ac.in/courses/106106177

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S.No	Board of Studies (BOS)	Course (Subject)	Course Code	Link
13	Information Technology	Virtual Reality	IT100654	https://nptel.ac.in/uacourses/10610
14.	MBA	Management for Technocrats	MG100655	https://nptel.ac.in/courses/110105146
			MG100656	https://onlinecourses.swayam2.ac.in/nou22_mg07/
15.	MBA	Industrial Management	MG100657	https://onlinecourses.swayam2.ac.in/nou22_mg06/preview
			MG100658	https://onlinecourses.nptel.ac.in/noc22_mg81/preview
16.	Mechanical Engineering	Operation Research	ME100659	https://nptel.ac.in/courses/110106062
17.	Mechanical Engineering	Engineering Economics	ME100660	https://nptel.ac.in/courses/112107209

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SCHEME OF TEACHING AND EXAMINATION
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Subject Code CS102601	Compiler Design	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of this course is • To provide the skills needed for building compilers for various situations that one may encounter in a career in Computer Science. • To understanding the fundamental principles in compiler design.	On successful completion of the course, the student will be able to: **CO1**. Explain the concepts of Compilers and roles of the lexical analyzer. **CO2**. Apply the concepts of different Parsing techniques and implement the knowledge to Yacc tool. **CO3**. Develop syntax directed translation schemes. **CO4**. Implement the principles of scoping, parameter passing and runtime memory management. **CO5**. Use the new code optimization techniques to improve the performance of a program in terms of speed and space and develop algorithms to generate code for a target machine.

UNIT I: Introduction : Introduction to Compiler, single and multi-pass compilers, Translators, Phases of Compilers, Compiler writing tools, Finite Automata and Lexical Analyzer: Role of Lexical Analyzer, Specification of tokens, Recognition of tokens, Regular expression, Finite automata, from regular expression to finite automata, transition diagrams, Implementation of lexical analyzer with LEX.

UNIT II: Syntax Analysis and Parsing Techniques : Context free grammars, Bottom-up parsing and top down parsing, Top down Parsing : elimination of left recursion, recursive descent parsing, Predicative Parsing, Bottom Up Parsing : Operator precedence parsing, LR parsers, Construction of SLR, Canonical LR and LALR parsing tables, Construction of SLR parse tables for Ambiguous grammar, parser generator- YACC, error recovery in top down and bottom up parsing.

UNIT III: Syntax Directed Translation & Intermediate Code Generation : Synthesized and inherited attributes, Construction of syntax trees, bottom up and top down evaluation of attributes, S- attributed and L attributed definitions ,Postfix notation; Three address codes, quadruples, triples and indirect triples, Translation of assignment statements, control flow, Boolean expression and Procedure Calls.

UNIT IV: Run-time Environment : Storage organization, activation trees, activation records, allocation

strategies, Parameter passing symbol table, dynamic storage allocation.

UNIT V: Code Optimization and Code Generation : Basic blocks and flow graphs, Optimization of basic blocks, Loop optimization, Global data flow analysis, Loop invariant computations. Issue in the design of Code generator, register allocation, the target machine, and simple Code generator.

Text Books:

S. No.	Title	Author(s)	Publisher
1	Compilers Principles, Techniques and Tools	Alfred V. Aho, Ravi Sethi and Ullman J.D	Addison Wesley
2	Principle of Compiler Design	Alfred V. Aho and J.D. Ullman	Narosa Publication
3	Introduction to Compiler Techniques	.P. Bennet	Tata McGraw-Hill

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Compiler Design in C	A.C. Holub	PHI
2	Compiler construction (Theory and Practice)	A. Barret William and R.M., Bates	Galgotia Publication
3	Compiler Design	O.G. Kakde	Laxmi Publication

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SCHEME OF TEACHING AND EXAMINATION
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Subject Code CS102602	Software Engineering & Project Management	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of this course is to : • To introduce software project and to understand about the different software processes & To introduce ethical and professional issues and to explain why they are concern to software engineers • Understand good coding practices, including documentation, contracts, regression tests and daily builds. • To understand how Software engineering & Project Management is concerned with theories, methods and tools for professional software development.	After completion of this course, the students would be able to : **CO1**. Select and implement different software development process models. **CO2.** Extracting and analyzing software requirements specifications for different projects **CO3.** Developing some basic level of software architecture/design **CO4.** Analyzing software risks and risk management strategies, applying different testing and debugging techniques and analyzing their effectiveness . **CO5.** Defining the concepts of software quality and reliability on the basis of International quality standards, defining the basic concepts and importance of Software project management concepts like cost estimation, scheduling and reviewing the progress.

UNIT I: Introduction to Software Engineering **[CO1]**

Evolution and impact of Software engineering, software life cycle models: Waterfall, prototyping, Evolutionary, and Spiral models. Feasibility study, Functional and Non-functional requirements, Requirements gathering, Requirements analysis and specification. **[7 Hours]**

UNIT II : Software Requirement Analysis and Specification **[CO2]**

Types of Requirement, Feasibility Study, Requirement Analysis and Design: DFD, Data Dictionary, HIPO Chart, Warnier Orr Diagram, Requirement Elicitation: Interviews, Questionnaire, Brainstorming, Facilitated Application Specification Technique (FAST), Use Case Approach. SRS Case study, Software Estimation: Size Estimation: Function Point (Numericals). Cost Estimation: COCOMO (Numericals), COCOMO-II (Numericals). Earned Value Management [**8 Hours]**

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UNIT III : Software Design **[CO3]**
Basic issues in software design, modularity, cohesion, coupling and layering, function-oriented software design: DFD and Structure chart, object modeling using UML,Object-oriented software development, user interface design. Coding standards and Code review techniques. **[7 Hours]**

UNIT IV : Testing Strategies **[CO4]**
Fundamentals of testing, White-box, and black-box testing, Test coverage analysis and test case design techniques, mutation testing, Static and dynamic analysis, Software reliability metrics, reliability growth modeling. Software Risk management: Reactive vs Proactive Risk strategies, software risks, Risk identification, Risk projection. **[7 Hours]**

UNIT V : Software project Management **[CO5]**
Project planning and control, cost estimation, project scheduling using PERT and GANTT charts, cost-time relations: Rayleigh-Norden results, quality management, ISO and SEI CMMI, PSP and Six Sigma. Computer aided software engineering, software maintenance, software reuse, Component-based software development. **[7 Hours]**

Text Books:

S. No.	Title	Author(s)	Publisher
1	Software Engineering: A practitioner's Approach	Roger S Pressman	McGrawHill
2	Software Engineering	Ian Sommerville	Pearson education

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Software Engineering: A Precise Approach	Pankaj Jalote	Wiley India
2	Software Engineering : A Primer	Waman S Jawadekar	Tata McGraw-Hill
3	Fundamentals of Software Engineering	Rajib Mall	PHI
4	Software Engineering, Principles and Practices	Deepak Jain	Oxford University Press
5	Software Engineering: Abstraction and modeling	Diner Bjorner	Springer International edition

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Subject Code CS1115603	IoT Development Boards	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of this course is to make students know the hands-on experience using different IoT architectures, to provide skills for interfacing sensors and actuators with different IoT architectures, to develop skills on data collection and logging in the cloud	On successful completion of the course, the student will be able to: **CO1.** Basic Concepts of Arduino UNO. **CO2.** To understand Arduino Uno connections with sensors . **CO3.** To apply commonly used IOT protocols such as REST API, MQTT through IOT based demonstration. **CO4.** To understand Raspberry PI along with critical protocols and its communication to csloud. **CO5.** To solve analog sensor and digital sensor Interfacing with IOT devices.

UNIT – I : IoT- Introduction and its components **[CO1]**

IoT building blocks, Sensors and Actuators, IoT Devices, IoT boards (Arduino Uno, ESP 8266-12E Node MCU, and Raspberry Pi 3). **[6 Hrs]**

UNIT – II: **Arduino Uno** **[CO1,CO2]**

Getting started with the Uno boards, blink program, connection of sensors to the Uno board, reading values of sensors from the Uno board, interrupts. Case study: Temperature/Humidity Control; Case Study: Sending values Temperature/Humidity values to the Internet via GSM module **[6Hrs]**

UNIT – III: ESP 8266-12E Node MCU **[CO2,CO3]**

Getting started with the ESP board, Micropython and Explorer IDE, Flushing the ESP8266 board with micropython, connecting sensors to the ESP board, Connecting ESP board to WiFi, Interfacing ESP with the Cloud (REST API-GET, POST, MQTT), interrupts, comparison of ESP 32 board with the ESP 8266 board. Case Study: Switching light on /off remotely. Case Study: Voice-based Home Automation for switching lights on/off (Android phone – Google Assistant (Assistant <-> IFTTT), MQTT (ESP <-> IFTTT), ESP 8266 <-> Lights). **[10 Hrs]**

UNIT – IV: Raspberry Pi 3 **[CO4]**

Rpi3 introduction and installing the Raspbian Stretch OS, Headless - Computer and Rpi3 configuration to connect

through SSH via Ethernet, Headless - connecting Rpi3 remotely without Ethernet cable via SSH, IP address, Rpi 3 - Testing the GPIO pins through Scripts **[10 Hrs]**

UNIT – V Raspberry pi3 interfacing with Sensor **[CO5]**

DHT11, Raspberry pi3 python library install and reading sensor feed, 'Plug and play ' type cloud platform overview for integration to IOT devices, 'Plug and play' cloud platform for integration to IOT device - actuator (LED), Plug and play platform - Custom widget (DHT11-Sensor) integration through Python. New - Raspeberry Pi 4 Vs Raspberry Pi3 Mobel B Comparison, LoRawan /LPWAN – Overview **[6 Hrs]**

Text Books:

S. No.	Title	Author(s)	Publisher
1	Internet of Things with Raspberry Pi 3: Leverage the power of Raspberry Pi 3 and JavaScript to build exciting IoT projects 2018	Rao, M.	Packt Publishing Ltd
2	Arduino for beginners: essential skills every maker needs 2013	Baichtal, J.	Pearson Education.

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Internet of Things with ESP8266 (2016)	Schwartz, M.	Packt Publishing Ltd
2	Getting started with raspberry PI (2012)	Richardson, M., & Wallace, S.	O'Reilly Publisher Media, Inc

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SCHEME OF TEACHING AND EXAMINATION
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Subject Code CS102691	Cloud Computing Lab	L = 0	T = 0	P = 2	Credits =1
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	3 hours

Course Objectives	Course Outcomes
• . To develop web applications in cloud • To learn the design and development process involved in creating a cloud based application • To learn to implement and use parallel programming using Hadoop	**On successful completion of the course, the student will be able to:** **CO1**. Configure various virtualization tools such as Virtual Box, VMware workstation. **CO2**. Design and deploy a web application in a PaaS environment. **CO3**. Learn how to simulate a cloud environment to implement new schedulers. **CO4**. Install and use a generic cloud environment that can be used as a private cloud. **CO5**. Manipulate large data sets in a parallel environment

List of Experiments

[12 Hrs]

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. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
8. Install Hadoop single node cluster and run simple applications like word count.
9. Create an application (Ex: Word Count) using HadoopMap/Reduce.
10. Case Study: PAAS(Facebook, Google App Engine)
11. Case Study: Amazon Web Services.

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Text Books:

S. No.	Title	Author(s)	Publisher
1.	Cloud Computing- A Practical Approach	Velte	TMH Pub
2.	Cloud Computing	Kumar Saurabh	Wiley Pub
3.	Hadoop: The Definitive Guide	Tom White	O'Reilly

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B.Tech. (Sixth Semester) Computer Science & Engineering [AI, AIML, BDA, GT]

Subject Code CS102692	Software Engineering and Project Management Lab	L = 0	T = 0	P = 2	Credits =1
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	3 hours

Course Objectives	Course Outcomes
The goal of this course is to teach and provide experience building software projects in service to real-time end-user beneficiaries. The laboratory is pursued in the following sequence of stages with due coordination with co-projectees in teams (of 3–4 students) and supervision of laboratory instructor upon which the project is graded accordingly.	**On successful completion of the course, the student will be able to:** **CO1**. Define various software application domains and remember different process model used in software development. **CO2**. Explain needs for software specifications also they can classify different types of software requirements and their gathering techniques. **CO3**. Convert the requirements model into the design model and demonstrate use of software and user-interface design principles. **CO4**. Justify the role of SDLC in Software Project Development and evaluate importance of Software Engineering. **CO5**. Generate project schedules, deliverables and construct, design and develop network diagram for different type of projects; also practicing the activities of each phase.

List of Experiments

[12 Hrs]

Instructions to be Strictly Followed by Students

1) A group of two to three students should develop software that could be developed during session.

2) Technology/Tool like (C/C++/VB/Gambas/PhP/Core Java/Servlet/ JSP …. Any other relevant tool) can be selected for Developing their project

3) Phase wise documentation
- Writing the complete problem statement.
- Writing the Software Requirement Specification document.
- Drawing the entity relationship diagram.

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- Drawing the data flow diagrams at level 0 and level 1. of the project should be submitted (soft and hard copy).

4) All group members must have a copy of the documentation, which are to be checked by faculty Lab Incharge, phase wise.

5) Before the Final Practical examinations, every individual student should submit his own hardcopy of the documentation in a Punched Cardboard File Only, with a CD containing the softcopy of the same.

6) During Final Submissions, every copy of the documentation should be accompanied by a Submission Certificate duly signed by the Teacher In-charge and Head of Department

LIST OF EXPERIMENTS

Expt: 1 - Aim: Phases in software development project, overview, need, coverage of topics
Procedure:

1) Open an appropriate software engineering guide and study the software development life cycle and related topics.
2) Study the need of the software engineering.
3) Study the coverage of topics such as life cycle models and their comparison

Expt: 2 - Aim: To assign the requirement engineering tasks.
Procedure:

1) Identify the different requirement engineering tasks.
2) Assign these tasks to various students to set the ball rolling.
3) Ask the students to start working on the given tasks.

Expt: 3- Aim: To perform the system analysis: Requirement analysis, SRS (Allotted Project)
Procedure:

1) Assign the group of the students different tasks of system analysis.
2) Ask students to meet different users and start analysis the requirements.
3) Ask students to give presentations group-wise of their system requirements analysis.

Expt: 4- Aim: To perform the function oriented diagram: DFD(level 0, level 1)
Procedure:

1) Identify various processes, data store, input, output etc. of the system and ask students to analyze
2) Use processes at various levels to draw the DFDs.
3) Identify various modules, input, output etc. of the system and ask students to analyze.

Expt: 5- Aim: To perform the function oriented diagram: Structured chart
Procedure:

1) Iidentify various processes, data store, input, output etc. of the system and ask students to analyse
2) Identify various modules, input, output etc. of the system and ask students to analyse.
3) Use various modules to draw Structured charts.

Expt: 6- Aim: To perform the user's view analysis: Use case diagram
Procedure:
1) Identify various processes, use-cases, actors etc. of the system and ask students to analyse.
2) Use processes at various levels to draw the use-case diagram

Expt: 7- Aim: To draw the structural view diagram : Class diagram
Procedure:
1) Identify various elements such as classes, member variables, member functions etc. of the class diagram
2) Draw the class diagram as per the norms.

Expt: 8- Aim: To draw the structural view diagram : Object diagram
Procedure:
1) Identify various elements such as various objects of the object diagram
2) Draw the object diagram as per the norms.

Expt: 9- Aim: To draw the behavioral view diagram : Sequence diagram
Procedure:
1) Identify various elements such as controller class, objects, boundaries, messages etc.of the sequence diagram
2) Draw the sequence diagram as per the norms.

Expt: 10- Aim: To draw the behavioral view diagram : Collaboration diagram
Procedure:
1) Identify various elements such as for the sequence diagram of the collaboration diagram
2) Draw the collaboration diagram as per the norms

Expt: 11- Aim: To draw the behavioral view diagram : State-chart diagram.
Procedure:
1) Identify various elements states and their different transition of the state-chart diagram
2) Draw the state-chart diagram as per the norms.

Expt: 12- Aim: To draw the behavioral view diagram : Activity diagram
Procedure:
1) Identify various elements such as different activity their boundaries etc. of the activity diagram
2) Draw the activity diagram as per the norms.

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Text Books:

S. No.	Title	Author(s)	Publisher
1.	Fundamentals of Software engineering	Rajib Mall	PHI Learning Pvt. Ltd.
2.	Software design – From programming to architecture	Eric Braude	John Wiley & Sons Inc.
3.	Object-oriented software engineering – A use case driven approach	Ivar Jacobson	Pearson India

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Subject Code CS115693	IoT Board Lab	L = 0	T = 0	P = 2	Credits =1
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	3 hours

Course Objectives	Course Outcomes
The objective of this course is to give students hands-on experience using different IoT architectures, to provide skills for interfacing sensors and actuators with different IoT architectures and to develop skills on data collection and logging in the cloud	**On successful completion of the course, the student will be able to:** **CO1** Basic Concepts of Arduino UNO. **CO2** To understand Arduino Uno, NODE MCU 8266 and Raspberry PI along with critical protocols and its communication to cloud. **CO3** Students will be capable to design IoT applications in different domain and be able to analyze their performance. **CO4** To solve analog sensor and digital sensor Interfacing with IOT devices. **CO5** Build IOT applications using Arduino UNO Raspberry PI.

List of Experiments **[12 Hrs]**

1. Measure the Distance Using Ultrasonic Sensor and Make Led Blink Using Arduino
2. Detect the Vibration of an Object Using Arduino
3. Sense the Available Networks Using Arduino.
4. LDR to Vary the Light Intensity of LED Using Arduino.
5. Interact with DHT11 sensor with NodeMCU and compose a program to print temperature and humidity reading on screen.
6. Compose a program on NodeMCU to transfer temrature and stickness information to thingspeak cloud
7. Communicate OLED with NodeMCU and compose a program to print temperature and misture reading on it.
8. Switch Light On and Off Based on the Input of User Using Raspberry Pi
9. MySQL Database Installation in Raspberry Pi
10. SQL Queries by Fetching Data from Database in Raspberry Pi

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11. Study of AT89S52 Ultra Development Kit with Development Tool /Environment of Kiel Software for Microcontroller programming.
12. To familiarize with Intel Galileo Gen2 board and understand the procedure of creation and compilation of C source code.
13. Wifi module interfacing with Intel Galileo Gen2 Board.

Text Books:

S. No.	Title	Author(s)	Publisher
1	Internet of Things with Raspberry Pi 3: Leverage the power of Raspberry Pi 3 and JavaScript to build exciting IoT projects 2018	Rao, M.	Packt Publishing Ltd
2	Arduino for beginners: essential skills every maker needs 2013	Baichtal, J.	Pearson Education.

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Internet of Things with ESP8266 (2016)	Schwartz, M.	Packt Publishing Ltd
2	Getting started with raspberry PI (2012)	Richardson, M., & Wallace, S.	O'Reilly Publisher Media, Inc

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Subject Code CS102694	Minor Project-II	L = 0	T = 0	P =2	Credits = 1
Evaluation Scheme	ESE	CT	TA	-	ESE Duration
	50	-	25	-	3 Hours

Course Objectives	Course Outcomes
The objectives of this lab are: The objective of this course is to improve student 's ability to analyze, design and solve complex engineering problems through pedagogies **(Project Based Learning)** that support them in developing these skills. The goal here is not to passively absorb and reiterate information; but rather to actively engage with the content, work through itwith others, relate to it through an analysis, use modern tools and effectively solve problems with the corresponding knowledge gained.	**On successful completion of the course, the studentwill be able to:** **CO1:** Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach. **CO2:** Reproduce, improve and refine technical aspects of engineering projects applying appropriate techniques, resources, and modern engineering and IT tools. **CO3:** Work as an individual and as a member or leader in teams in development of technical projects. **CO4:** Follow management principle and value health, safety and ethical practices during project. **CO5:** Communicate and report effectively project related activities and findings.

The Process Followed to Maintain the Quality of Student Projects are: [12 Hrs.]

(a) Allotment of Projects:

(i) Students form their team (max four students) and submit their areas in which they would liketo pursue their projects.

(ii) Through meeting and deliberations students are allotted guide depending on their preferenceand maximum number of groups under a faculty is limited to three.

(b) Identification of projects:

Students are asked to formulate problem statement and state objectives of their project inconsultation with the project guide

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c) Continuous Monitoring

(i) Progress is continuously monitored by guide and instructions are given how to proceed further during their project periods as per time table.

(ii) Students submit weekly progress report to the project in-charge after consultation with their project guide.

(d) Evaluation

(i) In order to evaluate projects two project seminars (assessment) are taken in which student ‘s team present their project through presentations and demonstrate their work.

(ii) Students are assessed on the basis of their technical skill implementation, use of modern tools, communication skill, team work, health, safety and ethical practices and relevance of theproject.

(iii) At the end of the semesters a report is submitted by the students and student ‘s projects are finally evaluated by external examiner in end semester practical examination based

Reference Books:

S. No.	Title	Authors	Publisher
1	Basics Of Project Management	IES Master Team	IES Master Publication (1 January 2021)
2	Modern Systems Analysis and Design	Jeffrey A. Hoffer, Joey F. George, Joseph S. Valakati	Pearson Education; Third Edition; 2002.

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SCHEME OF TEACHING AND EXAMINATION
B.Tech. (Sixth Semester) Computer Science & Engineering [AI, AIML, BDA, GT]

Professional Elective-II

Subject Code CS102621	Smart Contract	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
1. To understand the Smart Contracts in Blockchain. 2. To learn the tools and programming skills required to generate Smart Contracts. 3. To assess the efficiency of the security issues.	After the completion of this course, the students will be able to: **CO1**. Understand the basics and objectives of Smart Contracts in a Blockchain. **CO2**. Evaluate the various functionalities and features in an Ethereum to generate Smart Contracts. **CO3**. Introduce the Solidity language in creation of a Smart Contracts. **CO4**. Incorporate Smart Contracts in decentralized applications. **CO5**. Assess the security issues and effectiveness of a Smart Contracts in real world scenarios.

Unit 1: Fundamentals of Smart Contracts **Blockchain Terminologies** –Crypto currency and Smart Contracts - Understanding the Virtual Machine of a Blockchain - Terminology, concepts and practices in Smart Contracts. **Ethereum Smart Contracts** Definition of Ethereum - Prevalence of the Ethereum blockchain in Smart Contracts development - Ethereum Virtual Machine (EVM) - Instances of working Ethereum Smart Contracts. **[8 Hrs.]**

Unit 2 Various Aspects in **Application of Smart Contracts** - Market impact and scientific innovation – Trust - Security, using Merkle Trees – Future resistance features in Smart Contracts applications - Workflow of developing a Smart Contracts - Execution environments in writing a Smart Contracts. **[7 Hrs.]**

Unit 3: Solidity Language Basics Layout of a Solidity Source File - Structure of a contracts - Control structures – Functions -Scoping and declarations. **Solidity with Contracts** Creating contracts - Object-oriented high level language features - Visibility and Getters –Events - Abstract Contracts. **[7 Hrs.]**

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Unit 4: Decentralized Applications Decentralized Application Architecture - Connecting to the Blockchain and Smart Contracts –Building Apps – Deployment. **[7 Hrs.]**

Unit 5: Security Issues Shifting from Trust-in-People to Trust-in-Code - Data permanence - Selective-Obscurity -Security counter measures. Contemporary Issues **[7 Hrs.]**

Text Books:

S. No.	Title	Author(s)	Publisher
1	Ethereum Smart Contracts Development in Solidity	Gavin Zheng, Longxiang Gao, Liqun Huang, Jian Guan	Springer Singapore
2	Introducing Ethereum and solidity	Dannen, C.	Berkeley: Springer

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Solidity Programming Essentials: A beginner's guide to build smart contracts for Ethereum and Blockchain	Modi, Ritesh	Packet Publishing Ltd

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SCHEME OF TEACHING AND EXAMINATION
B.Tech. (Sixth Semester) Computer Science & Engineering [AI, AIML, BDA, GT]

Subject Code CS102622	Cloud Computing	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The Objective is: • To provide students with the fundamentals and essentials of Cloud Computing. • To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.	After the completion of this course, the students willbe able to: **CO1**. State Cloud fundamentals & its application. **CO2.** Describe the architecture of cloud & various solutions. **CO3.** Paraphrase virtualization technologies & describe cloud management. **CO4**. Explain cloud security fundamentals. **CO5.** Apply various cloud platforms like Google App Engine, Hadoop etc.

UNIT I: Introduction **[CO1]**

Historical development ,Vision of Cloud Computing, Characteristics of cloud computing as per NIST , Cloud computing reference model ,Cloud computing environments, Cloud services requirements, its advantages and limitations, Cloud and dynamic infrastructure, Cloud Adoption and rudiments. **[7 Hrs.]**

Unit-II: Cloud Computing Architecture **[CO2]**

Cloud Reference Model, Concept of IaaS, PaaS, SaaS, AaaS, BaaS, FaaS, DaaS, STaaS, CaaS, NaaS, DBaaS, AaaS, aPaaS, iPaaS, apimPaaS, IoT PaaS, mPaaS, dbPaaS, and UIPaaS, Types of Clouds, Cloud Interoperability & Standards, Scalability and Fault Tolerance, Virtual Desktop Infrastructure. Fog computing, Mist(Edge) computing **[7 Hrs.]**

Unit –III: Cloud Management & Virtualization Technology **[CO3]**

Resiliency, Provisioning, Asset management , Conceps of Map reduce , Cloud Governance, High Availability and Disaster Recovery. Virtualization: Fundamental concepts of compute ,storage, networking, desktop and application virtualization .Virtualization benefits, server virtualization, Block and file level storage virtualization Hypervisor management software, Infrastructure Requirements , Virtual LAN(VLAN)and Virtual SAN(VSAN) and their benefits . **[8 Hrs.]**

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Unit-IV: Cloud Solutions **[CO4]**

Cloud Ecosystem, Cloud Business Process Management, Cloud Service Management. Cloud Offerings: Cloud Analytics, Testing Under Control, **Cloud Security:** Cloud Information security fundamentals, Cloud security services, Design principles, Secure Cloud Software Requirements, Policy Implementation, Cloud Computing Security Challenges, Virtualization security Management, Cloud Computing Secutity Architecture . **[7 Hrs.]**

Unit-V: Market Based Management of Clouds **[CO5]**

Federated Clouds/Inter Cloud: Characterization & Definition , Cloud Federation Stack , Third Party Cloud Services . Overview of cloud applications: ECG Analysis in the cloud, Protein structure prediction, Gene Expression Data Analysis ,Satellite Image Processing ,CRM and ERP ,Social networking .

Case study : Google App Engine, Microsoft Azure , Hadoop , Amazon , Aneka **[7 Hrs.]**

Text Books:

S. No.	Title	Author(s)	Publisher
1	Mastering Cloud Computing	Buyya, Selvi	TMH Pub
2	Cloud Computing	Kumar Saurabh	Wiley Pub

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Cloud Security	Krutz , Vines	Wiley Pub
2	Cloud Computing- A Practical Approach	Velte	TMH Pub
3	Cloud Computing	Sosinsky	Wiley Pub

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SCHEME OF TEACHING AND EXAMINATION
B.Tech. (Sixth Semester) Computer Science & Engineering [AI, AIML, BDA, GT]

Subject Code CS102623	Object Oriented Modeling And Design	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
• Understand the basic steps of Object Oriented Analysis and Design. • Gain practical knowledge in the UML diagrams and notations. • Build an object-oriented model for a project using UML.	Upon completion of this course student will be able to- **CO1**. Understand basic object-oriented concepts for designing a solution. **CO2**. Apply an iterative, use case-driven process to the development of a robust design model. **CO3**. Use the UML to represent the design model. **CO4**. Apply the OO concepts abstraction, encapsulation, inheritance, hierarchy, modularity, and polymorphism to the development of a robust design model. **CO5**. Design a software system using object-oriented software engineering paradigm.

UNIT I: Introduction and Modeling Concepts

Introduction- What is Object-Orientation? What is Object-Oriented Development?, Object-Oriented themes, Evidence for usefulness of Object-Oriented Development, OO Modeling history.

Modeling Concepts: Modeling as design technique-Modeling, Abstraction, The three Models. Class Modeling- Object and Class, Links and Associations Concepts. Generalization and Inheritance, A Sample Class Model, Navigation of Class Models. Advanced Class Modeling –Advanced Objects and Class Concepts, Association ends, N-array associations, Aggregation, Abstract Classes, Multiple Inheritance, Metadata, Reification, Constrains, Derived Data, and Packages. **[7 Hrs.]**

UNIT II: State Modeling and Interaction Modeling

State Modeling- Events and States, Transition & Conditions, State diagrams, State diagram behavior, Nested State diagrams, Concurrency. Advanced State Modeling- Nested State diagram, Nested States, Signal Generalization, Concurrency, A Sample State Model, Relation of Class and State Models. Interaction Model- Use Case Models, Sequence Models, Activity Models. Advanced Interaction Modeling- Use Case relationships, Procedural Sequence Models, Special Constructs for activity Models. **[7 Hrs.]**

UNIT III: Analysis and Design

Process Overview- Development Stages, Development Life cycle. System Conception- Developing a System concept, Elaborating a Concept, Preparing a Problem statement. Domain Analysis- Overview of Analysis,

Domain Class Model, Domain State Model, Domain Interaction Model, Iterating and Analysis. Application Analysis- Application Interaction Model, Application Class Model, Application State Model, Adding Operations. **[7 Hrs.]**

UNIT IV: System design and class Design

System design: Overview of System Design, Estimating Performance, Making a Reuse Plan, Breaking a System into Subsystems, Identifying Concurrency, Allocating Subsystems, Management of Data Storage, Handling Global Resources, Choosing Software Control Implementation, Handling Boundary Conditions, Setting Trade-off Priorities, Common Architectural Styles, Architecture of the ATM System.

Class design: Overview of Object Design, Bridging the gap, Realizing Use Cases, Designing Algorithms, Recursing Downward, Refactoring, Design Optimization, Reification of Behavior, Adjustment of Inheritance, Organizing a Class Design, ATM Example **[8 Hrs.]**

UNIT V: Implementation

Implementation Modeling- Overview of Implementation, fine-tuning classes, Fine tuning generalizations, realizing Associations, Testing. OO Languages- Introduction, Abbreviated ATM Model, Implementing Structure, Implementing Functionality. Databases- Introduction, Abbreviated ATM Model, Implementing Structure-basic and advanced, Implementing Structure for the ATM Example, Implementing functionality, OO Databases. Programming Style-OO Style, Reusability, Extensibility, Robustness, Programming in-the-large. **[7 Hrs.]**

Text Books:

S. No.	Title	Author(s)	Publisher
1.	Object – Oriented Modeling and Design with UML	Michael R Blaha and James R Rumbaugh	Pearson Education, India
2.	Object oriented systems development	Ali Bahrami,	McGraw-Hill Higher Education

Reference Books:

S. No.	Title	Author(s)	Publisher
1.	Object Oriented Analysis & Design	Atul Kahate	Tata McGraw-Hill Education
2.	Object-Oriented Analysis and Design with Applications	Grady Booch, Robert A. Maksimchuk Michael W. Engle, Bobbi J. Young, Jim Conallen, Kelli A. Houston	Addison-Wesley Professional

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SCHEME OF TEACHING AND EXAMINATION
B.Tech. (Sixth Semester) Computer Science & Engineering [AI, AIML, BDA, GT]

Subject Code CS102624	Mobile Computing	L = 2	T =1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
• To introduce the fundamental design principles & issues in cellular & mobile communications. • To enable the student to understand the basic features of cellular-mobile communication systems anddigital radio system. • To motivate students to understand the different technology for working of mobile devices, their advantages and disadvantages and emerging problems.	After successful completion of the course students will be able to: **CO1**. Understand the basic physical-layer architecture of a mobile communication system. **CO2**. Understand various multiple-access techniques for mobile communications, and their advantages and disadvantages. **CO3**. Understand the concepts of wireless communication techniques **CO4**. Understand the concepts of ADHOC networks. **CO5**. Students will be able to acknowledge about the working and development of mobile and wireless devicesin detail, services provided by them and recent application development trends in this field.

Unit- I Introduction, Cell Coverage & Frequency Management

Mobile and wireless devices, Frequencies forradio transmission, A basic cellular system, Cell Size. Elements of cellular radio systems, Design and Interference, Concept of frequency reuse, cell splitting, Channels, Multiplexing, Access Techniques, Medium Access control, Spread spectrum, Specialized MAC, Cell Throughput,, Co-channel interference reduction factor, Frequency management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment, Why hand off, types of handoff and their characteristics, dropped call rates & their evaluation. **[7 Hrs.]**

Unit- II GSM Architecture & Services

GSM Services and Features, GSM System Architecture, GSM Radio Subsystem, GSM Channel Types, Example of a GSM Call, Signal Processing in OSM, Channel Coding for Data Channels, Channel Coding for Control Channels, Frequency and Channel Specifications. **New Data Services:** DECT Functional Concept, DECT Radio Link, Personal Access Communication Systems, PACS System Architecture, PACS Radio Interface, UMTS **[7 Hrs.]**

UNIT-III: Wireless Networks

Wireless LAN, Hidden Nodes in Wireless Networks, Ordered MAC Techniques and Wireless Networks, Deterministic MACs for Wireless Networks, Comparison Of MAC Techniques for Wireless Networks; Infrared

V/S Radio Transmission; IEEE 802.11, Architecture, Layers, Management; HIPERLAN; Bluetooth; Wireless Broadband (WiMAX), RFiD, Java Card., WLL. **[7 Hrs.]**

UNIT-IV: Mobile network and Transport layer
Mobile Network Layer; Mobile IP, DHCP, ADHOC Networks; Mobile Transport Layer; Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP; Fast Transmit/Fast Recovery, Transmission/Time Out Freezing, Selective Retransmission, Transaction Oriented TCP. **[7 Hrs.]**

UNIT–V: Mobile System Development and Support: Wireless Application Protocol (WAP) – WAP Model, WAP Gateway, WAP Protocols WAP User Agent Profile and Caching, Wireless Bearers for WAP, WAP Developer Toolkits, Mobile Station Application Execution Environment Third-Generation Mobile Services - Paradigm Shifts in Third-Generation Systems W-CDMA and cdma2000, Improvements on Core Network, Quality Service in 3G Wireless Operating System for 3G Handset, Third- Generation Systems and Field Trials, Other Trial Systems, Impact on Manufacture and Operator Technologies. **[8 Hrs.]**

Text Books:

S. No.	Title	Author(s)	Publisher
1	Mobile Communications	Schiller, Jochen	Pearson Education Asia – Addison WesleyLongman PTE. Ltd.
2	Wireless Communication Principles and Practice	Theodore S Rappaport	Pearson Education

Reference Books:

S. No.	Title	Author(s)	Publisher
1.	Mobile Data Wireless LAN Technologies	Dayem, Rifaat A	Prentice Hall Internationa
2.	The Essential Guide to Wireless Communication Applications	Dornan, A	PearsonEducation Asia.
3.	The Wireless Application Protocol	Sandeep Singhal	Pearson Education Asia
4.	Third Generation Mobile Telecommunication systems	P. Stavronlakis	Springer Publishers

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SCHEME OF TEACHING AND EXAMINATION
B.Tech. (Sixth Semester) Computer Science & Engineering [AI, AIML, BDA, GT]

Subject Code CS102625	Robotics and Automation	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course is: • To acquire the knowledge on advanced algebraic tools for the description of motion. • To develop the ability to analyze and design the motion for articulated systems. • 3. To develop an ability to use software tools for analysis and design of robotic systems.	After successful completion of the course students will be able to: **CO1**. Use matrix algebra and Lie algebra for computing the kinematics of robots **CO2**. Calculate the forward kinematics and inverse kinematics of serial and parallel robots. **CO3**. Calculate the Jacobian for serial and parallel robot. **CO4**. Do the path planning for a robotic system. **CO5**. Be proficient in the use of Maple or Matlab for the simulation of robots.

UNIT-I: Fundamental Concepts of robotics History, present status & future trends-Robotics & automation-Laws of Robotics-Robot definitions, Robotics systems & robot anatomy-Specification of Robots-resolution, Repeatability & accuracy of a manipulator. Robot Drives & Power Transmission Systems & Control: Robot drive mechanisms, hydraulic-electric-pneumatic drives, mechanical transmission method-Rotary-to /Rotary motion conversion, Rotary –to linear motion conversion-End effectors-Types- in piping problem-Remote centered compliance devices-control of actuators in robotics mechanisms. **[8 Hrs.]**

Unit-II: Sensors & Intelligent Robots Sensory devices-Non optical-position sensors-optical position sensors-Velocity sensors-Proximity sensors-contact & non-contact type-touch &slip sensors-Force & torque sensors-Al &Robotics. **[7 Hrs.]**

Unit-III: Computer Vision for Robotics Systems Robot vision systems-Imaging components-image representation-Hardware aspects-Picture coding, Object recognition & categorization-Visual inspection-Software Considerations-Application, Commercial robotics vision systems **[7 Hrs.]**

Unit-IV: Transformations & Kinematics Homogenous coordinates-coordinates references frames-Homogenous transformation for the manipulator-The forward & inverse problem of manipulator kinematics-

Motion generation Manipulator dynamics-Jacobian in terms of D-H matrices-Controller architecture. **[7 Hrs.]**

Unit-V: Robot Cell Design & Control Specification of commercial robots-Robots design & process specification-Motor selection in the design of a robotic joint-Robot cell layouts-Economic & social aspect of robotics. Application of Robots: Capabilities of Robots-Robotics applications-Obstacle avoidance-Robotics in India-The future of robotics Factor Automation-Hierarchical computer control. **[7 Hrs.]**

Text Books:

S. No.	Title	Author(s)	Publisher
1.	Robotics Engg-An Integrated Approach	Richard D. Klafter, Thomas A. Chmielewski Michael Negin	Eastern Economy Edition Prentice Hall of India
2.	Robotics Technology & Flexible Automation	S. R. Deb and S. Deb	McGrawHill 2nd edition

Reference Books:

S. No.	Title	Author(s)	Publisher
1.	Robotics: Control, Sensing, Vision& Intelligence	K.S.Fu, R.C. Gomalez, C.S.G. Lee	Tata McGraw Hill
2.	Industrial Robots-Technology Programming & application	MikellP. Groover et.al	McGraw Hill
3.	Handbook of Industrial Robotics	ShimanY. Nof. John	Willey & Sons, New York

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SCHEME OF TEACHING AND EXAMINATION
B.Tech. (Sixth Semester) Computer Science & Engineering [AI, AIML, BDA, GT]

Open Elective-I

Subject Code CS100643	Enterprise Resource Planning	L = 3	T = 0	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The Objective of the course is: • To know the basics of ERP and business modules of ERP • To understand the key implementation issues of ERP • To be aware of some popular products in the area of ERP • To appreciate the current and future trends in ERP	On successful completion of the course, the student will be able to: **CO1**: Students will know the strategic importance of Business models. **CO2**: Students will able to know about the working of different modules in a manufacturing company **CO3**: Students will understand the information system used in any company **CO4**: Students will understand the business model and implementing ERP **CO5**: Students will learn to use commercial ERP packages

UNIT 1:

INTRODUCTION: ERP: An Overview, Enterprise – An Overview, Origin, Evolution and Structure: Conceptual Mode of ERP, The Benefits of ERP, ERP and Related Technologies, Business Process Reengineering(BPR), Data Warehousing, Data Mining, OLAP, Product Life Cycle Management(PLM), Supply Chain Management(SCM). **[7 Hrs.]**

UNIT 2:

ERP IMPLEMENTATION: ERP Implementation Lifecycle, Implementation Methodology, Hidden Costs, Organizing the Implementation, Role of SDLC/SSAD, Object Oriented Architecture Vendors, Consultants and Users, Contracts with Vendors, Consultants and Employees, Project Management and Monitoring. **[7 Hrs.]**

UNIT 3:

THE BUSINESS MODULES: Business modules in an ERP Package, Finance, Manufacturing, Human Resources, Bills of Materials, Plant Maintenance, Materials Management, Quality Management, Sales and

Distribution, MRP , MRP II. **[7 Hrs.]**

UNIT 4:

THE ERP MARKET: ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, The Changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications. **[7 Hrs.]**

UNIT 5:

ESENT AND FUTURE: ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture Using ERP tool: ERP Market Place, SAP AG, PeopleSoft, Baan, JD Edwards, Oracle, QAD, SSA.Turbo Charge the ERP System, EIA, ERP and e-Commerce, ERP and Internet, Future Directions **[8 Hrs.]**

Text Books:

S. No.	Title	Author(s)	Publisher
1	ERP Demystified	Alexis Leon	Tata McGraw Hill
2	Enterprise Resource Planning Concepts and Practice	Vinod Kumar Garg & N. K. Venkitakrishnan	Prentice Hall of India Private Limited

Reference Books:

S. No.	Title	Author(s)	Publisher
1	ERP	Devan Parag	Excell Publishers
2	Frontiers of E-Commerce	Ravi & B. Whinston	Addison Wesley
3	Concepts in Enterprise Resource Planning	Joseph A Brady, Ellen F Monk, Bret Wagner	Thompson Course Technology

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SCHEME OF TEACHING AND EXAMINATION
B.Tech. (Sixth Semester) Computer Science & Engineering [AI, AIML, BDA, GT]

Subject Code CS100644	Quantum Computing	L = 3	T = 0	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
• An introduction to quantum computation. • To impart the necessary knowledge to develop and implement algorithms and write programs using these algorithms. • Develop quantum algorithm. • Program quantum algorithm on major toolkits. • The algebra of complex vector spaces and quantum mechanics is covered within the course	After completion of course, student should be able to **CO1**. The basic principles of quantum computing. **CO2**. The fundamental differences between conventional computing and quantum computing. **CO3**. Several basic quantum computing algorithms. **CO4**. The classes of problems that can be expected to be solved well by quantum computers. **CO5**. Develop quantum logic gate circuits

UNIT-I: Introduction to Quantum Computing

Motivation for studying Quantum Computing., Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc.) , Origin of Quantum Computing, Overview of major concepts in Quantum Computing, Qubits and multi-qubits states, Bra-ket notation. Bloch Sphere representation, Quantum Superposition, Quantum Entanglement. **[7 Hrs.]**

UNIT-II: Math Foundation for Quantum Computing

Matrix Algebra: basis vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors., Unitary operators and projectors, Dirac notation, Eigen values and Eigen vectors. **[7 Hrs.]**

UNIT-III: Elements

Building Blocks for Quantum Program, Architecture of a Quantum Computing platform , Details of q-bit system of information representation: Block Sphere , Multi-qubits States , Quantum superposition of qubits (valid and invalid superposition) , Quantum Entanglement , Useful states from quantum algorithmic perspective e.g. Bell State , Operation on qubits: Measuring and transforming using gates. , Quantum Logic gates and Circuit: Pauli, Hadamard, phase shift, controlled gates, Ising, Deutsch, swap etc. **[8 Hrs.]**

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UNIT-IV: Programming Model
Programming model for a Quantum Computing Program, Steps performed on classical computer, Steps performed on Quantum Computer, Moving data between bits and qubits. Basic techniques exploited by quantum algorithms., Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum Walks **[7 Hrs.]**

UNIT-V Quantum Algorithms Major Algorithms, Shor's Algorithm, Grover's Algorithm, Deutsch's Algorithm, Deutsch -Jozsa Algorithm, OSS Toolkits for implementing Quantum program, IBM quantum experienc , Microsoft Q, RigettiPyQuil (QPU/QVM) **[7 Hrs.]**

Text Books:

S. No.	Title	Author(s)	Publisher
1	Quantum Computation and Quantum Information	Michael A. Nielsen	Cambridge University Press
2	Quantum Computing Explained	David McMahon	Wiley

Reference Books:

S. No.	Title	Author(s)	Publisher
1	IBM Experience: https://quantumexperience,ng,bluemix.net	-	-
2	Microsoft Quantum Development Kit https://www.microsoft.com/enus/quantum/developmentkit	-	-

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SCHEME OF TEACHING AND EXAMINATION
B.Tech. (Sixth Semester) Computer Science & Engineering [AI, AIML, BDA, GT]

Subject Code CS100645	Digital Marketing	L = 3	T = 0	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course is: 1. To provide students with the fundamentals and essentials of Digital Marketing Concepts and tools available. 2. To provide students a sound foundation of the Digital marketing tools so that they are able to start using and adopting these tools in their real life scenarios.	After the completion of this course, the students will be able to: **CO1**. State Digital Marketing fundamentals. **CO2**. Describe the architecture of marketing& various solutions. **CO3**. Paraphrase digital marketing tools& describe tools management. **CO4**. Explain and enhance fundamental strategies. **CO5**. Apply various tools for web analytics.

Unit 1: Introduction to Digital Marketing, Digital Marketing vs traditional marketing, Importance of digital marketing, recent trends and current scenario of the industry, Marketing Automation, Influencer & Podcast, Web Remarketing, Design Essentials, Video Marketing The Art of Pitching **[7 Hrs.]**

Unit 2: Search Engine Optimization (SEO), Search Engine Marketing, search engine's results page (SERP), on-page and off-page optimization, keywords research, meta tags, meta description, link building, search volume, cost-per-click (CPC), customer lifetime value (CLV), call-to-action (CTA). cost-per-view (CPV), cost-per-impression (CPM) **[7 Hrs.]**

Unit 3: Social Media Marketing Using different social media platforms like Facebook, Instagram, YouTube, Twitter, LinkedIn, Pinterest, Google+, Snapchat, etc. Email Marketing : create and send product-based emails in bulk, open rate and conversion rate. Affiliate Marketing, Content Marketing & Strategy, Web Remarketing, Mobile Marketing, Adsense, Blogging, Video Marketing **[7 Hrs.]**

Unit 4: Web Analytics based on traffic source, referring sites, page views, and conversion rates of that website. E-Commerce Management Maintenance of an online product-listing website through product keyword research, product pricing, positive reviews, and customer retention. Online Reputation Management (ORM) **[8**

Hrs.]

Unit 5: Planning and Creating a Website, Design Essentials, Digital Media Planning and Buying, create a website on WordPress. Content Strategy: How to create content that matches the user intent and also your business goals. E-Commerce Management, Art of Pitching, ROI, cost-per-install (CPI), cost-per-order (CPO), cost-per-acquisition (CPA), click-through-rate (CTR) etc. **[7 Hrs.]**

Text Books:

S. No.	Title	Author(s)	Publisher
1.	Machine Learning	Tom M. Mitchell	McGraw-Hill Education (India) Private Limited
2.	Introduction to Machine Learning (Adaptive Computation and Machine Learning)	EthemAlpaydin	MIT Press
3.	Machine Learning: An Algorithmic Perspective	Stephen Marsland	CRC Press
4.	Pattern Recognition and Machine Learning	Bishop, C.	Springer-Verlag

Reference Books:

S. No.	Title	Author(s)	Publisher
1.	Introduction to Artificial Intelligence and Expert Systems	Dan W. Patterson	Prentice Hall of India.
2.	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems (First Edition)	Aurelien Geron	O'Reilly Media
3.	Dive into Deep Learning	Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola	E-Books
4.	Machine Learning for Humans	Vishal Maini ,Samer Sabri	E-Books