**Vivekanand Education Society’s Institute of Technology** 

**(Affiliated to University of Mumbai, Approved by AICTE & Recognized by Govt. of Maharashtra)**

**Department of Information Technology**

**Academic Year 2023-24**

**Semester V, VI**

**Program Structure for Third Year Information Technology**

**Scheme for Autonomous Program**

**(With Effect from 2023-2024)**

**Semester V**

| Course  Code | Course Name | Teaching Scheme (Contact Hours) | | Credits Assigned | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Theory | Practical | Theory | Practical | Tutorial | Total |
| ITC501 | Internet Programming | 3 | - | 3 | - | - | 3 |
| ITC502 | Computer Network Security | 3 | - | 3 | - | - | 3 |
| ITC503 | Entrepreneurship and E- business | 3 | - | 3 | - | - | 3 |
| ITC504 | Software Engineering | 3 | - | 3 | - | - | 3 |
| **ITDO501X** | **Department Optional Course – 1** | **3** | **-**  **-** | **3** | **-**  **-** |  | **3** |
| ITL501 | IP Lab | -  - | 2 | -  - | 1 |  | 1 |
| ITL502 | Security Lab | -  - | 2 | -  - | 1 |  | 1 |
| ITL503 | DevOPs Lab | -  - | 2 | -  - | 1 |  | 1 |
| ITL504 | Advance DevOPs Lab | - | 2 | -  - | 1 |  | 1 |
| ITL505 | Professional Communication & Ethics-II (PCE-II) | -  - | 2  \*  +  2 | -  - | 2 |  | 2 |
|  | Total | 15 | 16 | 15 | 8 |  | 23 |

\* Theory class ; $ indicates workload of Learner (Not Faculty), for Mini Project

Department of Information Technology Syllabus for Undergraduate Programme

| Course  Code | Course Name | Examination Scheme | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Theory | | | | Term  Work | Pract  & oral | Total |
| Internal Assessment | | End  Sem  Exam | Exam  Duration (Hrs) |  |  |  |
| Mid Test (MT) | CA |  |  |  |  |  |
| ITC501 | Internet Programming | 20 | 20 | 60 | 2 | - | - | 100 |
| ITC502 | Computer Network Security | 20 | 20 | 60 | 2 | - | - | 100 |
| ITC503 | Entrepreneurship and E  business | 20 | 20 | 60 | 2 | - | - | 100 |
| ITC504 | Software Engineering | 20 | 20 | 60 | 2 | - | - | 100 |
| **ITDO501**  **X** | **Department Optional**  **Course**  **– 1** | 20 | 20 | 60 | 2 | - | - | 100 |
| ITL501 | IP Lab | - | - | - | - | 25 | 25 | 50 |
| ITL502 | Security Lab | - | - | - | - | 25 | 25 | 50 |
| ITL503 | DevOPs Lab | - | - | - | - | 25 | 25 | 50 |
| ITL504 | Advance DevOPs Lab | - | - | - | - | 25 | 25 | 50 |
| ITL505 | Professional  Communication & Ethics II (PCE-II) | - | - | - | - | 25 | 25 | 50 |
| ITM501 | Mini Project – 2 A Web Based Business Model | -- | -- | -- | -- | 25 | 25 | 50 |
|  | Total | 100 | 100 | 300 | - | 150 | 150 | 800 |

Department Optional Courses:

| 1. Microcontroller Embedded Programming | 2. Computer Graphics & Multimedia System |
| --- | --- |
| 3. Advance Data Management Technologies | 4. Advanced Data structure and Analysis |

Department of Information Technology Syllabus for Undergraduate Programme

| **Course Code:** | **Course Title:** | **Credit** |
| --- | --- | --- |
| **ITC501** | Internet Programming | 3 |
| **Prerequisite:** Knowledge of basic programming, network fundamentals and operating systems. | |  |
| **2) Course Objectives:** The course aims: | |  |
| 1 | To orient students to Web Programming fundamentals. |  |
| 2 | To expose students to JavaScript to develop |  |
| 3 | To orient students to Basics of REACT along with installation |  |
| 4 | To expose students to Advanced concepts in REACT |  |
| 5 | To orient students to Fundamentals of node.js |  |
| 6 | To expose students to node.js applications using express framework. |  |
| **3) Course Outcomes:** On successful completion, of course, learner/student will be able to: | |  |
| 1 | Select protocols or technologies required for various web applications. |  |
| 2 | Apply JavaScript to add functionality to web pages. |  |
| 3 | Design front end application using basic React. |  |
| 4 | Design front end applications using functional components of React. |  |
| 5 | Design back-end applications using Node.js. |  |
| 6 | Construct web based Node.js applications using Express. |  |

Department of Information Technology Syllabus for Undergraduate Programme

**4) Syllabus**

| **Module** |  | **Content** | **Hrs** |
| --- | --- | --- | --- |
| Module 1 | Web  program  ming  fundame  ntals | **Web Application Architecture**,Working of web browser, HTTP protocol,HTTPS, DNS, TLS, XML, JSON, DOM, URL, URI, REST API. | 03 |
| Module 2 | Java script: | Introduction to ES6, Difference between ES5 and ES6. Variables, Condition, Loops, Functions, Events, Arrow functions, Setting CSS Styles using JavaScript, DOM manipulation, Classes and Inheritance. Iterators and Generators, Promise, Client server communication, Fetch | 06 |
| Module 3 | React  fundame  ntals | Installation, Installing libraries, Folder and file structure, Components, Component lifecycle, State and Props, React Router and Single page applications, UI design, Forms, Events, | 06 |
| Module 4 | Advanced  React: | Functional components- Refs, Use effects, Hooks, Flow architecture, Model-View  Controller framework, Flux, Bundling the  application. Web pack. | 07 |
| Module 5 | NodeJS | **Features of NodeJS, Modules,** Environment setup, First app, Asynchronous programming, Callback concept, Architecture: Event loops,  REPL, Event emitter, Networking module,  Buffers, Streams, File system, Web module**. Connecting NodeJS to Database** | 08 |
| Module 6 | Express | Introduction to Express ,Installing Express,Creating First Express application,The application, request, and response objects, Configuring Routes, REST API,Generator, **Understanding Middleware**, Cookies, Session, Authentication. Integrating  with React. | 07 |

Department of Information Technology Syllabus for Undergraduate Programme

|  |  | **Total** | 37 |
| --- | --- | --- | --- |

| **5) Textbooks:** | |
| --- | --- |
| 1 | Rediscovering JavaScript, Master ES6, ES7, and ES8, By Venkat Subramaniam, 2018 |
| 2 | Learning React Functional Web Development with React and Redux, Alex Banks and Eve Porcello, O’Reilly |
| 3 | Learning React Functional Web Development with React and Redux, Alex Banks and Eve Porcello, O’Reilly |
| 4 | RESTful Web API Design with Node.js 10, Valentin Bojinov, Packt Publication |
| **6) Reference Books:** | |
| 1 | Web Development with Node and Express, Ethan Brown, O’Reilly |

Department of Information Technology Syllabus for Undergraduate Programme

| **7) Internal Assessment:**  Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.(Total 40)  Mid Term test is to be conducted when approx. 50% syllabus is completed Duration of the midterm test shall be one hour.  **8) Continuous Assessment:-**  Continuous Assessment **is of 20 marks.** The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:-  **Sr.no Rubrics Marks** 1. \*Certificate course for 4 weeks or more:-  10 marks  NPTEL/ Coursera/ Udemy/any MOOC  2. Project based Assignment 10 marks  3. Participation in event/ workshop /talk / competition  5 marks  followed by small report and certificate of  participation relevant to the subject (in other  institutes)  4. Multiple Choice Questions (Quiz) 5 marks |
| --- |

**\*** Rubrics 1 compulsory, along with rubrics rubrics 2 or ( rubrics 3 & 4) students can select.

**\*** For sr.no.1, the date of the certification exam should be within the term and in case a student is unable to complete the certification , the grading has to be done accordingly.

**9) Rubrics for slow learners:-**

1.) Case study, Presentation, group discussion, technical debate on recent trends in the said course (10 marks)

2. Project based Learning and evaluation / Extra assignment / Question paper solution (10 marks)

3) Multiple Choice Questions (Quiz) (5 marks)

Department of Information Technology Syllabus for Undergraduate Programme

4) Literature review of papers/journals (5 marks)

5) Library related work (5 marks)

**10) Rubrics for Indirect Assessment :-**

1. Mock Viva/Practical

2. Skill Enhancement Lecture

3. Extra Assignments / lab / lecture

| **11) End Semester Theory Examination:** | |
| --- | --- |
| 1 | Question paper will be of 60 marks |
| 2 | Question paper will comprise a total of five questions |
| 3 | All question carry 20 marks |
| 4 | Any three questions out of five need to be solved. |

Department of Information Technology Syllabus for Undergraduate Programme

| **Course**  **Code: ITC502** | **Course Title :Computer Network Security** | **Credit** |
| --- | --- | --- |
| Currently same | (Subject name) | 3 |
| **1)Prerequisite:** Basic concepts of Computer Networks & Network Design, Operating System | |  |
| **2)Course Objectives:**  The course aims: | |  |
| 1 | Explain the fundamentals concepts of computer security and network security. |  |
| 2 | Identify the basic cryptographic techniques using classical and block encryption methods. |  |
| 3 | Study and describe the system security malicious software. |  |
| 4 | Describe the Network layer security, Transport layer security and application layer security. |  |
| 5 | Explain the need of network management security and illustrate the need for NAC. |  |
| **6** | Identify the function of an IDS and firewall for the system security. |  |
| **3)Course Outcomes:**  On successful completion, of course, learner/student will be able to: | |  |
| 1 | Explain the fundamentals concepts of computer security and network security. |  |
| 2 | Identify the basic cryptographic techniques using classical and block encryption methods. |  |

~~Department of Information Technology Syllabus for Undergraduate Programme~~

| 3 | Study and describe the system security malicious software. |
| --- | --- |
| 4 | Describe the Network layer security, Transport layer security and application layer security. |
| 5 | Explain the need of network management security and illustrate the need for NAC. |
| **6** | Identify the function of an IDS and firewall for the system security. |

**4) Syllabus**

| **Module** |  | **Content** | **Hrs** |
| --- | --- | --- | --- |
| **Module 1** | **Introducti on**  **to**  **Network**  **Security & cryptogra phy** | Computer security and Network Security(Definition), CIA, Services, Mechanisms and attacks, The OSI security  architecture, Network security model. Classical Encryption techniques (mono-alphabetic and poly-alphabetic substitution techniques: Vigenere cipher, playfair cipher, transposition techniques: keyed and keyless transposition  ciphers). Introduction to  steganography.  **Self-learning Topics:** Study some more classical encryption techniques and solve more problems on all techniques. Homomorphic encryption in cloud computing | 07 |

Department of Information Technology Syllabus for Undergraduate Programme

| **Module 2** | **Cryptogra phy:**  **Key**  **manageme nt,**  **distributio n**  **and user**  **authentica tion** | Block cipher modes of  operation,Data Encryption Standard,  Advanced Encryption Standard (AES). RC5 algorithm. Public key cryptography: RSA  algorithm. Hashing Techniques: SHA256, SHA-512, HMAC and CMAC, Digital Signature  Schemes – RSA, DSS. Remote user  Authentication Protocols,  Kerberos, Digital Certificate: X.509, PKI  **Self-learning Topics:** Study working of elliptical curve digital signature and its benefits over RSA digital signature. | 09 |
| --- | --- | --- | --- |
| **Module 3** | **Malicious Software** | SPAM, Trojan horse, Viruses, Worms, System Corruption, Attack Agents, Information Theft, Trapdoor, Keyloggers, Phishing, Backdoors, Rootkits, Denial of Service Attacks,  Zombie  **Self-learning Topics:** Study the recent malicious software and their effects. | 04 |
| **Module 4** | **IP**  **Security,**  **Transport level**  **security**  **and Email Security** | IP level Security: Introduction to IPSec, IPSec Architecture, Protection Mechanism (AH and ESP), Transport level security: VPN. Need Web Security  considerations, Secure  Sockets Layer  (SSL)Architecture, Transport Layer Security (TLS), HTTPS, | 07 |

~~Department of Information Technology Syllabus for Undergraduate Programme~~

|  |  | Secure Shell (SSH) Protocol Stack. Email Security: Secure Email S/MIME Screen reader support enabled.  **Self-learning Topics:** Study Gmail security and privacy from Gmail help |  |
| --- | --- | --- | --- |
| **Module 5** | **Network**  **Managem ent**  **Security**  **and**  **Network**  **Access**  **Control** | Network Management  Security:SNMPv3,  NAC:Principle elements of NAC,Principle NAC  enforcement methods, How to implement NAC Solutions, Use cases for network access control  **Self-learning Topics:** Explore any open source network  management security tool | 06 |
| **Module 6** | **System**  **Security** | IDS,Classification of Intrusion Detection Systems,Detection Method of IDS Deployment, Firewall Design Principles, Characteristics of Firewalls, Types of Firewalls,IDS vs Firewalls  **Self-learning Topics:**  Study firewall rules table | 06 |
|  |  | **Total** | **39** |

Department of Information Technology Syllabus for Undergraduate Programme

| **5) Textbooks:** | |
| --- | --- |
| 1 | William Stallings, Cryptography and Network Security, Principles and Practice, 6th Edition, Pearson Education, March 2013. |
| 2 | Behrouz A. Ferouzan, “Cryptography & Network Security”, Tata Mc Graw Hill. |
| 3 | Mark Stamp’s Information Security Principles and Practice, Wiley |
| 4 | Bernard Menezes, “Cryptography & Network Security”, Cengage Learning. |
| **6) Reference Books:** | |
| 1 | Applied Cryptography, Protocols, Algorithms and Source Code in C, Bruce Schneier, Wiley. |
| 2 | Cryptography and Network Security, Atul Kahate, Tata Mc Graw Hill. |
| 3 | www.rsa.com |

Department of Information Technology Syllabus for Undergraduate Programme

| **7) Internal Assessment:**  Assessment consists of one )Mid Term Test of 20 marks and Continuous Assessment of 20 marks.(Total 40  Mid Term test is to be conducted when approx. 50% syllabus is completed Duration of the midterm test shall be one hour.  **8) Continuous Assessment:-**  Continuous Assessment **is of 20 marks.** The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:-  **Sr.no Rubrics Marks** 1. \*Certificate course for 4 weeks or more:-  10 marks  NPTEL/ Coursera/ Udemy/any MOOC  2 Mini Project / Extra Experiments/ Virtual Lab 10 marks 3. GATE Based Assignment test/Tutorials etc 10 marks 4. Multiple Choice Questions (Quiz) 5 marks |
| --- |

**\***For sr.no.1, the date of the certification exam should be within the term and in case a student is unable to complete the certification , the grading has to be done accordingly.

**9)Rubrics for slow learners:-**

1.) Case study, Presentation, group discussion, technical debate on recent trends in the said course (10 marks)

2. Project based Learning and evaluation / Extra assignment / Question paper solution (10 marks)

3) Multiple Choice Questions (Quiz) (5marks)

4) Literature review of papers/journals (5 marks)

5) Library related work (5 marks)

Department of Information Technology Syllabus for Undergraduate Programme

**10)Rubrics for Indirect Assessment :-**

1. Mock Viva/Practical

2. Skill Enhancement Lecture

3. Extra Assignments/lab/lecture

| **11)End Semester Theory Examination:** | |
| --- | --- |
| 1 | Question paper will be of 60 marks |
| 2 | Question paper will comprise a total of five questions |
| 3 | All question carry 20 marks |
| 4 | Any three questions out of five need to be solved. |

Department of Information Technology Syllabus for Undergraduate Programme

| **Course**  **Code:** | **Course Title** | **Credit** |
| --- | --- | --- |
| ITC503 | Entrepreneurship and E-business | 3 |
| **1)Prerequisite:** | |  |
| **2)Course Objectives:** | |  |
| 1 | Distinguish Entrepreneur and Entrepreneurship starting and feasibility study |  |
| 2 | Realize the skills required to be an entrepreneur |  |
| 3 | Acquaint the students with challenges of starting new ventures |  |
| 4 | Identify the right sources of fund for starting a new business |  |
| 5 | Be familiarized with concept of E-business Models |  |
| **6** | cccUnderstand various E-business Strategies |  |
| **3)Course Outcomes:** | |  |
| 1 | Understand the concept of entrepreneurship and its close relationship with enterprise and owner-management. |  |
| 2 | Understand the nature of business development in the context of existing organizations and of new business start-ups. |  |
| 3 | Comprehended important factors for starting a new venture and business development |  |
| 4 | Know issues and decisions involved in financing and resourcing a business start-up |  |
| 5 | Describe various E-business Models |  |
| **6** | Discuss various E-business Strategies |  |

Department of Information Technology Syllabus for Undergraduate Programme

**Syllabus**

| **Module** | **Content** | **Hrs** |
| --- | --- | --- |
| Module 1  Introduction | Concept, meaning and definition of Entrepreneur and Entrepreneurship. Evolution of Entrepreneurship, Role of Entrepreneurship in economic Development; Managerial vs entrepreneurial approach; Classification and types of Entrepreneurs. Characteristics and qualities of successful Entrepreneurs; Women Entrepreneurs; Corporate & Social entrepreneurship.  Self-learning Topics: Factors impacting emergence of entrepreneurship | 04 |
| Module 2  Entrepreneurship Development and Leadership | Entrepreneurial Motivation: motivating factors, Types of startups; Characteristics of entrepreneurial leadership, Components of Entrepreneurial Leadership; Factors influencing entrepreneurial development and motivation, Entrepreneurial Opportunities and challenges, Entrepreneurship process. Types of Enterprises and Ownership Structure: small scale, medium scale and large-scale enterprises: Meaning and definition (evolution), role of small enterprises in economic development; proprietorship, Policies governing SMEs, partnership, Ltd. companies and co-operatives: their formation, capital structure and source of finance.  *Self-learning Topics: study the white paper https://www.ncert.nic.in/ncerts/l/lebs213.pdf* | 06 |
| Module 3  New Venture  Planning | Methods to Initiate Ventures; Acquisition-Advantages of acquiring an ongoing venture and examination of key issues; Developing a Marketing plan-customer analysis, sales analysis and competition analysis, Business Plan-benefits of drivers, perspectives in business plan preparation, elements of a business plan; Business plan failures.  *Self-learning Topics: Refer following URL to study various case studies https://www.entrepreneurindia.co/case-studies* | **07** |
| Module 4  Financing &  Managing Venture | Financing Stages; Sources of Finance; Venture Capital; Criteria for evaluating new-venture proposals & Capital-process. Management of venture: objectives and functions of management, scientific management, general and strategic management; introduction to human resource management: planning, job analysis, training, recruitment and selection  *Self-learning Topics: visit website ttps://www.startupindia.gov.in* | 06 |
| Module 5  Overview of E –  business | Concept of E-business, Business Success through adoption of technology, information management for business Initiatives, Performance improvement through e-business. Introduction to various collaborative partnerships, E commerce: Sectors of ecommerce, B to C, B to B and C to C ecommerce, Ecommerce success factors, clicks and Bricks in ecommerce, collaborative commerce. E-Marketplace, M-commerce, E-Government; Various E business Models, Challenges of the E-Business Models, Globalization of E business. | 08 |

Department of Information Technology Syllabus for Undergraduate Programme

|  | *Self-learning Topics: Social media applications for E-Business, Social media analytics.* |  | |
| --- | --- | --- | --- |
| Module 6  Strategic Initiatives for Technology | Customer Relationship Management: The evolution of CRM, functional areas of CRM, contemporary trends - SRM, PRM AND ERM, Future Trends of CRM Enterprise Resource Planning: Core and Extended ERP; components of ERP system; Benefits and Risks of ERP implementation Supply Chain Management: Meaning, definition, importance, and characteristics of SCM, Elements of SCM, Push & Pull supply chain model, Use of e-business to restructure supply chain, Supply chain management implementation Procurement: Meaning and advantages of e –procurement, Types& Drivers of e- procurement, Components of eprocurement systems, Implementation of eprocurement  *Self-learning Topics: SEM and SEO E-CRM* | 08 | |
|  | **Total** | **39** | |
| **5) Textbooks:** | | |  |
| 1 | Entrepreneurship; Robert Hisrich, Michael Peters; Tata McGraw Hill Publication | |  |
| 2 | Entrepreneurship: New venture creation by David Holt, Prentice Hall of India Pvt. Ltd. | |  |
| 3 | E- Business & E– Commerce Management: Strategy, Implementation, Practice – Dave Chaffey, Pearson | |  |
| 4 | E-commerce – A Managerial Perspective- P. T. Joseph, Prentice Hall India Publications. Content | |  |
| **6) Reference Books:** | | |  |
| 1 | Entrepreneurship and Innovations in E-business An Integrative Perspective by Fang Zhao, Idea Group Publications. | |  |
| 2 | Business Driven Technology –Haag/Baltzan/Philips –Tata McGraw Hill Publication | |  |
| 3 | Digital Business and E-commerce Management by Dave Chaffey, David EdmundsonBird, Tanya Hemphill, Pearson Education | |  |
| 4 | E-Business 2.0 Roadmap for Success by Dr. Ravi Kalakota, Marcia Robinson, Pearson Education | |  |

Department of Information Technology Syllabus for Undergraduate Programme

| 5 | Case Studies in International Entrepreneurship: Managing and Financing Ventures in the Global Economy. By Walter Kuemmerle, Walter Kuemmerle. McGraw-Hill/Irwin, 2004 |
| --- | --- |

| **7) Internal Assessment:**  Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.(Total 40) Mid Term test is to be conducted when approx. 50% syllabus is completed Duration of the midterm test shall be one hour.  **8) Continuous Assessment:-**  Continuous Assessment is of 20 marks. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:- | | |
| --- | --- | --- |
| **Sr.no** | **Rubrics** | **Marks** |
| 1. | \*Certificate course for 4 weeks or more:-  NPTEL/ Coursera/ Udemy/any MOOC | 10 marks |
|  | 2. Wins in the event/competition/hackathon | 10 marks |
| 3. | Content beyond syllabus presentation | 10 marks |
| 4. | **Creating Proof of concept /case studies (preparing a proposal for the new proposed business)** | **10 marks** |
| 5. | **Mini Project / Extra Experiments/ Virtual Lab (Development of e-commerce web portal for the proposed business discussed under case study)** | **10 marks** |
| 6. | GATE Based Assignment test/Tutorials etc | 10 marks |
|  | 7. Participation in event/workshop/talk / competition followed by small report and certificate of participation relevant to the subject(in other institutes) | 5 marks |
| 8. | Multiple Choice Questions (Quiz) | 5. marks |
|  | | |

**\***For sr.no.1, the date of the certification exam should be within the term and in case a student is unable to complete the certification , the grading has to be done accordingly.

**9) Rubrics for the slow learners:-**

1) **Case study**, Presentation, group discussion, technical debate on recent trends in the said course (10 marks)

Department of Information Technology Syllabus for Undergraduate Programme

2) Project based Learning and evaluation / Extra assignment / Question paper solution (10 marks)

3) Multiple Choice Questions (Quiz) (5 marks)

4) Literature review of papers/journals (5 marks)

5) Library related work (5 marks)

**10)Rubrics for Indirect Assessment :-**

1. **Mock Viva**/Practical

2. Skill Enhancement Lecture

3. Extra Assignments/lab/lecture

| **11)End Semester Theory Examination:** | |
| --- | --- |
| 1 | Question paper will be of 60 marks |
|  | 2Question paper will comprise a total of five questions |
|  | 3All question carry 20 marks |
|  | 4Any three questions out of five needs to be solved. |

Department of Information Technology Syllabus for Undergraduate Programme

| **Course**  **Code: ITC504** | **Course Title :Software Engineering** | **Credit** |
| --- | --- | --- |
| Currently same | (Subject name) | 3 |
| **1)Prerequisite:** Basic programming of knowledge. | |  |
| **2)Course Objectives:**  The course aims: | |  |
| 1 | To provide the knowledge of software engineering discipline |  |
| 2 | To understand Requirements and analyze it |  |
| 3 | To do planning and apply scheduling |  |
| 4 | To apply analysis, and develop software solutions |  |
| 5 | To demonstrate and evaluate real time projects with respect to software engineering principles |  |
| **6** | Apply testing and assure quality in software solution |  |
| **3)Course Outcomes:**  On successful completion, of course, learner/student will be able to: | |  |
| 1 | Understand and use basic knowledge in software engineering |  |
| 2 | Identify requirements, analyze and prepare models |  |
| 3 | Plan, schedule and track the progress of the projects. |  |

Department of Information Technology Syllabus for Undergraduate Programme

| 4 | Design & develop the software solutions for the growth of society |
| --- | --- |
| 5 | To demonstrate and evaluate real time projects with respect to software engineering principles |
| **6** | Apply testing and assure quality in software solution |

**4) syllabus**

| **Module** |  | **Content** | **Hrs** |
| --- | --- | --- | --- |
| **Module 1** | **Introducti on to**  **Software**  **Engineeri ng** | Nature of Software, Software Engineering, Software Process, Capability Maturity Model (CMM) Generic Process Model, Prescriptive Process Models: The Waterfall Model, V model, Incremental Process Models,  Evolutionary Process Models, Concurrent Models, Agile process, Agility Principles, Extreme Programming (XP), Scrum, Kanban model Self-learning Topics: Personal and Team Process Models | 07 |
| **Module 2** | **Requirem ent**  **Analysis** | Software Requirements: Functional & non functional – user-system requirement engineering process – feasibility studies – elicitation – validation & management – software prototyping – S/W documentation – Analysis and modelling Requirement Elicitation, Software requirement specification (SRS), Self-learning Topics: prioritizing requirements (Kano diagram) - real life application case study | 09 |
| **Module 3** | **Software**  **Estimation** | Management Spectrum, 3Ps (people, product and process) Process and Project metrics | 04 |

Department of Information Technology Syllabus for Undergraduate Programme

|  | **and**  **Schedulin g** | Software Project Estimation: LOC, FP, Empirical Estimation Models - COCOMO II Model, Specialized Estimation Techniques, Object based estimation, use-case based estimation Project scheduling: Defining a Task Set for the Software Project, Timeline charts, Tracking the Schedule, Earned Value Analysis Self-learning Topics: Cost  Estimation Tools and Techniques, Typical Problems with IT Cost Estimates. |  |
| --- | --- | --- | --- |
| **Module 4** | **Design**  **Engineeri ng** | Design Process & quality, Design Concepts, The design Model, Pattern-based Software Design. 4.2 Architectural Design :Design Decisions, Views, Patterns, Application Architectures, Modeling Component level Design: component, Designing class based components, conducting component-level design, User Interface Design: The golden rules, Interface Design steps & Analysis, Design Evaluation Self-learning Topics: Refinement, Aspects, Refactoring | 07 |
| **Module 5** | **Software**  **Risk,**  **Configura tion**  **Managem ent** | Risk Identification, Risk Assessment, Risk Projection, RMMM Software Configuration management, SCM repositories, SCM process Software Quality Assurance Task and Plan, Metrics, Software Reliability, Formal Technical Review (FTR), Walkthrough Self learning Topics:: Configuration management for WebApps | 06 |
| **Module 6** | **Software**  **Testing**  **and**  **Maintenan ce** | Testing: Software Quality, Testing:  Strategic Approach, Strategic Issues  Testing: Strategies for Conventional  Software, Object oriented software,  Web AppsValidating Testing- System Testing- Art of Debugging.  Maintenance : Software Maintenance | 06 |

Department of Information Technology Syllabus for Undergraduate Programme

|  |  | Software Supportability  Reengineering- Business Process  Reengineering- Software  Reengineering- Reverse Engineering  Restructuring- Forward Engineering  Self-learning Topics: Test Strategies for WebApps |  |
| --- | --- | --- | --- |
|  |  | **Total** | **39** |

| **5) Textbooks:** | |
| --- | --- |
| 1 | 1 Roger S. Pressman, Software Engineering: A practitioner's approach, McGraw Hill |
| 2 | 2 Rajib Mall, Fundamentals of Software Engineering, Prentice Hall India |
| 3 | 3 PankajJalote, An integrated approach to Software Engineering, Springer/Narosa. |
| 4 | 4 Ian Sommerville, Software Engineering, Addison-Wesley. William Stallings, Cryptography and Network Security, Principles and Practice, 6th Edition, Pearson Education, March 2013. |
| **6) References** | |
| 1 | https://www.youtube.com/watch?v=wEr6mwquPLY |

Department of Information Technology Syllabus for Undergraduate Programme

| **7) Internal Assessment:**  Assessment consists of one )Mid Term Test of 20 marks and Continuous Assessment of 20 marks.(Total 40  Mid Term test is to be conducted when approx. 50% syllabus is completed Duration of the midterm test shall be one hour.  **8) Continuous Assessment:-**  Continuous Assessment **is of 20 marks.** The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:-  **Sr.no Rubrics Marks** 1. \*Certificate course for 4 weeks or more:-  10 marks  NPTEL/ Coursera/ Udemy/any MOOC  2 Case studies + Assignment 10 marks |
| --- |

**\***For sr.no.1, the date of the certification exam should be within the term and in case a student is unable to complete the certification , the grading has to be done accordingly. **9)Rubrics for slow learners:-**

1.) Case study, Presentation, group discussion, technical debate on recent trends in the said course (10 marks)

2. Project based Learning and evaluation / Extra assignment / Question paper solution (10 marks)

| **11)End Semester Theory Examination:** | |
| --- | --- |
| 1 | Question paper will be of 60 marks |

~~Department of Information Technology Syllabus for Undergraduate Programme~~

| 2 | Question paper will comprise a total of five questions |
| --- | --- |
| 3 | All question carry 20 marks |
| 4 | Any three questions out of five need to be solved. |

Department of Information Technology Syllabus for Undergraduate Programme

| **Course Code:** | **Course Title:** | **Credit** |
| --- | --- | --- |
| **ITDO5012** | Advance Data Management Technologies | 3 |
| **Prerequisite:** Basic concepts of a Relational database and SQL | |  |
| **2) Course Objectives:** The course aims: | |  |
| 1 | To impart knowledge related to query processing and query optimization phases of a database management system |  |
| 2 | To learn advanced techniques for data management and to overview emerging data models like Temporal, Mobile, and Spatial databases. |  |
| 3 | To introduce advanced database models like distributed databases. |  |
| 4 | To create awareness of how enterprises can organize and analyze large amounts of data by creating a Data Warehouse. |  |
| 5 | To understand the process of data extraction, transformation, and loading |  |
| 6 | To understand the concept of Big data and NoSQL databases. |  |
| **3) Course Outcomes:** On successful completion, of course, the learner/student will be able to: | |  |
| 1 | Measure query costs and design alternate efficient paths for query execution.. |  |
| 2 | Apply sophisticated access protocols to control access to the database |  |
| 3 | Implement Distributed databases. |  |
| 4 | Organize strategic data in an enterprise and build a data Warehouse. |  |
| 5 | Analyse data using OLAP operations so as to take strategic decisions |  |

~~Department of Information Technology Syllabus for Undergraduate Programme~~

| 6 | Design modern applications using NoSQL databases. databases.. |
| --- | --- |

**4) Syllabus**

| **Module** |  | **Content** | **Hrs** |
| --- | --- | --- | --- |
| Module 0 | Prerequisite | Reviewing basic concepts of a Relational database, SQL concepts | 02 |
| Module 1 | Query Processing and Optimization | Overview: Introduction, Query processing in DBMS, Steps of Query Processing, Measures of Query Cost Selection Operation, Sorting, Join Operation, Evaluation of Expressions. Query Optimization Overview, Goals of Query Optimization, Approaches of Query Optimization, Transformations of Relational Expression, Estimating Statistics of Expression. | 06 |
| Module 2 | Advanced  Data  Management  Techniques | Advanced Database Access protocols: Discretionary Access Control Based on Granting and Revoking Privileges.  Mandatory Access Control and RoleBased Access Control, Remote Database access protocol. Overview of Advanced Database Models like Mobile databases, Temporal databases, Spatial databases. | 06 |
| Module 3 | Distributed  Databases | Introduction: Distributed Data Processing, Distributed Database System: Architecture, Types, Design Issues. Data Fragmentation, Allocation in distributed databases.**Transaction execution in Distributed Database:2 phase commit and 3 phase commit protocol** | 05 |
| Module 4 | Data  Warehousing,  Dimensional  Modelling and OLAP | The Need for Data Warehousing; Data Warehouse Defined; Is data warehouse still relevant in the age of big data, Features of a Data Warehouse; Data Warehouse Architecture-Enterprise or centralized, federated and multi tired architectures; Data Warehouse and Data Marts; Data | 09 |

~~Department of Inform~~a~~tion Technology Syllabus for Undergraduate Programme~~

|  |  | Warehousing Design Strategies, Data modeling Dimensional Model; The Star Schema; How Does a Query Execute? The Snowflake Schema; Fact Tables and Dimension Tables; Factless Fact Table;, Updates To Dimension Tables, Primary Keys, Surrogate Keys & Foreign Keys. What is business intelligence, use of BI, Tools used in BI, Need for Online Analytical Processing; OLAP Operations in a cube: Roll-up, Drill-down, Slice, Dice, Pivot; OLAP Architectures: MOLAP, ROLAP, DOLAP and HOLAP. |  |
| --- | --- | --- | --- |
| Module 5 | ETL Process | Challenges in ETL Functions; Data Extraction; Identification of Data Sources; Immediate Data Extraction, Deferred Data Extraction; Data Transformation: Tasks Involved in Data Transformation, Techniques of Data Loading. **Trends in DataWarehouse:knowlege**  **management, CRM, SCM** | 05 |
| Module 6 | Big data and  NoSQL | Big data and NoSQL : Introduction, types and characteristics of big data, **Big Data Challenges, Examples of Big Data in Real Life, Big Data Applications.** What is NoSQL, CAP theorem, BASE property, NoSQL data architecture patterns: Key-value stores, Graph stores, Column family stores, Document stores. **MongoDB.** | 07 |
|  |  | **Total** | 37 |

Department of Information Technology Syllabus for Undergraduate Programme

| **5) Textbooks:** | |
| --- | --- |
| 1 | Korth, Slberchatz, Sudarshan, ”Database System Concepts”, 6th Edition, McGraw – Hill |
| 2 | Elmasri and Navathe, “Fundamentals of Database Systems”, 6th Edition, PEARSON Education. |
| 3 | Theraja Reema, “Data Warehousing”, Oxford University Press. |
| 4 | Raghu Ramakrishnan and Johannes Gehrke, “Database Management Systems” 3rd Edition - McGraw Hill |
| **6) Reference Books:** | |
| 1 | Paulraj Ponniah, “Data Warehousing: Fundamentals for IT Professionals”, Wiley India. |
| 2 | Peter Rob and Carlos Coronel, “Database Systems Design, Implementation and Management”, Thomson Learning, 9th Edition. |
| 3 | Ralph Kimball, Margy Ross, “The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling”, 3rd Edition. Wiley India |

Department of Information Technology Syllabus for Undergraduate Programme

| **7) Internal Assessment:**  Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.(Total 40)  Mid Term test is to be conducted when approx. 50% syllabus is completed Duration of the midterm test shall be one hour.  **8) Continuous Assessment:-**  Continuous Assessment **is of 20 marks.** The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:-  **Sr.no Rubrics Marks** 1. \*Certificate course for 4 weeks or more:-  10 marks  NPTEL/ Coursera/ Udemy/any MOOC  2. GATE Based Assignment test/Tutorials etc 10 marks  3. Participation in event/ workshop /talk / competition  5 marks  followed by small report and certificate of  participation relevant to the subject (in other  institutes)  4. Multiple Choice Questions (Quiz) 5 marks |
| --- |

**\*** Rubrics 1 compulsory, along with rubrics 2 or ( rubrics 3 & 4) students can select. **\*** For sr.no.1, the date of the certification exam should be within the term and in case a student is unable to complete the certification , the grading has to be done accordingly. **9) Rubrics for slow learners:-**

1.) Case study, Presentation, group discussion, technical debate on recent trends in the said course (10 marks)

2. Project-based Learning and evaluation / Extra assignment / Question paper solution (10 marks)

3) Multiple Choice Questions (Quiz) (5 marks)

4) Literature review of papers/journals (5 marks)

5) Library related work (5 marks)

Department of Information Technology Syllabus for Undergraduate Programme

**10) Rubrics for Indirect Assessment :-**

1. Mock Viva/Practical

2. Skill Enhancement Lecture

3. Extra Assignments / lab / lecture

| **11) End Semester Theory Examination:** | |
| --- | --- |
| 1 | Question paper will be of 60 marks |
| 2 | Question paper will comprise a total of five questions |
| 3 | All questions carry 20 marks |
| 4 | Any three questions out of five need to be solved. |

Department of Information Technology Syllabus for Undergraduate Programme

| **Course**  **Code: TDO5014** | **Course Title: Advance Data Structure and Analysis** | **Credit** |
| --- | --- | --- |
| Currently same | (Subject name) | 3 |
| **1) Prerequisite:** Basics of Data structures and analysis and programming language, **Time and space complexity of algorithm** | |  |
| **2) Course Objectives:** | |  |
| 1 | To learn mathematical background for analysis of algorithm |  |
| 2 | To learn various advanced data structures. |  |
| 3 | To understand the different design approaches of algorithms. |  |
| 4 | To learn dynamic programming methods. |  |
| 5 | To understand the concept of pattern matching |  |
| **6** | To learn advanced algorithms. |  |
| **3) Course Outcomes:** | |  |
| 1 | Describe the different methods for analysis of algorithms. |  |
| 2 | Choose an appropriate advanced data structure to solve a specific problem. |  |
| 3 | Apply an appropriate algorithmic design approach for a given problem. |  |
| 4 | Apply the dynamic programming technique to solve a given problem. |  |
| 5 | Select an appropriate pattern matching algorithm for a given application. |  |
| **6** | Describe the concepts of Optimization, Approximation and Geometric algorithms. |  |

Department of Information Technology Syllabus for Undergraduate Programme

**4) syllabus**

| **Module**0 |  | **Content** | **Hr**  **s** |
| --- | --- | --- | --- |
| Prerequisi  te | Basics of Data structures and analysis and programming language | 2 |
| 1 | Introducti  on | Fundamentals of the analysis of algorithms: Time and Space complexity, Asymptotic analysis and notation, average and worst-case analysis, Recurrences: The substitution method, Recursive tree method, Masters method.  Self-learning Topics: Analysis of Time and space complexity of iterative and recursive algorithms | 4 |
| 2 | Advance  d Data  Structure  s | B/B+ tree, Red-Black Trees, Heap operations,  Implementation of priority queue using heap, Topological Sort.  Self-learning Topics: Implementation of Red-Black Tree and Heaps. | 5 |
| 3 | Divide  and  Conquer  AND  Greedy  algorithm  s | Introduction to Divide and conquer, Analysis of Binary Search, Merge sort and Quick sort, Finding minimum and maximum algorithm. Introduction to Greedy Algorithms: Knapsack Problem, Job sequencing using deadlines, Optimal storage on tape, Optimal Merge Pattern, Analysis of all these algorithms and problem solving.  Self-learning Topics: Implementation of minimum and maximum algorithm, Knapsack problem, Job sequencing using deadlines. | 8 |
| 4 | Dynamic  algorithm  s | Introduction to Dynamic Algorithms, all pair shortest path, 0/1 knapsack, traveling salesman problem, Matrix Chain Multiplication, Optimal binary search tree, Analysis of All algorithms and problem solving.  Self-learning Topics: Implementation of All pair shortest path, 0/1 Knapsack and OBST. | 6 |

Department of Information Technology Syllabus for Undergraduate Programme

| 5 | String  Matching | Introduction, the naïve string matching algorithm, Rabin Karp algorithm, Boyer Moore algorithm, KnuthMorris-Pratt algorithm, Longest Common Subsequence (LCS), Analysis of All algorithms and problem solving.  Self-learning Topics: Implementation of Robin Karp algorithm, KMP algorithm and LCS. | 7 |
| --- | --- | --- | --- |
| 6 | Advanc  ed  Algorith  ms and  NP  problem  s | Optimization Algorithms: Genetic algorithm(GA) Approximation Algorithms: Vertex-cover  problem and **TSP**,  **Geometric Algorithm: Closest Pair**  Introduction to NP-Hard and NP-Complete  Problems  Self-learning Topics: Implementation of Genetic algorithm and Vertex-cover problem,  **Randomized algorithms** | 7 |
|  | **Total** | **39** |

Department of Information Technology Syllabus for Undergraduate Programme

| **5) Textbooks:** | |
| --- | --- |
| 1 | Introduction to Algorithms, Cormen, Leiserson, Rivest, Stein, PHI. |
| 2 | Algorithms: Design and Analysis, Harsh Bhasin, OXFORD |
| 3 | Fundamentals of Computer Algorithms, Horowitz, Sahani, Rajsekaran, Universities Press. |
| 4 | C and Data structures, Deshpande, Kakde, Dreamtech Press. |
| **6) Reference Books:** | |
| 1 | Data Structures and Algorithms in C++, Goodritch, Tamassia, Mount, WILEY. |
| 2 | Data Structures using C, Reema Thareja , OXFORD. |
| 3 | Data Structures and Algorithm Analysis in C, Mark A. Weiss, Pearson. |
| 4 | Optimization Algorithms and Applications, By Rajesh Kumar Arora by Chapman and Hall |

Department of Information Technology Syllabus for Undergraduate Programme

| **7) Internal Assessment:**  Assessment consists of one )Mid Term Test of 20 marks and Continuous Assessment of 20 marks.(Total 40  Mid Term test is to be conducted when approx. 50% syllabus is completed Duration of the midterm test shall be one hour.  **8) Continuous Assessment:-**  Continuous Assessment **is of 20 marks.** The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:-  **Sr.no Rubrics Marks** 1. \*Certificate course for 4 weeks or more:-  10 marks  NPTEL/ Coursera/ Udemy/any MOOC  2. GATE Based Assignment test/Tutorials etc 10 marks  3. Participation in event/workshop/talk / competition  5 marks  followed by small report and certificate of  participation relevant to the subject(in other  institutes)  4. Multiple Choice Questions (Quiz) 5 marks |
| --- |

**\***For sr.no.1, the date of certification exam should be within the term and in case a student is unable to complete the certification , the grading has to be done accordingly. **9)Rubrics for slow learners:-**

1.) Case study, Presentation, group discussion, technical debate on recent trends in the said course (10 marks)

2. Project based Learning and evaluation / Extra assignment / Question paper solution (10 marks)

3) Multiple Choice Questions (Quiz) (5marks)

4) Literature review of papers/journals (5 marks)

5) Library related work (5 marks)

**10)Rubrics for Indirect Assessment :-**

Department of Information Technology Syllabus for Undergraduate Programme

1. Mock Viva/Practical

2. Skill Enhancement Lecture

3. Extra Assignments/lab/lecture

| **11)End Semester Theory Examination:** | |
| --- | --- |
| 1 | Question paper will be of 60 marks |
| 2 | Question paper will comprise a total of five questions |
| 3 | All question carry 20 marks |
| 4 | Any three questions out of five needs to be solved. |

Department of Information Technology Syllabus for Undergraduate Programme

| **Lab Code** | **Lab Name** | **Credit** |
| --- | --- | --- |
| **ITL501** | **IP Lab** | **1** |

| **1)Prerequisite:** | |
| --- | --- |
| **2) Lab Objectives:** The course aims: | |
| 1 | To orient students to HTML for making webpages |
| 2 | To orient students to HTML for making webpages |
| 3 | To expose students to developing responsive layout |
| 4 | To expose students to developing responsive layout |
| 5 | To expose students to developing responsive layout |
| 6 | To orient students to Node.js for developing backend applications |
| **3) Lab Outcomes:** On successful completion, of course, learner/student will be able to: | |
| 1 | Identify and apply the appropriate HTML tags to develop a webpage. |
| 2 | Identify and apply the appropriate CSS tags to format data on webpage |
| 3 | Identify and apply the appropriate CSS tags to format data on webpage |
| 4 | Use JavaScript to develop interactive web pages. |
| 5 | Construct front end applications using React |
| 6 | Construct back end applications using Node.js/Express |

| **4)Suggested Experiments: (minimum number of experiments to be completed can be specified)** |
| --- |
|  |

Department of Information Technology Syllabus for Undergraduate Programme

| **Sr. No.** | **Name of the Experiment** |
| --- | --- |
| 1 | Experiment to study basics of HTML5 and basic tags of HTML5. |
| 2 | Experiment to study Advanced tags of HTML5 . |
| 3 | Experiment to study basics of CSS. |
| 4 | Experiment to study advanced features supported by CSS3. |
| 5 | Experiment to study the basics of Java Script. |
| 6 | Experiment to study Advanced JavaScript concepts. |
| 7 | Experiment to study basics of Bootstrap. |
| 8 | Experiment to study the basics of React. |
| 9 | Experiment to study the Advanced React. |
| 10 | Experiment to study basics of Node JS. |
| 11 | Experiment to study basics of Express JS. |

| **5) Useful Links:** | |
| --- | --- |
| 1 | https://www.nptel.ac.in |
| 2 | https://www.tutorialspoint.com |
| 3 | https://nodejs.dev/learn |
| 4 | https://www.udemy.com/ |

| **6) Term Work:** | |
| --- | --- |
| 1 | Term Work shall consist of at least 12 Practical’s based on the above |

~~Department of Information Technology Syllabus for Undergraduate Programme~~

|  | list. Also, Term work Journal must include at least 2 assignments:  Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5  Marks (Attendance) |
| --- | --- |
| **7) Continuous assessment exam** | |
| 1 | Experiment submission on time |
| 2 | Explaination/concepts |
| 3 | Algorithm implementation |
| 4 | Analysis |
| 5 | Performance/Documentation |

Department of Information Technology Syllabus for Undergraduate Programme

| **Lab Code** | **Lab Name** | **Credit** |
| --- | --- | --- |
| ITL502 | Security  Lab | **1** |

| **1)Prerequisite: The Lab experiments aims:** | |
| --- | --- |
| **2)Lab Objectives:** | |
| 1 | To apply the knowledge of symmetric cryptography to implement classical ciphers. |
| 2 | To analyze and implement public key encryption algorithms, hashing and digital signature algorithms. |
| 3 | To explore the different network reconnaissance tools to gather information about networks. |
| 4 | To explore the tools like sniffers, port scanners and other related tools for analyzing. |
| 5 | To Scan the network for vulnerabilities and simulate attacks. |
| 6 | To set up intrusion detection systems using open-source technologies and to explore email security. |
| **3)Lab Outcomes: On successful completion, of course, learner/student will be able to:** | |
| 1 | Illustrate symmetric cryptography by implementing classical ciphers. |
| 2 | Demonstrate Key management, distribution and user authentication. |
| 3 | Explore the different network reconnaissance tools to gather information about networks. |
| 4 | Use tools like sniffers, port scanners and other related tools for analyzing packets in a network. |

Department of Information Technology Syllabus for Undergraduate Programme

| 5 | Use open-source tools to scan the network for vulnerabilities and simulate attacks. |
| --- | --- |
| 6 | Demonstrate the network security system using open source tools. |

| **4)Suggested Experiments: (minimum number of experiments to be completed can be specified)** | |
| --- | --- |
|  | |
| **Sr. No.** | **Name of the Experiment** |
| 1 | Breaking the Mono-alphabetic Substitution Cipher using Frequency analysis method. |
| 2 | Design and Implement a product cipher using Substitution ciphers. |
| 3 | Cryptanalysis or decoding Playfair, vigenere cipher. |
| 4 | Encrypt long messages using various modes of operation using AES or DES. |
| 5 | Cryptographic Hash Functions and Applications (HMAC): to understand the need, design and applications of collision resistant hash functions. |
| 6 | Implementation and analysis of RSA cryptosystem and Digital signature scheme using RSA. |
| 7 | Study the use of network reconnaissance tools like WHOIS, dig, traceroute, nslookup to gather information about networks and domain registrars. |
| 8 | Study of packet sniffer tools wireshark: -  a. Observer performance in promiscuous as well as non promiscuous mode.  b. Show the packets can be traced based on different filters. |
| 9 | Download, install nmap and use it with different options to scan open ports, perform OS fingerprinting, ping scan, tcp port scan, udp port scan, etc. |

Department of Information Technology Syllabus for Undergraduate Programme

| 10 | Study of malicious software using different tools: a) Keylogger attack using a keylogger tool.  b) Simulate DOS attack using Hping or other tools c) Use the NESSUS/ISO Kali Linux tool to scan the network for vulnerabilities. |
| --- | --- |
| 11 | Study of Network security by  a) Set up IPSec under Linux.  b) Set up Snort and study the logs.  c) Explore the GPG tool to implement email security |

| **5)Useful Links:** | |
| --- | --- |
| 1 | IITB virtual Lab: http://cse29-iiith.vlabs.ac.in/ |
| 2 | https://www.dcode.fr/en |

| **6)Term Work:** | |
| --- | --- |
| 1 | Term Work shall consist of at least 10 Practical based on the above list. Also, Term work Journal must include at least 2 assignments:  Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5  Marks (Attendance) |
| **7)Continuous assessment exam** | |
| 1. | Timely Submission of Experiments weekwise |
| 2. | Explanation/concept: |
| 3. | Algorithm/implementation: |
| 4. | Analysis: |

Department of Information Technology Syllabus for Undergraduate Programme

| 5. | Documentation/Performance: |
| --- | --- |

Department of Information Technology Syllabus for Undergraduate Programme

| **Lab Code** | **Lab Name** | **Credit** |
| --- | --- | --- |
| ITL503 | **DevOps** | **1** |

| **1)Prerequisite: The Lab experiments aims:** | |
| --- | --- |
| **2)Lab Objectives:** | |
| 1 | To understand DevOps practices which aims to simplify Software Development Life Cycle |
| 2 | To be aware of different Version Control tools like GIT, CVS or Mercurial |
| 3 | To Integrate and deploy tools like Jenkins and Maven, which is used to build, test and deploy applications in DevOps environment |
| 4 | To be familiarized with selenium tool, which is used for continuous testing of applications deployed. |
| 5 | To use Docker to Build, ship and manage applications using containerization |
| 6 | To understand the concept of Infrastructure as a code and install & configure Ansible/Puppet tool. |
| **3)Lab Outcomes: On successful completion, of course, learner/student will be able to:** | |
| 1 | To understand the fundamentals of DevOps engineering and be fully proficient with DevOps terminologies, concepts, benefits, and deployment options to meet your business requirements |
| 2 | To obtain complete knowledge of the “version control system” to effectively track changes augmented with Git and GitHub |
| 3 | To understand the importance of Jenkins to Build and deploy Software Applications on server environment |

Department of Information Technology Syllabus for Undergraduate Programme

| 4 | Understand the importance of Selenium and Jenkins to test Software Applications |
| --- | --- |
| 5 | To understand concept of containerization and Analyze the Containerization of OS images and deployment of applications over Docker |
| 6 | To Synthesize software configuration and provisioning using Ansible/Puppet. |

| **Sr.**  **No.** | **Module** | **Detailed Content** | **Hour s** | **LO**  **Mappin g** |
| --- | --- | --- | --- | --- |
| 0 | Prerequisite | Knowledge of Linux Operating system, installation and configuration of services and command line basics,  Basics of Computer  Networks and Software  Development Life cycle. | **00** | LO1 |
| I | Introduction to Devops | Understanding of the process to be followed during the development of an application, from the inception of an idea to its final deployment. Learn about the concept of DevOps and the practices and principles followed to implement it in any company’s software development life cycle.  Learn about the phases of Software Lifecycle. Get familiar with the concept of Minimum Viable Product (MVP) & Cross-functional Teams. Understand why DevOps evolved as a prominent culture in most of the modern-day startups to achieve agility in the software development process | **04** | LO1 |

Department of Information Technology Syllabus for Undergraduate Programme

**Self-Learning Topics: Scrum,**

**Kanban, Agile**

| II | Version  Control | In this module you will learn:  • GIT Installation, Version  Control, Working with remote  repository  • GIT Cheat sheet  • Create and fork repositories in GitHub  • Apply branching, merging and rebasing concepts.  • Implement different Git  workflow strategies in real-time scenarios  • Understand Git operations in IDE  **Self-Learning Topics: AWS**  **Codecommit, Mercurial,**  **Subversion, Bitbucket, CVS** | **04** | LO1 & LO2 |
| --- | --- | --- | --- | --- |
| III | Continuous Integration  using Jenkins | In this module, you will know how to perform Continuous Integration using Jenkins by building and automating test cases using Maven / Gradle / Ant.  • Introduction to Jenkins (With Architecture)  • Introduction to Maven / Gradle / Ant.  • Jenkins Management Adding a slave node to Jenkins  • Build the pipeline of jobs using Maven / Gradle / Ant in Jenkins, create a pipeline script to deploy an application over the tomcat  server  **Self-Learning Topics: Travis CI, Bamboo, GitLab, AWS CodePipeline** | **04** | LO1 & LO3 |

Department of Information Technology Syllabus for Undergraduate Programme

IV Continuous Testing with

Selenium

In this module, you will learn about selenium and how to automate your test cases for testing web elements. You will also get introduced to X-Path, TestNG and integrate Selenium with Jenkins and Maven.

• Introduction to Selenium

• Installing Selenium

• Creating Test Cases in Selenium WebDriver

• Run Selenium Tests in Jenkins Using Maven

**Self-Learning Topics: Junit, Cucumber**

**04** LO1 , LO4

| V | Continuous Deployment: Containerizati on with  Docker | In this module, you will be introduced to the core concepts and technology behind Docker. Learn in detail about container and various operations performed on it.  • Introduction to Docker  Architecture and Container Life Cycle  • Understanding images and  containers  • Create and Implement docker images using Dockerfile.  • Container Lifecycle and working with containers.  • To Build, deploy and manage web or software application on Docker Engine.  • Publishing image on Docker Hub.  **Self-Learning Topics: Docker Compose, Docker Swarm.** | **05** | LO1 & LO5 |
| --- | --- | --- | --- | --- |

Department of Information Technology Syllabus for Undergraduate Programme

VI Continuous Deployment:

Configuration

Management

with Puppet

**Text books**

In this module, you will learn to Build and operate a scalable automation system.

• Puppet/Ansible Architecture • Puppet/Ansible Master Slave Communication

• Puppet/Ansible Blocks

• Installation and Configuring Puppet/Ansible Master and Agent on Linux machines.

**Self-Learning Topics:Saltstack**

**05** LO1 & LO6

1. DevOps Bootcamp, Sybgen Learning

2. Karl Matthias & Sean P. Kane, Docker: Up and Running, O'Reilly Publication. 3. Len Bass, Ingo Weber, Liming Zhu, “DevOps, A Software Architects Perspective”, Addison Wesley Pearson Publication.

4. John Ferguson Smart,” Jenkins, The Definitive Guide”, O'Reilly Publication. 5. “Mastering Puppet 5: Optimize enterprise-grade environment performance with Puppet”, by Ryan Russell Yates Packt Publishing (September 29, 2018)

**References:**

1. Sanjeev Sharma and Bernie Coyne,” DevOps for Dummies”, Wiley Publication 2. Httermann, Michael, “DevOps for Developers”, Apress Publication. 3. Joakim Verona, “Practical DevOps”, Pack publication

4. Puppet 5 Essentials - Third Edition: A fast-paced guide to automating your infrastructure by Martin Alfke Packt Publishing; 3rd Revised edition (September 13, 2017)

Department of Information Technology Syllabus for Undergraduate Programme

| **Sr. No.** | **Name of the Experiment** |
| --- | --- |
| 1 | Case study on real world: To understand DevOps: Principles, Practices, and DevOps Engineer Role and Responsibilities. |
| 2 | To understand Version Control System / Source Code Management, install git and create a GitHub account. |
| 3 | To Perform various GIT operations on local and Remote repositories using GIT Cheat-Sheet |
| 4 | Advanced git commands |
| 5 | To understand Continuous Integration, install and configure Jenkins with Maven/Ant/Gradle to setup a build Job. |
| 6 | To Build the pipeline of jobs using Maven / Gradle / Ant in Jenkins, create a pipeline script to Test and deploy an application over the tomcat server. |
| 7 | To understand Jenkins Master-Slave Architecture and scale your Jenkins standalone implementation by implementing slave nodes. |
| 8 | To Setup and Run Selenium Tests in Jenkins Using Maven. |
| 9 | To understand Docker Architecture and Container Life Cycle, install Docker and execute docker commands to manage images and interact with containers. |
| 10 | To learn Dockerfile instructions, build an image for a sample web application using Dockerfile. |
| 11 | Docker Compose – multi container tool |
| 12 | To install and Configure Pull based Software Configuration Management and provisioning tools using Puppet/Ansible. |
| 13 | To learn Software Configuration Management and provisioning using Puppet/Ansible Blocks(Manifest, Modules, Classes, Function) |
| 14 | To provision a LAMP/MEAN Stack using Puppet/Ansible Manifest. |

Department of Information Technology Syllabus for Undergraduate Programme

| **5)Useful Links:** | |  |
| --- | --- | --- |
| 1. DevOps Bootcamp, Sybgen Learning  2. Len Bass, Ingo Weber, Liming Zhu, “DevOps, A  Software Architects Perspective”, Addison Wesley  Pearson Publication.  3. https://devops.com/  4. http://git-scm.com/  5. https://github.com/  6. https://education.github.com/git-cheat-sheet  education.pdf  7. John Ferguson Smart,” Jenkins, The Definitive Guide”, O'Reilly Publication.  8. https://www.jenkins.io/  9. https://www.jenkins.io/doc/developer/publishing/continuo us-integration/#ji-toolbar  10.https://www.jenkins.io/doc/book/security/  11.https://www.selenium.dev/  12.Karl Matthias & Sean P. Kane, Docker: Up and Running, O'Reilly Publication.  13.https://www.docker.com/  14.https://github.com/docker  15.https://docs.docker.com/compose/  16.https://docs.docker.com/samples/django/  17.https://docs.docker.com/engine/swarm/  18.“Mastering Puppet 5: Optimize enterprise-grade  environment performance with Puppet”, by Ryan Russell Yates Packt Publishing (September 29, 2018)  19.https://puppet.com/ | |  |
| **6)Term Work:** | | |
| 1 | Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance) | |
| **7) Continuous assessment exam** | | |

Department of Information Technology Syllabus for Undergraduate Programme

| 1. | Timely Submission of Experiments weekwise |
| --- | --- |
| 2. | Explanation/concept: |
| 3. | Algorithm/implementation: |
| 4. | Analysis: |
| 5. | Documentation/Performance: |

Department of Information Technology Syllabus for Undergraduate Programme

| **Lab Code** | **Lab Name** | **Credit** |
| --- | --- | --- |
| ITL504 | **Adv. DevOps** | **1** |

| **1)Prerequisite: The Lab experiments aims:** | |
| --- | --- |
| **2)Lab Objectives:** | |
| 1 | To understand DevOps practices and cloud native environments to achieve continuous software  delivery pipelines and automated operations that address the gap between IT resources and growing  cloud complexity. |
| 2 | To Use Kubernetes services to structure N-tier applications |
| 3 | To be familiarized with Infrastructure as code for provisioning, compliance, and management of  any cloud infrastructure, and service. |
| 4 | To understand that security and speed in software development are not inversely-related objectives  Internalizing the contribution of tools and automation in DevSecOps |
| 5 | To understand various troubleshooting techniques by monitoring your entire infrastructure and  business processes |
| 6 | To understand how software and software-defined hardware are provisioned dynamically. |
| **3)Lab Outcomes: On successful completion, of course, learner/student will be able to:** | |
| 1 | To understand the fundamentals of Cloud Computing and be fully proficient with Cloud based DevOps solution deployment options to meet your business requirement |

Department of Information Technology Syllabus for Undergraduate Programme

| 2 | To deploy single and multiple container applications and manage application deployments with rollouts in Kubernetes |
| --- | --- |
| 3 | To apply best practices for managing infrastructure as code environments and use terraform to define and deploy cloud |
| 4 | To identify and remediate application vulnerabilities earlier and help integrate security in the development process using SAST Techniques. |
| 5 | To use Continuous Monitoring Tools to resolve any system errors (low memory, unreachable server etc.) before they have any negative impact on the business productivity |
| 6 | To engineer a composition of nano services using AWS Lambda and Step Functions with the Serverless Framework |

| **Sr.**  **No.** | **Module** | **Detailed Content** | **Hour s** | **LO**  **Mappin g** |
| --- | --- | --- | --- | --- |
| 0 | Prerequisite | Knowledge of Linux Operating system, installation  and configuration of services and command line  basics, Basics of Computer Networks, Software  Development Life cycle, Cloud Computing and  DevOps Ecosystem. | **02** |  |

Department of Information Technology Syllabus for Undergraduate Programme

I Introduction to

Devops on

Cloud

**04** LO1

Learn about various cloud services and

service

providers, also get the brief idea of how to implement

DevOps over Cloud Platforms.

Introduction to high availability

architecture

and auto-scaling

Set up the DevOps infrastructure on the cloud

Work and set up IDE on Cloud9

Deploy projects on AWS using Code

Build,

CodeDeploy, and CodePipeline

Self-Learning Topics: AWS Codestar

| II | Container  Orchestration using  Kubernetes | In this module, you will learn how Kubernetes automates many of the manual  processes involved in deploying, managing, and scaling containerized applications.  Install and configure Kubernetes Spin Up a Kubernetes Cluster  Check the Nodes of Your Kubernetes Cluster  Installing kubectl to manage cluster and deploy Your  First Kubernetes Application  Self-Learning Topics:  Using Services and Ingresses to Expose Deployments  Perform logging, monitoring, services, and  volumes in Kubernetes. | 04 | LO1,  LO2 |
| --- | --- | --- | --- | --- |

Department of Information Technology Syllabus for Undergraduate Programme

| III | Infrastructure Automation with  Terraform | In this module you will learn,  Infrastructure as code  for provisioning, compliance, and management of any  cloud infrastructure, and service. Introduction to Infrastructure as Code with Terraform  Install, Build, change and Destroy Infrastructure using Terraform.  Self-Learning Topics:  Terraform  Create Resource Dependencies  Provision Infrastructure  Define Input Variables, Query Data with output and store remote state | **04** | LO1,LO 3 |
| --- | --- | --- | --- | --- |
| IV | DevSecOps: Static  Application Security  Testing  (SAST) | In this module, you will learn to identify and remediate application vulnerabilities earlier and help integrate security in the  development process using tools like SonarQube / Gitlab /  Perform static analysis on application source code and binaries. Spot potential vulnerabilities before deployment Analysis of java / web-based project Jenkins SonarQube / Gitlab Integration Self-Learning Topics: Snyk, OWASP | **04** | LO1,LO 4 |

Department of Information Technology Syllabus for Undergraduate Programme

ZAP, Analysis Core Plugin

| V | DevSecOps: Continuous  Monitoring | In this module, you will learn to detect, report, respond to the attacks and issues which occur within the infrastructure. Introduction to Continuous Monitoring Introduction to Nagios  Installing Nagios  Nagios Plugins (NRPE) and Objects Nagios  Commands and Notification  Monitoring of different servers using Nagios  Self-Learning Topics: Splunk, Snort, Tenable | **04** | LO1,LO 6 |
| --- | --- | --- | --- | --- |
| VI | NoOps:  Serverless  Computing | In this module, you will learn serverless computing platform like AWS Lambda, which allows you to build your code and  deploy it without ever needing to configure  or manage underlying servers.  AWS Lambda - Overview and  Environment  Setup  Building and Configuring the Lambda function (NODEJS/PYTHON/JAVA) Creating & Deploying using AWS Console/CLI  Creating & Deploying using Serverless Framework  Self-Learning Topics: AWS Lambda Create a REST API with the Serverless | **04** | LO1,LO 6 |

Department of Information Technology Syllabus for Undergraduate Programme

Framework

**Text books**

1. 1. AWS Certified SysOps Administrator Official Study Guide: Associate Exam by Stephen Cole (Author), Gareth Digby (Author), Chris Fitch (Author), Steve Friedberg (Author), Shaun Qual

2. AWS Certified Solutions Architect Official Study Guide: Associate Exam by Joe Baron

3. Terraform: Up & Running - Writing Infrastructure as Code, Second Edition by Yevgeniy Brikman , O'Reilly

4. Kubernetes: Up and Running - Dive into the Future of Infrastructure, Second Editionby Brendan Burns,O'Reilly

5. Going Serverless with AWS Lambda: Leveraging the latest services from the AWS cloud by Ajay Pherwani , Shroff/X-Team;

6. Learning Nagios, Packt Publishing.

**References:**

1. Learning Aws - Second Edition: Design, build, and deploy responsive applications using AWS by Amit Shah Aurobindo Sarkar

2. Mastering Aws Lambda by Yohan Wadia Udita Gupta

Department of Information Technology Syllabus for Undergraduate Programme

| **Sr. No.** | **Name of the Experiment** |
| --- | --- |
| 1 | To understand the benefits of Cloud Infrastructure and Setup AWS Cloud9 IDE, Launch AWS  Cloud9 IDE and Perform Collaboration Demonstration. |
| 2 | To Build Your Application using AWS CodeBuild and Deploy on S3 / SEBS using AWS  CodePipeline, deploy Sample Application on EC2 instance using AWS CodeDeploy. |
| 3 | To understand the Kubernetes Cluster Architecture, install and Spin Up a Kubernetes Cluster on  Linux Machines/Cloud Platforms |
| 4 | To install Kubectl and execute Kubectl commands to manage the Kubernetes cluster and deploy  Your First Kubernetes Application. |
| 5 | To understand terraform lifecycle, core  concepts/terminologies and install it on a Linux Machine |
| 6 | To Build, change, and destroy AWS / GCP /Microsoft Azure/ DigitalOcean infrastructure Using  Terraform |
| 7 | To understand Static Analysis SAST process and learn to integrate Jenkins SAST to  SonarQube/GitLab. |
| 8 | Create a Jenkins CICD Pipeline with SonarQube / GitLab Integration to perform a static analysis  of the code to detect bugs, code smells, and security vulnerabilities on a sample Web / Java /  Python application |
| 9 | To Understand Continuous monitoring and Installation and configuration of Nagios Core,  Nagios Plugins and NRPE (Nagios Remote Plugin Executor) on Linux Machine. |
| 10 | To perform Port, Service monitoring, Windows/Linux server monitoring using Nagios. |

Department of Information Technology Syllabus for Undergraduate Programme

| 11 | To understand AWS Lambda, its workflow, various functions and create your first Lambda  functions using Python / Java / Nodejs. |
| --- | --- |
| 12 | To create a Lambda function which will log “An Image has been added” once you add an  object to a specific bucket in S3. |

| **5)Useful Links:** |
| --- |
| 1. DevOps Bootcamp, Sybgen Learning  2. Len Bass, Ingo Weber, Liming Zhu, “DevOps, A  Software Architects Perspective”, Addison Wesley  Pearson Publication.  3. https://devops.com/  4. http://git-scm.com/  5. https://github.com/  6. https://education.github.com/git-cheat-sheet  education.pdf  7. John Ferguson Smart,” Jenkins, The Definitive Guide”, O'Reilly Publication.  8. https://www.jenkins.io/  9. https://www.jenkins.io/doc/developer/publishing/continuo us-integration/#ji-toolbar  10.https://www.jenkins.io/doc/book/security/  11.https://www.selenium.dev/  12.Karl Matthias & Sean P. Kane, Docker: Up and Running, O'Reilly Publication.  13.https://www.docker.com/  14.https://github.com/docker  15.https://docs.docker.com/compose/  16.https://docs.docker.com/samples/django/  17.https://docs.docker.com/engine/swarm/  18.“Mastering Puppet 5: Optimize enterprise-grade  environment performance with Puppet”, by Ryan Russell Yates Packt Publishing (September 29, 2018)  19.https://puppet.com/ |

Department of Information Technology Syllabus for Undergraduate Programme

|  |
| --- |

| **6)Term Work:** | |
| --- | --- |
| 1 | Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance) |
| **7) Continuous assessment exam** | |
| 1. | Timely Submission of Experiments weekwise |
| 2. | Explanation/concept: |
| 3. | Algorithm/implementation: |
| 4. | Analysis: |
| 5. | Documentation/Performance: |

Department of Information Technology Syllabus for Undergraduate Programme

| **Course Code:** | **Course Title** | **Credit** |
| --- | --- | --- |
| ITL505 | Professional  Communication &  Ethics-II (PCE-II) | 02 |
| **1)Prerequisite:** | |  |
| **2)Course Objectives:** | |  |
| 1 | To discern and develop an effective style of writing important technical/business documents |  |
| 2 | To investigate possible resources and plan a successful job campaign. |  |
| 3 | To understand the dynamics of professional communication in the form of group  discussions, meetings, etc. required for career enhancement. |  |
| 4 | To develop creative and impactful presentation skills. |  |
| 5 | To analyze personal traits, interests, values, aptitudes and skills. |  |
| **6** | To d To understand the importance of integrity and develop a personal code of ethics.To discern and develop an effectlop a personal code of ethics. |  |
| **3)Course Outcomes:** | |  |
| 1 | plan and prepare effective business/ technical documents which will in turn |  |
| 2 | provide solid foundation for their future managerial roles. |  |
| 3 | strategize their personal and professional skills to build a professional image and meet the demands of the industry. |  |

Department of Information Technology Syllabus for Undergraduate Programme

|  |  |
| --- | --- |
| 4 | emerge successful in group discussions, meetings and result-oriented agreeable solutions in group communication situations. |
| 5 | develop creative thinking and interpersonal skills required for effective professional  communication. |
| **6** | apply codes of ethical conduct, personal integrity and norms of organizational behaviour. |

**4) syllabus**

| **Module** |  | **Content** | **Hrs** |
| --- | --- | --- | --- |
| Module 1 |  | **ADVANCED TECHNICAL WRITING**  **:PROJECT/PROBLEM**  **BASED LEARNING (PBL):**  1.1 Purpose and Classification of Reports:  Classification on the basis of:  Subject Matter (Technology, Accounting, Finance, Marketing, etc.)  Time Interval (Periodic, One-time, Special)  Function (Informational, Analytical, etc.)  Physical Factors (Memorandum, Letter, Short & Long) 1.2. Parts of a Long Formal Report:  Prefatory Parts (Front Matter)  Report Proper (Main Body)  Appended Parts (Back Matter)  1.3. Language and Style of Reports  Tense, Person & Voice of Reports  Numbering Style of Chapters, Sections, Figures, Tables and Equations  Referencing Styles in APA & MLA Format  Proofreading through Plagiarism Checkers  1.4. Definition, Purpose & Types of Proposals Solicited (in conformance with RFP) & Unsolicited | 06 |

Department of Information Technology Syllabus for Undergraduate Programme

|  |  | Proposals  Types (Short and Long proposals)  1.5. Parts of a Proposal  Elements  Scope and Limitations  Conclusion  1.6. Technical Paper Writing  Parts of a Technical Paper (Abstract, Introduction, Research Methods, Findings and Analysis, Discussion, Limitations,  Future Scope and References)  Language and Formatting  Referencing in IEEE Format |  |
| --- | --- | --- | --- |
| Module 2 |  | EMPLOYMENT SKILLS  2.1. Cover Letter & Resume  Parts and Content of a Cover Letter  Difference between Bio-data, Resume & CV  Essential Parts of a Resume  Types of Resume (Chronological, Functional & Combination)  2.2 Statement of Purpose  Importance of SOP  Tips for Writing an Effective SOP  2.3 Verbal Aptitude Test  Modelled on CAT, GRE, GMAT exams  2.4. Group Discussions  Purpose of a GD  Parameters of Evaluating a GD  Types of GDs (Normal, Case-based & Role Plays) GD Etiquettes  2.5. Personal Interviews  Planning and Preparation  Types of Questions  Types of Interviews (Structured, Stress, Behavioural, Problem  Solving & Case-based)  Modes of Interviews: Face-to-face (One-to one and Panel)  Telephonic, Virtual | 06 |

Department of Information Technology Syllabus for Undergraduate Programme

| Module 3 |  | **BUSINESS MEETINGS**  1.1. Conducting Business Meetings  Types of Meetings  Roles and Responsibilities of Chairperson, Secretary and Members  Meeting Etiquette  3.2. Documentation  Notice  Agenda  Minutes | 02 |
| --- | --- | --- | --- |
| Module 4 |  | **TECHNICAL/ BUSINESS PRESENTATIONS** 1.1 Effective Presentation Strategies  Defining Purpose  Analyzing Audience, Location and Event  Gathering, Selecting &Arranging Material  Structuring a Presentation  Making Effective Slides  Types of Presentations Aids  Closing a Presentation  Platform skills  1.2 Group Presentations  Sharing Responsibility in a Team  Building the contents and visuals together  Transition Phases | 0  2 |
| Module 5 |  | **INTERPERSONAL SKILLS**  1.1. Interpersonal Skills  Emotional Intelligence  Leadership & Motivation  Conflict Management & Negotiation  Time Management  Assertiveness  Decision Making  5.2 Start-up Skills  Financial Literacy  Risk Assessment  Data Analysis (e.g. Consumer Behaviour, Market Trends, etc.) | 0  8 |
| Module |  | **CORPORATE ETHICS** | 0 |

Department of Information Technology Syllabus for Undergraduate Programme

| 6 |  | 6.1Intellectual Property Rights  Copyrights  Trademarks  Patents  Industrial Designs  Geographical Indications  Integrated Circuits  Trade Secrets (Undisclosed Information)  6.2 Case Studies  Cases related to Business/ Corporate Ethics | 2 |
| --- | --- | --- | --- |
|  |  | **Total** |  |

Department of Information Technology Syllabus for Undergraduate Programme

| **5) Textbooks & refrence boos** | |
| --- | --- |
| 1 | Arms, V. M. (2005). Humanities for the engineering curriculum: With selected chapters from Olsen/Huckin: Technical writing and professional communication, second edition. Boston, MA: McGrawHill. |
| 2 | Bovée, C. L., &Thill, J. V. (2021). Business communication today. Upper Saddle River, NJ: Pearson. |
| 3 | . Butterfield, J. (2017). Verbal communication: Soft skills for a digital workplace. Boston, MA: Cengage  Learning. |
|  | |
| 4 | 4. Masters, L. A., Wallace, H. R., & Harwood, L. (2011).Personal development for life and work. Mason: South-Western Cengage Learning. |
| 5 | . Robbins, S. P., Judge, T. A., & Campbell, T. T. (2017). Organizational behaviour. Harlow, England: Pearson.  Press |

Department of Information Technology Syllabus for Undergraduate Programme

**7) Internal Assessment:**

**Term Work:**

Term work shall consist of minimum 8 experiments.

The distribution of marks for term work shall be as follows:

Assignment : 10 Marks

Attendance : 5 Marks

Presentation slides : 5 Marks

Book Report (hard copy) : 5 Marks

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work

and minimum passing in the term work

| **Sr.no** | **Rubrics** | **Marks** |
| --- | --- | --- |
| 1. | \*Certificate course for 4 weeks or more:- NPTEL/ Coursera/ Udemy/any MOOC | 10 marks |
| 2. | Wins in the event/competition/hackathon | 10 marks |
| 3. | Content beyond syllabus presentation | 10 marks |
| 4. | Creating Proof of concept | 10 marks |
| 5. | Mini Project / Extra Experiments/ Virtual Lab | 10 marks |
| 6. | GATE Based Assignment test/Tutorials etc | 10 marks |
| 7. | Participation in event/workshop/talk / competition followed by small report and certificate of participation relevant to the subject(in other institutes) | 5 marks |
| 8. | Multiple Choice Questions (Quiz) | 5 marks |

**\***For sr.no.1, the date of certification exam should be within the term and in case a student is unable to complete the certification , the grading has to be done accordingly.

**9)Rubrics for slow learners:-**

1.) Case study, Presentation, group discussion, technical debate on recent trends in the said course (10 marks)

2. Project based Learning and evaluation / Extra assignment / Question paper

Department of Information Technology Syllabus for Undergraduate Programme

solution (10 marks)

3) Multiple Choice Questions (Quiz) (5marks) 4) Literature review of papers/journals (5 marks) 5) Library related work (5 marks)

Department of Information Technology Syllabus for Undergraduate Programme

| **Course Code:** ITM501 | **Course Title :**  **Mini Project – 2 A Web Based Business Model** | **Credit** |
| --- | --- | --- |
| Currently same | **Mini Project – 1 A for Front end /backend Application using JAVA** |  |
| **1)Prerequisite:** | |  |
| **2)Course Objectives:**  The course aims: | |  |
| 1 | To acquaint with the process of identifying the needs and converting it into the problem. |  |
| 2 | To familiarize the process of solving the problem in a group. |  |
| 3 | To acquaint with the process of applying basic engineering fundamentals to attempt solutions to the problems. |  |
| 4 | To inculcate the process of self-learning and research. |  |
| **3)Course Outcomes:**  On successful completion, of course, learner/student will be able to: | |  |
| 1 | Identify problems based on societal /research needs. |  |
| 2 | Apply Knowledge and skill to solve societal problems in a group. |  |
| 3 | Develop interpersonal skills to work as member of a group or leader |  |
| 4 | Draw the proper inferences from available results through theoretical/ experimental/simulations. |  |
| 5 | Analyse the impact of solutions in societal and environmental context for sustainable development. |  |
| 6 | Use standard norms of engineering practices. |  |
| 7 | Excel in written and oral communication. |  |

Department of Information Technology Syllabus for Undergraduate Programme

| 8 | Demonstrate capabilities of self-learning in a group, which leads to life long learning. |
| --- | --- |
| 9 | Demonstrate project management principles during project work. |

**4) Guidelines for Mini Project**

| ∙ Students shall form a group of 3 to 4 students, while forming a group shall not be allowed less than three or more than four students, as it is a group activity. ∙ Students should do survey and identify needs, which shall be converted into problem statement for mini project in consultation with faculty supervisor/head of department/internal committee of nfaculties.  ∙ Students hall submit implementation plan in the form of Gantt/PERT/CPM chart, which will cover weekly activity of mini project.  ∙ A log book to be prepared by each group, wherein group can record weekly work progress,guide/supervisor can verify and record notes/comments. ∙ Faculty supervisor may give inputs to students during mini project activity; however, focus shall be on self-learning.  ∙ Students in a group shall understand problem effectively, propose multiple solution and select best possible solution in consultation with guide/ supervisor.  ∙ Students shall convert the best solution into working model using various components of their domain areas and demonstrate.  ∙ The solution to be validated with proper justification and report to be compiled in standard format of University of Mumbai.  ∙ With the focus on the self-learning, innovation, addressing societal problems and entrepreneurship quality development within the students through the Mini Projects, it is preferable that a single project of appropriate level and quality to be carried out in two semesters by all the groups of the students. i.e. Mini Project 1 in semester III and IV. Similarly, Mini Project 2 in semesters V and VI.  ∙ However, based on the individual students or group capability, with the mentor’s recommendations, if the proposed Mini Project adhering to the qualitative aspects mentioned above gets completed in odd semester, then that group can be allowed to work on the extension of the Mini Project with suitable improvements/modifications or a completely new project idea in even semester. This policy can be adopted on case by case basis. |
| --- |

Department of Information Technology Syllabus for Undergraduate Programme

**5) Guidelines for Assessment of Mini Project:**

**Term Work**

| ∙ The review/ progress monitoring committee shall be constituted by head of departments of each institute. The progress of mini project to be evaluated on continuous basis, minimum two reviews in each semester.  ∙ In continuous assessment focus shall also be on each individual student, assessment based on individual’s contribution in group activity, their understanding and response to questions.  ∙ Distribution of Term work marks for both semesters shall be as below; o Marks awarded by guide/supervisor based on log book : 10  o Marks awarded by review committee : 10  o Quality of Project report : 05 |
| --- |

**6) Review/progress monitoring committee may consider following points for assessment based on either one year or half year project as mentioned in general guidelines.**

**One-year project:**

∙ In first semester entire theoretical solution shall be ready, including components/system selection and cost analysis. Two reviews will be conducted based on presentation given by students group.

o First shall be for finalisation of problem

o Second shall be on finalisation of proposed solution of problem.

∙ In second semester expected work shall be procurement of component’s/systems, building of working prototype, testing and validation of results based on work completed in an earlier semester.

o First review is based on readiness of building working prototype to be

conducted.

o Second review shall be based on poster presentation cum demonstration of working model in last month of the said semester

**Half-year project:**

∙ In this case in one semester students’ group shall complete project in all aspects including,

o Identification of need/problem

o Proposed final solution

o Procurement of components/systems

o Building prototype and testing

∙ Two reviews will be conducted for continuous assessment,

Department of Information Technology Syllabus for Undergraduate Programme

o First shall be for finalisation of problem and proposed solution.

o Second shall be for implementation and testing of solution.

**7) Assessment criteria of Mini Project.**

| Mini Project shall be assessed based on following criteria; | |
| --- | --- |
| 1. | Quality of survey/ need identification |
| 2. | Clarity of Problem definition based on need. |
| 3. | Innovativeness in solutions |
| 4. | Feasibility of proposed problem solutions and selection of best solution |
| 5. | Cost effectiveness |
| 6. | Societal impact |
| 7. | Innovativeness |
| 8. | Cost effectiveness and Societal impact |
| 9. | Full functioning of working model as per stated requirements |
|  | 10. Effective use of skill sets |
|  | 11. Effective use of standard engineering norms |
|  | 12. Contribution of an individual’s as member or leader |
|  | 13. Clarity in written and oral communication |

∙ In **one year project**, first semester evaluation may be based on first six criteria’s and remaining may be used for second semester evaluation of performance of students in mini project.

∙ In **case of half year project** all criteria’s in generic may be considered for evaluation of performance of students in mini project.

**8) Guidelines for Assessment of Mini Project Practical/Oral Examination:**

| ∙ Report should be prepared as per the guidelines issued by the University of Mumbai. |
| --- |

Department of Information Technology Syllabus for Undergraduate Programme

| ∙ Mini Project shall be assessed through a presentation and demonstration of working model by the student project group to a panel of Internal and External Examiners preferably from industry or research organisations having experience of more than five years approved by head of Institution. |
| --- |
| ∙ Students shall be motivated to publish a paper based on the work in Conferences/students competitions. |

**Mini Project shall be assessed based on following points;**

1. Quality of problem and Clarity

2. Innovativeness in solutions

3. Cost effectiveness and Societal impact

4. Full functioning of working model as per stated requirements

5. Effective use of skill sets

6. Effective use of standard engineering norms

7. Contribution of an individual’s as member or leader

8. Clarity in written and oral communication

Department of Information Technology Syllabus for Undergraduate Programme

**Program Structure for Third Year Information Technology**

**Department Scheme for Autonomous Program**

**(With Effect**

**from 2023-2024)**

**Semester VI**

| Course  Code | Course Name | Teaching Scheme (Contact Hours) | | Credits Assigned | | |
| --- | --- | --- | --- | --- | --- | --- |
| Theory | Practical | Theory | Practical | Total |
| ITC601 | Data Mining & Business  Intelligence | 3 | -  - | 3 | -- | 3 |
| ITC602 | Web X.0 | 3 | -  - | 3 |  | 3 |
| ITC603 | Wireless Technology | 3 | -  - | 3 | -- | 3 |
| ITC604 | AI and DS – 1 | 3 | -  - | 3 | -- | 3 |
| **ITDO601 X** | **Department Optional Course – 2** | **3** | **-**  **-** | **3** | **--** | **3** |
| ITL601 | BI Lab | -  - | 2 | -- | 1 | 1 |
| ITL602 | Web Lab | -  - | 2 | -- | 1 | 1 |
| ITL603 | Sensor Lab | -  - | 2 | -- | 1 | 1 |
| ITL604 | MAD & PWA Lab | -  - | 2 | -- | 1 | 1 |
| ITL605 | DS using Python Skill based  Lab | -  - | 2 | -- | 1 | 1 |
| ITM601 | Mini Project – 2 B Based on ML | -  - | 4$ | -- | 2 | 2 |
|  | Total | 15 | 14 | 15 | 07 | 22 |

# Indicates workload of Learner (Not Faculty)

Department of Information Technology Syllabus for Undergraduate Programme

| Course  Code | Course Name | Examination Scheme | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Theory | | | | Term  Work | Pract  & oral | Total |
| Internal Assessment | | End  Sem  Exam | Exam  Duration (Hrs) |  |  |  |
| Mid Test (MT) | CA |  |  |  |  |  |
| ITC601 | Data Mining &  Business Intelligence | 20 | 20 | 40 | 60 | 3 | -  - | -- |
| ITC602 | Web X.0 | 20 | 20 | 40 | 60 | 3 | - | -- |
| ITC603 | Wireless Technology | 20 | 20 | 40 | 60 | 3 | - | -- |
| ITC604 | AI and DS – 1 | 20 | 20 | 40 | 60 | 3 | - | -- |
| **ITDO601 X** | **Department Optional**  **Course – 2** | **20** | **20** | **40** | **60** | **3** | **-** | **--** |
| ITL601 | BI Lab | -- | -- | -- | -- | -- | 25 | 25 |
| ITL602 | Web Lab | -- | -- | -- | -- | -- | 25 | 25 |
| ITL603 | Sensor Lab | -- | -- | -- | -- | -- | 25 | 25 |
| ITL604 | MAD & PWA Lab | -- | -- | -- | -- | -- | 25 | 25 |
| ITL605 | DS using Python Lab  (SBL) | -- | -- | -- | -- | -- | 25 | 25 |
| ITM601 | Mini Project – 2 B Based on ML | -- | -- | -- | -- | -- | 25 | 25 |
|  | Total | 100 | 100 | 200 | 300 | 150 | 150 | 800 |

Department Optional Courses:

| Department Optional Course III (ELDO701) | Department Optional Course IV (ELDO702) |
| --- | --- |
| Software Architecture | Green IT |
| Image Processing | Ethical Hacking and Forensic |

| **Course**  **Code: ITC601** | **Course Title: Data Mining & Business Intelligence** | **Credit** |
| --- | --- | --- |
| Currently same | **Data Mining & Business Intelligence** | 3 |
| **1) Prerequisite: Database Management System** | |  |
| **2) Course Objectives:** | |  |
| 1 | To introduce the concept of data warehouse data Mining as an important tool for enterprise data management and as a cutting-edge technology for building competitive advantage. |  |
| 2 | To enable students to effectively identify sources of data and process it for data mining. |  |
| 3 | To make students well versed in all data mining algorithms, methods of evaluation. |  |
| 4 | To impart knowledge of tools used for data mining. |  |
| 5 | To provide knowledge on how to gather and analyze large sets of data to gain useful business understanding. |  |
| **6** | To impart skills that can enable students to approach business problems analytically identifying opportunities to derive business value from data. |  |
| **3) Course Outcomes:** | |  |
| 1 | Demonstrate an understanding of the importance of data warehousing and data mining and the principles of business intelligence. |  |
| 2 | Organize and prepare the data needed for data mining using pre preprocessing techniques. |  |
| 3 | Perform exploratory analysis of the data to be used for mining. |  |
| 4 | Implement the appropriate data mining methods like classification, clustering or Frequent Pattern mining on large data sets. |  |
| 5 | Define and apply metrics to measure the performance of various data mining algorithms. |  |
| 6 | Apply BI to solve practical problems: Analyze the problem domain, use the data collected in enterprise apply the appropriate data mining technique, interpret and visualize the results and provide decision support. |  |

**4) syllabus**

| **Module**0 |  | **Content** | **Hrs** |
| --- | --- | --- | --- |
| Prerequisite | Basic Knowledge of databases | 1 |
| I | Data  Warehouse  (DWH)  Fundamenta ls with  Introduction to Data  Mining | DWH characteristics, Dimensional modeling:  Star, Snowflakes, OLAP operation, OLTP vs  OLAP  Data Mining as a step in KDD, Kind of patterns  to be mined, Technologies used, Data Mining  applications.  Self-learning Topics: Data Marts, Major issues  in Data Mining. | 4 |
| II | Data  Exploratio  n  and Data  Preprocessi  ng | Types of Attributes, Statistical Description of  Data, Measuring Data Similarity and  Dissimilarity.  Why Preprocessing? Data Cleaning, Data  Integration, Data Reduction: Attribute Subset  Selection, Histograms, Clustering, Sampling, Data Cube aggregation, Data transformation and Data Discretization: Normalization, Binning,  Histogram Analysis  Self-learning Topics Data Visualization, Concept hierarchy generation | 5 |
| III | Classificati  on | Basic Concepts; Classification methods: 1.  Decision Tree Induction: Attribute Selection  Measures, Tree pruning. 2. Bayesian  Classification: Naïve Bayes Classifier. Prediction: Structure of regression models;  Simple linear regression, Accuracy and Error  measures, Precision, Recall, Holdout, Random  Sampling, Cross Validation, Bootstrap,  Introduction of Ensemble methods, Bagging,  Boosting, AdaBoost and Random forest.  Self-learning Topics: Multiple linear regression, logistic regression, Random forest, nearest  neighbour classifier, SVM | 8 |
| IV | Clustering  and Outlier  Detection | Cluster Analysis: Basic Concepts; Partitioning Methods: K Means, K Medoids; Hierarchical Methods: Agglomerative, Divisive, BIRCH; Density-Based Methods: DBSCAN. What are outliers? Types, Challenges; Outlier Detection Methods: | 8 |

|  |  | Supervised, Semi Supervised, 08 CO4 Unsupervised, Proximity based, Clustering Based. Self-learning Topics Hierarchical methods : Chameleon, Density based methods: OPTICS, Grid based methods: STING, CLIQUE |  |
| --- | --- | --- | --- |
| V | Frequent  Pattern  Mining | Basic Concepts: Market Basket Analysis, Frequent Itemset, Closed Itemset, and Association Rules; Frequent Itemset. Mining Methods: The Apriori Algorithm: Finding Frequent Itemset Using Candidate Generation, Generating Association Rules from Frequent Itemset, Improving the Efficiency of Apriori, A pattern growth approach for mining Frequent Itemset, Mining Frequent Itemset using vertical data formats; Introduction to Advance Pattern Mining: Mining Multilevel Association Rules and Multidimensional Association Rules. Self-learning Topics: Association Mining to Correlation Analysis, lift, Introduction to Constraint Based Association Mining | 8 |
| VI | Business  Intelligen  ce | What is BI? Business intelligence architectures; Definition of decision support system; Development of a business intelligence system using Data Mining for business Applications like Fraud Detection, Recommendation System Self-learning Topics: Clickstream Mining, Market Segmentation, Retail industry, Telecommunications industry, Banking & finance CRM, Epidemic prediction, Fake News Detection, Cyberbullying, Sentiment Analysis etc. | 5 |
|  | **Total** | **39** |