



SHRI VILE PARLE KELAVANI MANDAL'S
SHRI BHAGUBHAI MAFATLAL POLYTECHNIC



COMPUTER ENGINEERING DEPARTMENT

SEMESTER-VI

(Scheme – 2022)





SHRI VILE PARLE KELAVANI MANDAL'S
SHRI BHAGUBHAI MAFATLAL POLYTECHNIC



COMPUTER ENGINEERING DEPARTMENT

Shri Vile Parle Kelavani Mandal's
SHRI BHAGUBHAI MAFATLAL POLYTECHNIC
TEACHING AND EXAMINATION SCHEME

PROGRAMME: COMPUTER ENGINEERING
SEMESTER: VI

w.e.f. Batch admitted in June, 2022 (Progressively)
Duration - 16 Weeks

| SR. NO. | COURSE NAME | CODE | SCHEME OF INSTRUCTIONS AND PERIODS PER WEEK | | | | | THEORY PAPER DURATION AND MARKS (ESE) | | EXAMINATION SCHEME AND MAXIMUM MARKS | | | | | | | Gr | SCHEME L/P/Cr |
|---------|---|-----------|---|----|---|---|--------------|---------------------------------------|--------------|--------------------------------------|----|-----|-----|-----|-----|-------|----|---------------|
| | | | L | P | D | T | Cr (L+P+D+T) | Hrs | Mks | SSL | TA | TH | TW | PR | OR | TOTAL | | |
| 1 | #Advanced Network Administration | ANA220815 | 4 | 2 | - | - | 6 | 3 | 70 | 20 | 10 | 70 | 50 | - | 50 | 200 | A | 426 |
| 2 | #Cloud Application Development | CLD228923 | 4 | 2 | - | - | 6 | 3 | 70 | 20 | 10 | 70 | 50 | - | 50 | 200 | A | 426 |
| 3 | # Project | PRO220816 | - | 6 | - | - | 6 | - | - | - | - | - | 50 | - | 50 | 100 | A | 066 |
| 4 | # Elective -III (Any One) | | | | | | | | | | | | | | | | | |
| 4.1 | Machine Learning & Tools | MLT220817 | 4 | 2 | - | - | 6 | 3 | 70 | 20 | 10 | 70 | 50 | - | 50 | 200 | A | 426 |
| 4.2 | Cyber Security | CBS220818 | 4 | 2 | - | - | 6 | 3 | 70 | 20 | 10 | 70 | 50 | 50 | - | 200 | A | 426 |
| 4.3 | Embedded System | EMS220819 | 4 | 2 | - | - | 6 | 3 | 70 | 20 | 10 | 70 | 50 | - | 50 | 200 | A | 426 |
| 5 | Data Visualization Tools | DVT220820 | - | 2 | - | - | 2 | - | - | - | - | - | 50 | 50 | - | 100 | A | 022 |
| 6 | Entrepreneurship Development & Start-Up | ESS228924 | 3 | 2 | - | - | 5 | 3 | @70 | 20 | 10 | @70 | 25 | - | - | 125 | M | 325 |
| TOTAL | | | 15 | 16 | - | - | 31 | No. of Papers= 04 | | 80 | 40 | 280 | 275 | 100 | 150 | 925 | | 15/16/31 |
| | | | TOTAL PERIODS= | | | | | 31 | TOTAL MARKS= | | | | | 925 | | | | |

Theory, Practical, Drawing and Tutorial of 1 Hour duration each equal to 1 Credit # Award Winning, @Online Examination, L- Lecture, P- Practical, D- Drawing Practice, T- Tutorial, Cr- Credit, ESE-End Semester Examination, SSL- Sessional, TA-Teachers Assessment, TH-Theory, TW- Term Work, PR- Practical, OR- Oral, Gr- Group, B- Basic, C- Core, A- Application, M- Management
PR/OR- Assessed by Internal and External Examiners Jointly, TW- Assessed by Internal Examiner Only.

Head of Department

Controller of Examination

Secretary CDC

Principal





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COMPUTER ENGINEERING DEPARTMENT

1. COURSE DETAILS

| | |
|---|---------------------------|
| Programme: Computer Engineering | Semester: VI |
| Course: #Advanced Network Administration | Group: A |
| Course Code: ANA220815 | Duration: 16 Weeks |

2. TEACHING AND EXAMINATION SCHEME

| Scheme of Instructions and Periods per Week | | | | | Examination Scheme and Maximum Marks | | | | | | | | |
|---|-----------------------|---------------------|----------------------|----------------------|---|-------|-----|----|----|----|----|----|-------|
| Theory Hrs L | Practical Hrs P | Drawing Hrs D | Tutorial Hrs T | Credits (L+P+D+T) | Theory Paper Duration and marks (ESE) | | SSL | TA | TH | TW | PR | OR | TOTAL |
| | | | | | Hours | Marks | | | | | | | |
| 4 | 2 | - | - | 6 | 3 | 70 | 20 | 10 | 70 | 50 | - | 50 | 200 |

3. COURSE OBJECTIVE

This course covers very vital issues related to network like Virtual private network, network management tools, back up, Network troubleshooting tools, Wireless network and Software defined Network.

4. SKILL COMPETENCY

The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experiences:

- Set up and manage Computer Network Services

5. COURSE OUTCOMES(COs)at the end of the semester student will be able to: -

| CO No. | COURSE OUTCOME |
|--------|--|
| CO1 | Restore, Backup and recovery of data . |
| CO2 | Describe wireless network |
| CO3 | Manage remote network access services |
| CO4 | Implement Routing Protocols . |
| CO5 | Describe Software defined network |
| CO6 | Manage network services |





COMPUTER ENGINEERING DEPARTMENT

6. CO-PO, CO- PSO MAPPING TABLE:

| Course and Code | Course Outcomes | Programme Outcomes | | | | | | | Programme Specific Outcomes | |
|---|-----------------|--------------------|------------|-------------|------------|-------------|----------|-------------|-----------------------------|------------|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 |
| #Advanced Network Administration ANA220815 | CO1 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 2 |
| | CO2 | 3 | 2 | 1 | - | - | - | 2 | 1 | 3 |
| | CO3 | 3 | 3 | 2 | 3 | 2 | - | 3 | 1 | 3 |
| | CO4 | 3 | 3 | 2 | 3 | 1 | - | 3 | 1 | 3 |
| | CO5 | 3 | 2 | 1 | - | - | - | 2 | 1 | 3 |
| | CO6 | 3 | 3 | 2 | 2 | 1 | 1 | 2 | 3 | 1 |
| | AVG | 2.83 | 2.5 | 1.67 | 2.5 | 1.25 | 1 | 2.33 | 1.33 | 2.5 |

7. COURSE CONTENTS

| Unit No. | TOPIC/Sub-Topic | COs |
|-----------|--|-----|
| I | Back up 1.1 Administering Disaster Recovery 1.2 Need, Backup Policy and Types of Backup 1.3 Scheduling Backups, Backup tools 1.4 Automated System Recovery (ASR) and restore data 1.5 Basic and. Dynamic Disks- RAID 1.6 Disk Management Tools and Tasks | CO1 |
| II | Wireless network 2.1 Features of wireless network, Wireless Network topology 2.2 Energy and power constraints, scalability, applications 2.3 Wireless technologies 2.3.1 Wireless PAN (Bluetooth), 2.3.2 Wireless LAN (Wi-Fi), 2.3.3 Wireless MAN (WiMAX) | CO2 |





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| | | |
|------------|---|-----|
| III | Remote Network Access 3.1 Need of remote access, remote access technology, 3.2 VPN- Types 3.3 VPN Protocols 3.3.1 IPsec-modes and security protocols 3.3.2 L2TP, PPTP 3.4 SSL VPN | CO3 |
| IV | Routing 4.1 Static, Dynamic Routing 4.2 Delivery (direct Vs Indirect) 4.3 Unicast, multicast, broadcast routing Forwarding – techniques, process 4.4 Routing Protocol Types: IGP, EGP, Vector Distance, Link State, Path Vector 4.5 Routing Information Protocol, RIP1, RIP2, RIPng Operation, Messaging, Timers 4.6 Open Shortest Path First (OSPF) Operation, Topology, Message 4.7 Broder Gateway Protocol Overview, Topology, Route advertisement, Path Attribute and route determination, Messages BGP/BGP4 | CO4 |
| V | Software Defined Network 5.1 SDN Network Virtualization, Overview Operation 5.2 Befits over Traditional Network 5.3 Data, Control, and Management Planes 5.4 SDN Architecture 5.5 SDN Models: Open SDN, SDN by APIs SDN Overlay Model Hybrid SDN 5.6 SD WAN | CO5 |





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| | | |
|-----------|---|-----|
| VI | <p>Network Management and troubleshooting</p> <p>6.1 Network Management System</p> <p>6.2 Simple Network Management Protocol: Network Management Architecture, SNMP Messages</p> <p>6.3. SNMP (v1 & v2)</p> <p>6.4 Network Troubleshooting: Establishing a Baseline, Network Problems Analysis Sources of Network Slowness Duplex and Speed Setting Mismatches. IP Address Conflicts, Network Congestion, Hardware Failure, Network Loops, Switching/Bridging Loops, Poor Typology Design, Connectivity Problems</p> <p>6.5 Troubleshooting Tools – Hardware, Software and Monitoring Problem, Isolating the Problem, Setting Priorities.</p> <p>6.6 Internal Security</p> <p>6.7 Account Security, File and Directory permissions, Practices and user education.</p> <p>6.8 External security</p> <p style="padding-left: 20px;">6.8.1 External Threats – Front Door threats, Back Door threats, Denial of services</p> <p style="padding-left: 20px;">6.8.2 Network security devices – Firewall- Policies and configuration, Intrusion Detection Vulnerability, Assessment, Misuse Detection Anomaly Detection , Network and Host based IDS, Honeypots</p> | CO6 |
|-----------|---|-----|

8. LIST OF PRACTICALS/ASSIGNMENTS

Term Work consists of Journal containing minimum 10 of experiments and a case study with approx.no 32 of hours required.

| Sr. No. | Title of Experiment/Assignment/Exercise/Tutorial/Drawings | Approx. Hrs required | Cos |
|--------------|---|----------------------|-----|
| 1. | To use back up services and disk management utilities in Operating system | 4 | CO1 |
| 2. | Case Study on : Back Tools / RAID Implementation | 2 | CO1 |
| 3. | Demonstrate WLAN Wireless PAN (Bluetooth) and WiMAX | 4 | CO2 |
| 4. | To Set Up IP Sec VPN | 2 | CO3 |
| 5. | Case Study : SSL VPN / OPEN VPN | 2 | CO3 |
| 6. | Implement Routing Information Protocol (RIP) and RIP V2 | 4 | CO4 |
| 7. | Implement OSPF Basic Topology | 2 | CO4 |
| 8. | Implement OSPF hierarchical Topology | 4 | CO4 |
| 9. | Implement Border Gateway Protocol | 2 | CO4 |
| 10. | Case Study/Implementation : OPEN FLOW /SD WAN | 2 | CO5 |
| 11. | Configure SNMP | 2 | CO6 |
| 12. | Use Networking Tools for Network Trouble shooting | 2 | CO6 |
| Total | | 32 | |





COMPUTER ENGINEERING DEPARTMENT

9. **TEACHERS ASSESSMENT (TA):** Assessment to be based on one of the following tools and rubrics for evaluation of TA to be well defined by course teacher.

1. Quiz
2. Seminar/ Presentation
3. Assignments
4. Case Study

10. IMPLEMENTATION STRATEGY(PLANNING)

1. Teaching Plan/Tutorials
2. Guest/Expert lectures
3. Slides
4. Case Study
5. Self-learning resources

11. LEARNING RESOURCES

| Sr. No. | Title Of Book | Author | Publication |
|---------|---|-------------------------|----------------------------|
| 1. | The Complete Reference Networking | Craig Zacker | Tata McGraw-Hill Education |
| 2. | Networking A Beginner's Guide | Bruce Hallberg | Tata McGraw-Hill Education |
| 3. | Introduction to Networking | Richard A. McMohan, Sir | Tata McGraw-Hill Education |
| 4. | Microsoft Press ,MCSE Training Kit , Networking Essential Plus | Microsoft Press Soft | Microsoft Press Soft |

12. WEB REFERENCES

1. <https://www.sciencedirect.com/topics/computer-science/network-management-system>
2. <https://attuneops.io/network-administrator-tools/>
3. <http://www.gfi.com/blog/101-free-admin-tools>
4. <https://apscnlan.k12.ar.us/downloads/Training%20Documents/Network/Basic%20Network%20Troubleshooting%20-%202015.pdf>

13. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

| Unit No. | Unit Title | Teaching Hours | Distribution of Marks | | | Total Marks |
|----------|--|----------------|-----------------------|-----------|-----------|-------------|
| | | | R Level | U Level | A Level | |
| 1 | Back Up | 10 | 2 | 4 | 2 | 8 |
| 2 | Wireless Networks | 10 | 2 | 4 | 4 | 10 |
| 3 | Remote Network Access | 12 | 2 | 6 | 6 | 14 |
| 4 | Routing | 12 | 2 | 6 | 6 | 14 |
| 5 | Software Defined Network | 8 | 2 | 4 | 6 | 12 |
| 6 | Network Management and troubleshooting | 12 | - | 6 | 6 | 12 |
| | Total | 64 | 10 | 30 | 30 | 70 |





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R: Remembering U: Understanding A: Applying (Bloom's revised Taxonomy levels) Note:

This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of CO. The actual distribution of marks at different taxonomy levels (R, U, A) in question paper may vary from above table.

14. COURSE EXPERT COMMITTEE MEMBERS

| Sr. No. | | NAME |
|---------|----------|--------------------------|
| 1. | Internal | Mr. Janardan S. Kulkarni |
| 2. | Internal | Mrs. Prachi S. Arora |
| 3. | External | Dr. Pratik Kanani |





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COMPUTER ENGINEERING DEPARTMENT

1. COURSE DETAILS

| | |
|---|---------------------------|
| Programme: CSE/IT | Semester: VI |
| Course: #Cloud Application Development | Group: A |
| Course Code: CLD228923 | Duration: 16 Weeks |

2. TEACHING AND EXAMINATION SCHEME

| Scheme of Instructions and Periods per week | | | | | Examination Scheme and Maximum Marks | | | | | | | | |
|---|-----------------------|---------------------|----------------------|--------------------------|---|-------|-----|----|----|----|----|----|-------|
| Theory Hrs L | Practical Hrs P | Drawing Hrs D | Tutorial Hrs T | Credits (L+P+D +T) | Theory Paper Duration and marks (ESE) | | SSL | TA | TH | TW | PR | OR | TOTAL |
| | | | | | Hours | Marks | | | | | | | |
| 4 | 2 | - | - | 6 | 3 | 70 | 20 | 10 | 70 | 50 | - | 50 | 200 |

3. COURSE OBJECTIVE

Cloud computing is perhaps the most flamboyant technological innovation of the 21st century. Cloud computing offers pooled computing resources to entrepreneurs, organizations, and society at large. It is a proven platform to resolve issues in emerging technologies such as cyber security.

4. SKILL COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences.

- **Write Cloud Application and Deploy cloud environment**
- **Integrate various services of cloud**

5. COURSE OUTCOMES (COs): At the end of the semester student will be able to: -

| CO No. | COURSE OUTCOME |
|--------|--|
| CO1 | Explain computing types and implement virtualization |
| CO2 | Recognize the need of appropriate cloud model and services |
| CO3 | Use various services to provide cloud-based solutions |
| CO4 | Implement containerization |
| CO5 | Describe recent trends in cloud computing |





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6. CO-PO, CO- PSO MAPPING TABLE: COMPUTER ENGINEERING

| Course and Code | Course Outcomes | Programme Outcomes | | | | | | | Programme Specific Outcomes | |
|--|-----------------|--------------------|-----|-----|-----|------|------|-----|-----------------------------|------|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 |
| #Cloud Application Development (CLD228923) | CO1 | 3 | 1 | 1 | 2 | - | 1 | 2 | - | 3 |
| | CO2 | 3 | 1 | 1 | 2 | - | 1 | 2 | - | 3 |
| | CO3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | - | 3 |
| | CO4 | 3 | 1 | 2 | 2 | 1 | 1 | 1 | - | 3 |
| | CO5 | 3 | 1 | - | - | 1 | - | 1 | - | 3 |
| | CO Avg. | 3 | 1.2 | 1.5 | 2 | 1.33 | 1.25 | 1.8 | - | 3 |

CO-PO, CO- PSO MAPPING TABLE: INFORMATION TECHNOLOGY

| Course and Code | Course Outcomes | Programme Outcomes | | | | | | | Programme Specific Outcomes | |
|--|-----------------|--------------------|-----|-----|-----|------|------|-----|-----------------------------|------|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 |
| #Cloud Application Development (CLD228923) | CO1 | 3 | 1 | 1 | 2 | - | 1 | 2 | - | 3 |
| | CO2 | 3 | 1 | 1 | 2 | - | 1 | 2 | - | 3 |
| | CO3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | - | 3 |
| | CO4 | 3 | 1 | 2 | 2 | 1 | 1 | 1 | - | 3 |
| | CO5 | 3 | 1 | - | - | 1 | - | 1 | - | 3 |
| | CO Avg. | 3 | 1.2 | 1.5 | 2 | 1.33 | 1.25 | 1.8 | - | 3 |





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7. COURSE CONTENTS

| UNIT NO. | TOPIC/Sub-topic | CO |
|----------|---|-----|
| I | <p>Principles of computing & Virtualization</p> <p>1.1 Eras of Computing</p> <p>1.2 Parallel v/s distributed computing, Elements of Parallel Computing, Elements of distributed computing,</p> <p>1.3 Technologies for distributed computing</p> <p>1.4 Introduction, Characteristics of virtualized environment, Type 1, and Type 2 Hypervisors</p> <p>1.5 Virtualization Technology Providers: VMware, Oracle Virtual Box, Microsoft Hyper-V, KVM, Xen</p> <p>1.6 VM Migration, VM consolidation, VM Management, advantages & disadvantages of virtualization</p> | CO1 |
| II | <p>Introduction to Cloud Computing</p> <p>2.1 NIST definition of cloud Computing, Essential characteristics of cloud computing</p> <p>2.2 Cloud Deployment Model: Public cloud, Private cloud, Community cloud, Hybrid cloud, Open Source & Closed clouds</p> <p>2.3 Cloud Service Models: IaaS, PaaS, SaaS, architecture and anatomy of cloud computing, cloud computing infrastructure, cloud economics and benefits</p> <p>2.4 Cost Metrics and Pricing Models: Business Cost Metrics, Cloud Usage Cost Metrics, Cost Management Considerations, Service Quality Metrics and SLAs</p> <p>Industrial Cloud Platforms: Amazon Web Services, Google App Engine, Microsoft Azure</p> | CO2 |
| III | <p>Cloud Platform</p> <p>3.1 Infrastructure Services: Elastic Cloud Computing (EC2), Cloud Data Network (CDN)-Cloud Front, Elastic Load Balancers (ELB)</p> <p>3.2 Storage Services: Simple Storage Service(S3), Deploying static website on S3, Command Line tool</p> <p>3.3 Database Services: Simple DB, RDS, Dynamo DB</p> <p>3.4 Network Services: VPC components: CIDR block, public & private subnet, routing tables, security group, Network Access Control Layer (NACL), problems/case study on designing VPC</p> <p>3.5 API Services: AWS APIs interaction with AWS service, establish connectivity between own modules in the cloud using RESTful Web Services i.e. serverless deployment, Lambda function</p> <p>3.6 Security Services: Encryption, Hashing, Digital Signature, Public Key Infrastructure (PKI), Identity and Access Management (IAM), Single Sign-On (SSO)</p> <p>3.7 Monitoring Services: Cloud Watch, AWS CloudTrail, Cloud Zero, Data Dog, Security Hub</p> | CO3 |
| IV | <p>Containerization</p> <p>4.1 Container platform, Container Vs Virtualization, function as a service, event-based processing</p> <p>4.2 Deploying Containers Docker and Kubernetes on cloud</p> | CO4 |





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| | | |
|----------|---|-----|
| V | <p>Recent trends and development</p> <p>5.1 Cloud trends in supporting Ubiquitous Computing, Enabling Technologies with the Internet of Things (RFID, Sensor Networks and ZigBee Technologies, PS) , Innovative Applications with the Internet of Things(Ex: Smart Buildings and Smart Power Grid)</p> <p>5.2 Future of Cloud-Based smart Devices, Faster time to Market for Software Applications, Home Based Cloud Computing, Energy Aware Cloud</p> | CO5 |
|----------|---|-----|

8. LIST OF PRACTICALS/ASSIGNMENTS/ TUTORIALS/DRAWINGS

Term Work consists of Journal containing minimum no of –10 Experiments/assignments/drawings.

| Sr. No. | Title of Experiment/Assignment/Exercise/Tutorial/Drawings | Approx. Hrs required | CO |
|--------------|---|----------------------|-----|
| 1 | To implement virtual machine using EC2. | 2 | CO1 |
| 2 | To install and configure AWS CLI | 2 | CO1 |
| 3 | To host a web application using PHP on EC2 | 2 | CO1 |
| 4 | To host a web application using EC2 and ELB | 2 | CO3 |
| 5 | To create bucket and uploading resources on S3 using AWS console and S3 command tool. | 2 | CO3 |
| 6 | To implement Virtual Private Cloud | 2 | CO3 |
| 7 | To create an API of random password/OTP generator using Serverless Lambda and AWS API Gateway | 2 | CO3 |
| 8 | To create users, groups, policies, and roles using Internet Access Management (IAM) | 2 | CO3 |
| 9 | To send an email & SMS using AWS Simple Notification Service (SNS) | 2 | CO3 |
| 10 | To deploy a docker/Kubernetes based app on cloud | 4 | CO4 |
| 11 | To deploy resources on Open-Source Cloud. (OpenStack/Apache Cloud Stack/Open Nebula) | 4 | CO2 |
| 12 | To deploy Fire Store based app on Google App Engine. | 2 | CO2 |
| 13 | To deploy resources on Microsoft Azure | 2 | CO2 |
| 14 | To monitor and analyze real time data of various sensors on cloud | 2 | CO5 |
| TOTAL | | 32 | |

9. TEACHERS ASSESSMENT (TA): Assessment to be based on one of the following tools and rubrics for evaluation of TA to be well defined by course teacher.

1. Seminar/ Presentation
2. Model/Chart making
3. Surveys
4. Case Study
5. Quiz

10. IMPLEMENTATION STRATEGY (PLANNING)

1. Teaching Plan
2. Minimum no of practical/assignments.
3. Industry visit





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4. Guest/Expert lectures
5. Demonstrations
6. Slides
7. Self-Learning Online Resources

11. SUGGESTED LEARNING RESOURCES

| Sr.No. | Title of Book | Author | Publication |
|--------|---|-------------------------------------|-------------|
| 1 | Virtualization for Dummies, Wiley Publication | Bernard Golden | Wiley |
| 2 | Cloud Computing Principles and Paradigms | Rajkumar Buyya | Wiley |
| 3 | Programming Amazon EC2 | Flavia Paganelli and Jurg van Vliet | O'reilly |
| 4 | Cloud Computing Bible | Barrie Sosinsky | Wiley |

12. WEB REFERENCES

1. www.aws.amazon.com
2. <http://www.nist.gov>
3. <https://www.ibm.com/cloud>
4. <https://docs.openstack.org/mitaka/install-guide-ubuntu/horizon-install.html>
5. <https://tutorialsdojo.com/aws-identity-and-access-management-iam/>

13. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

| Unit No. | Unit Title | Teaching Hours | Distribution of Theory Marks | | | |
|--------------|--|----------------|------------------------------|-----------|-----------|-------------|
| | | | R Level | U Level | A Level | Total Marks |
| I | Principles of computing & Virtualization | 10 | 4 | 6 | - | 10 |
| II | Introduction to Cloud Computing | 12 | 6 | 8 | - | 14 |
| III | Cloud Platform | 24 | 4 | 8 | 14 | 26 |
| IV | Containerization | 6 | 2 | - | 6 | 8 |
| V | Recent trends and development | 12 | 2 | 4 | 6 | 12 |
| TOTAL | | 64 | 18 | 26 | 26 | 70 |





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R Remember, U Understand, A Apply and above, (Bloom's revised taxonomy levels)

NOTE: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of COs. The actual distribution of marks at different taxonomy levels (R, U, A) in the question paper may vary from above table.

14. COURSE EXPERT COMMITTEE MEMBERS

| Sr. No. | | NAME |
|---------|----------|--------------------------------------|
| 1 | Internal | Mr. Manishkumar Solanki |
| 2 | Internal | Ms. Pradnya Natekar |
| 3 | External | Mr. Tejas J. Shah Practice Manager |
| | | Talent Transformation, Wipro Limited |





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1. COURSE DETAILS

| | |
|--|---------------------------|
| Programme: Computer Engineering | Semester: VI |
| Course: #Project | Group: A |
| Course Code: PRO220816 | Duration: 16 Weeks |

2. TEACHING AND EXAMINATION SCHEME

| Scheme of Instructions and Periods per Week | | | | | Examination Scheme and Maximum Marks | | | | | | | | |
|---|-----------------------|---------------------|----------------------|----------------------|---|-------|-----|----|----|----|----|----|-------|
| Theory Hrs L | Practical Hrs P | Drawing Hrs D | Tutorial Hrs T | Credits (L+P+D+T) | Theory Paper Duration and marks (ESE) | | SSL | TA | TH | TW | PR | OR | TOTAL |
| | | | | | Hours | Marks | | | | | | | |
| - | 06 | - | - | 06 | - | - | - | - | - | 50 | | 50 | 100 |

3. COURSE OBJECTIVE

To develop a project to give in depth understanding of all the concepts learnt at the lower semesters. To expose students to the various stages of making a project and the capability to work in a team

4. SKILL COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences.

- **Design and develop Hardware and/or Software system**

5. COURSE OUTCOMES (COs) at the end of the semester student will be able to

| CO No. | COURSE OUTCOME |
|--------|---|
| CO1 | Identify problem definitions that can be addressed by applying the acquired knowledge & skill |
| CO2 | Plan the activities with timeline chart, work in groups/team and co-ordinate the work |
| CO3 | Select design methodologies & its implementation. |
| CO4 | Write the Project Report |





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6. CO-PO, CO- PSO MAPPING TABLE

| Course and Code | Course Outcomes | Programme Outcomes | | | | | | | Programme Specific Outcomes | |
|-------------------------------|-----------------|--------------------|-------------|----------|----------|----------|-------------|------------|-----------------------------|----------|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 |
| #Project PRO220816 | CO1 | 1 | 3 | - | - | 2 | 2 | 1 | 3 | 3 |
| | CO2 | - | 2 | - | - | - | 3 | 1 | 3 | 3 |
| | CO3 | - | 2 | 3 | 3 | - | 3 | 3 | 3 | 3 |
| | CO4 | - | - | - | 1 | - | 3 | 1 | 3 | 3 |
| | CO Avg. | 1 | 2.33 | 3 | 2 | 2 | 2.75 | 1.5 | 3 | 3 |

7. Each student/group of students will submit project synopsis and detailed project report with following details

A) Project synopsis

- Abstract
- Chapter 1. Problem statement
- Chapter 2. System requirement specification
- Chapter 3. Proposed system/solution
- Chapter 4. Estimation and planning
- Chapter 5. Future scope
- Chapter 6. Conclusion
- Bibliography and References

B) Project Report

The report shall be presented in following sequence:

- Title sheet
- Project Certificate
- Project approval sheet
- Acknowledgement
- Abstract
- Table of contents





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COMPUTER ENGINEERING DEPARTMENT

List of tables (if desired)

List of Figures (if desired)

Chapter 1: Introduction (domain)

Chapter 2: Problem statement and proposed system (input /output statement, description, feasibility)

Chapter 3: Literature Review

Chapter 4: Design and Implementation (System Architecture, Requirement: hardware software any other , flow diagrams , activity diagrams, DFD , ER diagram if desired, User Interface)

Chapter 5: Result & Conclusions (Reports, future scope and limitation)

Bibliography and References

8. Identification of projects and allocation methodology to faculty members and relevance of the projects and their contribution towards attainments of PO's

- i. In the preceding semester, the Head of Department notifies and briefs the students about project development, industry sponsored project, modification or value addition in previous project, project group formation, selection criteria and project scope. Students are asked to carry out the literature survey, review the latest technologies, look for emerging trends, list software platform available, refer previous project reports to prepare project proposals considering available time, cost, feasibility, environment, safety, standards, lab facility, ethics etc.
- ii. At the beginning of the semester the project groups present their ideas in front of HOD and faculty members.
- iii. Based on above criteria and relevance to contribution towards attainment of POs, the project topics are finalized group-wise and groups are allocated to faculties based on their area of expertise.

9. Process for monitoring and evaluation, process to assess individual and team performance

- i. The students are asked to prepare and submit synopsis and detail implementation plan of 16 weeks to their respective guides.
- ii. Interaction between students and project guide to discuss implementation methodology.
- iii. The project guide monitors the progress of implementation on continuous basis.
- iv. Final evaluation of project by examiners through presentation, demonstration and viva-voce.

10. Methodology to assess individual/collective contribution/understanding:

a. Internal evaluation (50 marks) by project guide.

Phase-I: 30% evaluation

At the end of first month, all the groups are asked to give presentation on progress made till date in front of committee consisting of HOD and project guides. The projects are evaluated





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based on project idea, knowledge, amount of work done, adherence to plan at every stage, motivation, interest shown, demonstration of skills (hardware, software, presentation), self-motivation, sincerity, punctuality, ethics etc. by the project guide and project evaluation committee.

Phase-II: 30% evaluation

The above activity is carried out at the end of second month. The students are guided for preparation of project reports.

Phase III: 40% evaluation

The above activity is carried out at the end of the semester along with demo and submission of project report.

The internal evaluation will be done on the basis of following criteria and weightage:

| | Phase 1 (2-4 Week) | Phase 2 (6- 8 Weeks) | Phase 3 (14-16 Week) | Total |
|---------------------|------------------------------------|--|--|--------------|
| Marks | 15 | 15 | 20 | 50 |
| Evaluation Criteria | 1. Project idea 2. Presentation | 1. Progress made in the project 2. Presentation | 1. Progress made in implementation 2 Presentation | |

The student/ group will maintain the weekly report to monitor the progress of the project.

b. External evaluation (50 marks) by expert from industry/institute (external examiner)

The students demonstrate the prototype/ working projects and give power point presentation in front of

External examiner. Internal and external examiners evaluate the student on the following aspects:

- a. Understanding and completeness of the Project
- b. Approach to the solution of problem
- c. Planning and implementation
- d. Design and testing procedure
- e. Project Report
- f. Students' involvement in the Project

11. COURSE EXPERT COMMITTEE MEMBERS

| Sr. No. | Faculty | NAME |
|---------|----------|---|
| 1 | Internal | Mrs. Prachi Arora |
| 2 | Internal | Mr. J S kulkarni |
| 3 | Internal | Mr. Pratik Shah |
| 4 | External | Mr. Harinder Salwan Managing Director at Tricom Multimedia Pvt Ltd |

1. COURSE DETAILS





COMPUTER ENGINEERING DEPARTMENT

| | |
|--|--------------------------|
| Programme: Computer Engineering | Semester: VI |
| Course:# Machine Learning & Tools | Group A |
| Course Code: MLT220817 | Duration:16 Weeks |

2. TEACHING AND EXAMINATION SCHEME

| Scheme of Instructions and Periods per Week | | | | | Examination Scheme and Maximum Marks | | | | | | | | |
|---|--------------------|------------------|-------------------|-------------------|--------------------------------------|-------|-----|----|----|----|----|----|--------|
| Theory Hrs L | Practical Hrs P | Drawing Hrs D | Tutorial Hrs T | Credits (L+P+D+T) | Theory Paper Duration and marks(ESE) | | SSL | TA | TH | TW | PR | OR | TOT AL |
| | | | | | Hours | Marks | | | | | | | |
| 4 | 2 | - | - | 6 | 3 | 70 | 20 | 10 | 70 | 50 | -- | 50 | 200 |

3. COURSE OBJECTIVE

Machine learning (ML) is a branch of Artificial Intelligence (AI) that enables computers to “self-learn” from training data and improve over time, without being explicitly programmed. Machine learning algorithms are able to detect patterns in data and learn from them, in order to make their own predictions.

4. SKILL COMPETENCY

This course aims to help the students attain the following industry-identified competency through various teaching-learning experiences:

- **Design and apply various machine learning algorithms.**
- **Execute machine learning algorithms on data sets to get better insight.**

5. COURSE OUTCOMES (COs) at the end of the semester student will be able to: -

| CO No. | COURSE OUTCOME |
|--------|--|
| CO1 | Acquire fundamental knowledge of developing machine learning models. |
| CO2 | Develop a model using supervised/unsupervised machine learning algorithms for regression/ classification/ clustering |
| CO3 | Acquire an in-depth understanding of Ensemble learning methods. |
| CO4 | Design and Concrete implementations of various machine learning algorithms. |

6. CO-PO, CO- PSO MAPPING TABLE:





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COMPUTER ENGINEERING DEPARTMENT

| Course and Code | Course Outcomes | Programme Outcomes | | | | | | | Programme Specific Outcomes | |
|--|-----------------|--------------------|------------|------------|-------------|-------------|------------|----------|-----------------------------|----------|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 |
| #Machine Learning & Tools MLT220817 | CO1 | 3 | 2 | 1 | 1 | 1 | - | 2 | 2 | - |
| | CO2 | 3 | 2 | 3 | 2 | 1 | 2 | 2 | 3 | 1 |
| | CO3 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 1 |
| | CO4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | - |
| | CO Avg. | 3 | 2.5 | 2.5 | 1.75 | 1.25 | 1.5 | 2 | 2.25 | 1 |

7. COURSE CONTENTS

| UNIT NO. | TOPIC/Sub-topic | CO |
|-----------|--|------------|
| I | <p>Introduction to Machine Learning:</p> <p>1.1 Machine Learning, Issues in Machine Learning, Application of Machine Learning, steps in developing a Machine Learning Application.</p> <p>1.2 Types of Machine Learning: Supervised learning, unsupervised learning, Reinforcement learning.</p> <p>1.3 Split Data in Machine Learning: Training Data, Validation Data, and Testing Data</p> <p>1.4 Performance Metrics for Regression Problems: Mean Absolute Error (MAE), Root Mean Squared Error.</p> | CO1 |
| II | <p>Learning with Regression and trees:</p> <p>2.1 Decision trees: Introduction, Decision Trees for Interview call, Building Decision Trees, Deciding Feature to Split on, information gain, Gain Ratio,</p> <p>2.2 Constructing Decision Trees using Constructing Decision Trees using Gini Index, Classification, and Regression Trees (CART).</p> <p>2.3 Linear Regression: Introduction, correlation Coefficients, Cost function, Coefficient of Determination, Analysis of Linear Regression using dummy Data.</p> <p>2.4 Performance Metrics: Confusion Matrix, [Kappa Statistics], Sensitivity, Specificity, Precision.</p> | CO2 |





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| | | |
|------------|---|------------|
| III | <p>Ensemble Learning</p> <p>3.1 Understanding Ensembles, K-fold cross-validation, Boosting</p> <p>3.2 Bagging, Subbagging, Random Forest, Comparison with Boosting, Different ways to combine classifiers.</p> <p>3.3 Random forests: Introduction, Data Bagging, and Feature Selection, Extra Trees, Regression using decision Trees and Random Forest.</p> | CO3 |
| IV | <p>Learning with Classification:</p> <p>4.1 Naive Bayes: Introduction, Bayes Theorem, Working of Naive Bayes' Classifier, Types of Naive Bayes Model, Implementation of Naive Bayes algorithm.</p> <p>4.2 Introduction to clustering with overview of distance metrics and major clustering approaches.</p> <p>4.3 Introduction to the WEKA tool.</p> <p>4.4 Loading Data in Weka, Types of Machine Learning Algorithms in Weka.</p> | CO4 |
| V | <p>Introduction to clustering:</p> <p>5.1 Introduction to clustering: clustering methods.</p> <p>5.2 Introduction to K Means Clustering Algorithm.</p> <p>5.3 Graph-Based Clustering: Clustering with minimal spanning tree, Model-based Clustering: Expectation-Maximization Algorithm, Density-Based Clustering: DBSCAN.</p> | CO5 |

8.LIST OF PRACTICALS/ASSIGNMENTS/EXERCISES/TUTORIALS/DRAWINGS

Term Work consists of Journal containing minimum 10 experiments/assignments with approx. no of hours required and corresponding CO attained are specified here:

| Sr. No. | Title of Assignment | Approx.Hrs required | Cos |
|---------|---|---------------------|-----|
| 1 | To calculate the mean, and standard deviation of statistical data using Python. | 2 | CO1 |
| 2 | To predict Diamond on Price Prediction Dataset using linear regression. | 2 | CO2 |
| 3 | Implement decision tree algorithm. a. Read the dataset from the CSV file. b. Provide the corresponding expression of class. | 2 | CO2 |
| 4 | To perform grouping of flowers into flower species on any dataset using any Cloud Service. | 4 | CO2 |
| 5 | To implement Ensemble learning (bagging/boosting) | 2 | CO3 |
| 6 | Implement the Naive Bayes algorithm. a. Read the dataset from the CSV file. b. Demonstrate intermediate calculations of algorithms. | 4 | CO4 |





COMPUTER ENGINEERING DEPARTMENT

| | | | |
|----|---|-----------|-----|
| 7 | Load breast-cancer Classification dataset, and run advanced classification algorithms using the WEKA tool. | 4 | CO4 |
| 8 | To predict whether a customer will default or not on the debit card dataset using Naive Bayesian Classifier. | 4 | CO4 |
| 9 | To implement Graph Based Clustering. | 2 | CO5 |
| 10 | To perform Mushroom classification into number of species, take any dataset using k-means clustering. | 4 | CO5 |
| 11 | Mini Project | 2 | CO5 |
| | TOTAL | 32 | |

9. TEACHERS ASSESSMENT (TA): Assessment to be based on one of the following tools and rubrics for evaluation of TA to be well defined by course teacher.

1. Seminar/ Presentation
2. Quiz
3. Micro project
4. Assignment

10. IMPLEMENTATION STRATEGY (PLANNING)

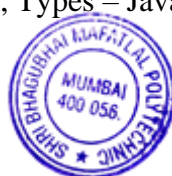
1. Conducting lectures as per teaching plan/ scheme
2. Minimum no of practical/assignments etc.
3. Guest/Expert Lecture
4. Self-Learning Online Resources.
5. Slides
6. Group discussions

11. SUGGESTED LEARNING RESOURCES

| Sr.No. | Title of Book | Author | Publication |
|--------|---|-----------------------------------|-----------------------|
| 1 | Introduction to Machine Learning | Ethem Alpaydin, PHI, | Third Edition |
| 2 | Machine Learning An Algorithmic Perspective | Stephen Marsland | CRC Press publication |
| 3 | Introduction to Machine Learning with Python: A Guide for Data Scientists | Andreas C. Müller, Sarah Guido | O'Reilly |
| 4 | Python for Data Analytics | Wes McKinney | O'Reilly |

12. WEB REFERENCES:

1. <https://python-course.eu/machine-learning>
2. https://www.tutorialspoint.com/machine_learning_with_python/index.htm
3. <https://www.kaggle.com/kanncaa1/machine-learning-tutorial-for-beginners>
4. <https://data-flair.training/blogs/train-test-set-in-python-ml>
5. Machine Learning: What It is, Tutorial, Definition, Types – Javatpoint





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COMPUTER ENGINEERING DEPARTMENT

13. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

| Sr.NO | Topic | Teaching Hours | Distribution of Theory Marks | | | |
|--------------|------------------------------------|----------------|------------------------------|---------|---------|-------------|
| | | | R Level | U Level | A Level | Total Marks |
| 1. | Introduction to Machine Learning | 14 | 4 | 6 | 4 | 14 |
| 2. | Learning with Regression and trees | 12 | 4 | 6 | 6 | 16 |
| 3. | Ensemble Learning | 12 | 4 | 2 | 6 | 12 |
| 4. | Learning with Classification | 14 | 4 | 4 | 6 | 14 |
| 5. | Introduction to clustering | 12 | 4 | 4 | 6 | 14 |
| TOTAL | | 64 | 20 | 22 | 28 | 70 |

R: Remember, **U:** Understand, **A:**Apply and above, (Bloom's revised taxonomy levels)

NOTE: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of COs. The actual distribution of marks at different taxonomy levels (R, U, A) in the question paper may vary from above table.

14.COURSE EXPERT COMMITTEE MEMBERS

| Sr. No. | | NAME |
|---------|----------|---|
| 1 | Internal | Ms. Pradnya Natekar |
| 2 | Internal | Ms. Sharyu Kadam |
| 4 | External | Mr. Manthan Desai Organization: Manager (AVP) in Accenture-Data Management CoE |





COMPUTER ENGINEERING DEPARTMENT

1. COURSE DETAILS

| | |
|--|--------------------------|
| Programme: Computer Engineering | Semester: VI |
| Course: #Cyber Security | Group: A |
| Course Code: CBS220818 | Duration:16 Weeks |

2. TEACHING AND EXAMINATION SCHEME

| Scheme of Instructions and Periods per Week | | | | | Examination Scheme and Maximum Marks | | | | | | | | |
|---|--------------------|------------------|-------------------|----------------------|---|-------|-----|----|----|----|----|----|-------|
| Theory Hrs L | Practical Hrs P | Drawing Hrs D | Tutorial Hrs T | Credits (L+P+D+T) | Theory Paper Duration and marks(ESE) | | SSL | TA | TH | TW | PR | OR | TOTAL |
| | | | | | Hours | Marks | | | | | | | |
| 4 | 2 | - | - | 6 | 3 | 70 | 20 | 10 | 70 | 50 | 50 | - | 200 |

3. COURSE OBJECTIVE

This course is intended to help student's gain fundamental and comprehensive understanding of cyber security. We will focus on an overview of major cyber security issues, technologies, and approaches.

Students who successfully complete this course will have a concept and knowledge of security properties, concerns, Policies, User Authentication, cryptography, Access Control, Malicious Software, Denial-of-Service Attacks. Students will also have hands on experience in selected cyber security technologies through lab sessions.

4. SKILL COMPETENCY

The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experiences:

- **Design and test cryptographic tactics**

5. COURSE OUTCOMES (COs) at the end of the semester student will be able to: -

| CO No. | COURSE OUTCOME |
|--------|--|
| CO1 | Understand system security concepts, classical encryption techniques and fundamental knowledge of various attacks. |
| CO2 | Apply user identification and authentication methods. |
| CO3 | Apply cryptographic algorithms and protocols to maintain Computer Security. |
| CO4 | Analyze different attacks on network, performance of firewalls and security protocols like SSL, IPsec, and PGP. |
| CO5 | Maintain secured networks and describe Information Security Compliance standards. |





COMPUTER ENGINEERING DEPARTMENT

6. CO-PO, CO- PSO MAPPING TABLE

| Course and Code | Course Outcomes | Programme Outcomes | | | | | | | Programme Specific Outcomes | |
|--------------------------------------|-----------------|--------------------|------------|----------|----------|------------|------------|------------|-----------------------------|----------|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 |
| #Cyber Security CBS220818 | CO1 | 3 | 2 | - | 2 | - | - | 2 | 1 | 3 |
| | CO2 | 2 | 3 | 1 | 3 | 1 | - | 3 | 1 | 3 |
| | CO3 | 3 | 3 | 1 | 3 | 1 | - | 3 | 1 | 3 |
| | CO4 | 2 | 2 | 1 | 3 | 2 | 1 | 3 | - | 3 |
| | CO5 | 2 | 3 | 2 | 3 | 2 | 1 | 3 | 1 | 3 |
| | CO Avg. | 2.4 | 2.6 | 1 | 3 | 1.2 | 0.4 | 2.8 | 0.8 | 3 |

7. COURSE CONTENTS

| UNIT NO. | TOPIC/Sub-topic | CO |
|-----------|--|------------|
| I | <p>Information Security Concepts</p> <p>1.1 Foundations of Computer Security: Definition and Need of computer security, Security Basics: Confidentiality, Integrity, Availability, Accountability, Non-Repudiation and Reliability.</p> <p>1.2 Risk and Threat Analysis: Assets, Vulnerability, Threats, Risks, Counter measures.</p> <p>1.3 Threat to Security: Viruses, Phases of Viruses, Types of Viruses, Dealing with Viruses, Worms, Trojan Horse, Intruders, Insiders.</p> <p>1.4 Type of Attacks: Active and Passive attacks, Denial of Service, DDOS, Backdoors and Trapdoors, Sniffing, Spoofing, Man in the Middle, Replay, Injection attack.</p> | CO1 |
| II | <p>User Authentication and Access Control</p> <p>2.1 Identification and Authentication: User name and Password, guessing password, Password Attacks-Piggybacking, Shoulder surfing, Dumpster diving.</p> <p>2.2 Biometrics: Finger Prints, Hand prints, Retina, patterns, Voice patterns, Signature and Writing patterns, Keystrokes.</p> <p>2.3 Access controls: Definition, Authentication Mechanism, Principle-Authentication, Authorization, Audit, Policies: DAC, MAC, RBAC.</p> <p>2.4 Digital Signature, Attacks on Digital Signature, Digital Signature Scheme: RSA</p> | CO2 |





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| | | |
|-----|---|-----|
| III | Cryptography 3.1 Introduction: Plain Text, Cipher Text, Cryptography, Cryptanalysis, Cryptology, Encryption, Decryption. 3.2 Substitution Techniques: Caesar's cipher, Modified Caesar's Cipher, Transposition Techniques: Simple Columnar Transposition. 3.3 Steganography: Procedure 3.4 Symmetric and Asymmetric cryptography: Introduction to Symmetric encryption, DES (Data encryption Standard) algorithm, Asymmetric key cryptography. | CO3 |
| IV | Network Security and Applications 4.1 Network security basics: TCP/IP vulnerabilities (Layer wise), Network Attacks: Packet Sniffing, ARP spoofing, port scanning, IP spoofing 4.2 Denial of Service: DOS attacks, ICMP flood, SYN flood, UDP flood, Distributed Denial of Service, MAC Flooding and Cloning. 4.3 Internet Security Protocols: PGP, SSL, Network security: IDS, Firewalls. 4.4 Public key infrastructure (PRI): Introduction, Certificates, Certificate authority, Registration Authority, X.509/PKIX certificate format. 4.5 Kerberos: Working, AS, TGS, SS. | CO4 |
| V | Security, Cyber Laws and Compliance Standards 5.1 IP Security- Overview, Protocols- AH. 5.2 Cyber Crime: Introduction, Hacking Digital Forgery, Cyber Stalking/Harassment. 5.3 Identity Theft and terrorism, Cyber Delhi Jon. 5.4 Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000, IT Act. 2008 and its Amendments. | CO5 |
| VI | Applications of security 6.1 Information Security Standard compliances SOX, GLBA, HIPAA, ISO, FISMA, NERC, PCI. 6.2 Ip security- IPSEC architecture, IPSEC services, IPSEC security association, ESP Transport and tunneling. 6.3 SSL protocol. | CO5 |





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8. LIST OF PRACTICALS/ASSIGNMENTS/EXERCISES/TUTORIALS/DRAWINGS

Term Work consists of Journal containing minimum 10 experiments/assignments with approx. no of hours required and corresponding CO attained are specified here:

| Sr. No. | Title of Assignment | Approx.Hrs required | Cos |
|---------|--|---------------------|-----|
| 1 | Set up operating system Updates. And Perform backup and restore of System. | 2 | CO1 |
| 2 | Implementing Authentication using any library. | 2 | CO2 |
| 3 | Implementing Digital signature. | 4 | CO2 |
| 4 | Implementation of any steganography algorithm | 2 | CO3 |
| 5 | Use Steganography to encode and decode the message using any tool. | 4 | CO3 |
| 6 | Write a program to implement Caesar Cipher. | 2 | CO3 |
| 7 | Trace the path of web site using Tracert Utility. | 4 | CO3 |
| 8 | Implementation of email security PGP. | 4 | CO4 |
| 9 | Implementation of IPsec. | 2 | CO5 |
| 10 | Trace the origin of email using any tool (e.g. emailTrackerPro). | 4 | CO5 |
| 11 | Assignment on E-commerce Security. | 2 | CO5 |
| | TOTAL | 32 | |

9. TEACHERS ASSESSMENT (TA): Assessment to be based on one of the following tools and rubrics for evaluation of TA to be well defined by course teacher.

1. Seminar/ Presentation
2. Quiz
3. Micro project
4. Assignment

10. IMPLEMENTATION STRATEGY (PLANNING)

1. Conducting lectures as per teaching plan/ scheme
2. Minimum no of practical/assignments etc.
3. Guest/Expert Lecture
4. Self-Learning Online Resources.

11. SUGGESTED LEARNING RESOURCES

| Sr.No. | Title of Book | Author | Publication |
|--------|--|-------------------|-------------------------------|
| 1 | William Stallings, "Cryptography and Network Security, Principles and Practice", 6th Edition | William Stallings | Pearson Education, March 2013 |
| 2 | Behrouz A. Ferouzan, "Cryptography & Network Security", Tata McGraw Hill | Ferouzan | Tata McGraw Hill |





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| | | | |
|---|---|--|------------------|
| 3 | Behrouz A. Forouzan & Debdeep Mukhopadhyay, "Cryptography and Network Security" 3rd Edition | Ferouzan | Tata McGraw Hill |
| 4 | Cyber Laws and IT Protection | Harish Chander PHI Publication, New Delhi, | PHI Publications |

12. WEB REFERENCES

- <https://community.jisc.ac.uk/library/advisory-services/ipsec-implementation-and-worked-examples>
- <https://www.scribd.com/document/573445463/practical-no-15>
- <https://www.prepbytes.com/blog/java/caesar-cipher-program-in-java/>
- <https://www.varonis.com/blog/pgp-encryption>

13. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

| Sr.NO | Topic | Teaching Hours | Distribution of Theory Marks | | | |
|--------------|---|----------------|------------------------------|---------|---------|-------------|
| | | | R Level | U Level | A Level | Total Marks |
| 1. | Information Security Concepts | 12 | 4 | 4 | 4 | 12 |
| 2. | User Authentication and Access control | 10 | 2 | 4 | 6 | 12 |
| 3. | Cryptography | 12 | 2 | 2 | 6 | 10 |
| 4. | Network Security and Applications | 10 | 6 | 4 | 4 | 14 |
| 5. | Security, Cyber Laws and Compliance Standards | 12 | 4 | 4 | 4 | 12 |
| 6. | Applications of security | 8 | 4 | 4 | 2 | 10 |
| TOTAL | | 64 | 22 | 22 | 26 | 70 |

14. COURSE EXPERT COMMITTEE MEMBERS

| Sr. No. | | NAME |
|---------|----------|---|
| 1 | Internal | Ms. Pradnya Natekar |
| 2 | Internal | Mr. Siddhesh Masurkar |
| 4 | External | Mr. Narendra Shekokar Professor in D.J.Sanghavi college of Engineering |





COMPUTER ENGINEERING DEPARTMENT

1. COURSE DETAILS

| | |
|--|--------------------------|
| Programme: Computer Engineering | Semester: VI |
| Course: #Embedded System | Group: A |
| Course Code: EMS220819 | Duration:16 Weeks |

2. TEACHING AND EXAMINATION SCHEME

| Scheme of Instructions and Periods | | | | | Examination Scheme and Maximum Marks | | | | | | | | |
|------------------------------------|-----------------|-------------|----------------|-------------------|--------------------------------------|-------|-----|----|----|----|----|----|-------|
| Theory Hrs L | Practical Hrs P | Drawing Hrs | Tutorial Hrs T | Credits (L+P+D+T) | Theory Paper Duration and marks(ESE) | | SSL | TA | TH | TW | PR | OR | TOTAL |
| | | | | | Hours | Marks | | | | | | | |
| 04 | 02 | - | - | 06 | 03 | 70 | 20 | 10 | 70 | 50 | -- | 50 | 200 |

3. COURSE OBJECTIVES

Embedded systems is the essential part of Computer Science. It deals with computer hardware with software embedded in it. This subject will enable student to develop logical thinking and use of “Firmware”. It is practical oriented subject having theoretical prerequisites of Microprocessor, Digital Techniques, Data Structures and Computer Architecture. Students will be able to develop Real Time Systems, Device drivers, use interrupt service mechanism, program timing and counting devices and develop embedded C-Programs for Microcontroller.

4. SKILL COMPETENCY

The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experiences:

- **Assembly language programming**
- **Real time operating system**

5. COURSE OUTCOMES (COs) at the end of the semester student will be able to: -

| CO No. | COURSE OUTCOME |
|--------|---|
| CO1 | Conceptualize various building blocks of 8051 Micro controller. |
| CO2 | Implement 8051 Micro Controller programs |
| CO3 | Infer the concept of Embedded System |
| CO4 | Use the Buses, Device Drivers and Interrupt mechanism used in Embedded Systems. |
| CO5 | Paraphrase RTOS concepts |





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6. CO-PO, CO- PSO MAPPING TABLE

| Course and Code | Course Outcomes | Programme Outcomes | | | | | | | Programme Specific Outcomes | |
|-------------------------------|-----------------|--------------------|------|-----|------|------|------|------|-----------------------------|------|
| | | PO 1 | PO 2 | PO3 | PO 4 | PO 5 | PO 6 | PO 7 | PSO 1 | PSO2 |
| #Embedded System EMS220819 | CO1 | 2 | - | - | - | - | - | 2 | 3 | - |
| | CO2 | 3 | 3 | 2 | 2 | 1 | 1 | 1 | 3 | - |
| | CO3 | 3 | 3 | 2 | 2 | 1 | 1 | 1 | 3 | - |
| | CO4 | 3 | 2 | 1 | 1 | 1 | 1 | 2 | 3 | - |
| | CO5 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 3 | - |
| | CO Avg. | 2.6 | 2.5 | 1.5 | 1.5 | 1 | 1 | 1.4 | 3 | - |

7. COURSE CONTENTS

| Sr.No. | TOPIC/Sub-Topics | CO |
|--------|---|-----|
| 1 | 8051 Microcontroller architecture 1.1 Difference between Microprocessors and Microcontrollers, 1.2 Introduction to 8051 microcontrollers family, Architectural block Diagram, Pin diagram and Pin, 1.3 Functions General Purpose and Special Function Registers, 1.4 Oscillator and clock circuit, Reset circuit, I/O Port circuits, 1.5 Memory organization, Internal program and data memory, 1.6 Instruction Set, Assembly level programming and Embedded C Programming | CO1 |
| 2 | 8051 Serial and Timer/ Counter Programming 2.1 Serial data input/output and associated registers. 2.2 Various modes of serial data communication, serial data communication programs in Assembly language/ Embedded C. 2.3 Use of counter as timer, Timer/Counters and associated registers, Various modes of timer/counter operations. 2.4 Time delay programs in Assembly language/ Embedded C. | CO2 |





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| | | |
|----------|--|------------|
| 3 | <p>8051 Interrupts</p> <p>3.1 Concept of Interrupt, interrupt versus polling, 3.2 Types of interrupts in 8051, Reset, interrupt control and associated registers, interrupt vectors, Interrupt execution, 3.3 RETI instruction, software generated interrupt, 3.4 Interrupt handler subroutine for timer/counter and serial data transmission/reception in Assembly language/ Embedded C.</p> | CO2 |
| 4 | <p>Introduction to embedded system</p> <p>4.1. Embedded systems, processor embedded into a system, embedded hardware units & devices in a system, embedded software in a system, examples of embedded system, 4.2. SOC & use of VLSI circuit design technology, complex system design & processors, 4.3. design process in embedded system, 4.4. formalization of system design & examples,</p> | CO3 |
| 5 | <p>Communication buses & Interrupts Servicing Mechanism</p> <p>5.1. I/O types & examples, 5.2. IIC, CAN and USB Bus 5.3. Serial communication devices, parallel device ports, wireless devices, 5.4. Timer & counting devices, watch dog timer, real time clock</p> | CO4 |
| 6 | <p>RTOS & Interprocess Communication</p> <p>6.1. Concepts of RTOS, Functions 6.2. Multitasking, Task synchronization & Mutual Exclusion, Starvation, Deadlock, Multiple processes, 6.3. Problem of sharing data by multiple task and routines,</p> | CO5 |

8. LIST OF PRACTICALS

Term Work consists of Journal containing minimum no of –10 experiments.

| Sr. No. | Title of Experiments | Approx.Hrs required | COs |
|---------|--|---------------------|-----|
| 1. | To explore various microcontrollers used in embedded systems. | 02 | CO1 |
| 2. | To write sample assembly program in Keil & to observe various files created. | 02 | CO2 |
| 3 | To write a program in Embedded C. | 04 | CO2 |
| 4 | To perform I/O operations with 8051 Ports. | 02 | CO2 |
| 5 | To perform Serial communication with 8051. | 02 | CO2 |
| 6 | To perform Timers programming with 8051. | 04 | CO2 |
| 7 | To perform Interrupt Handling programming with 8051. | 02 | CO2 |





SHRI VILE PARLE KELAVANI MANDAL'S
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COMPUTER ENGINEERING DEPARTMENT

| | | | |
|-----------|--|----|-----|
| 8 | To interface the Keyboard with 8051. | 02 | CO2 |
| 9 | To interface the LCD with 8051. | 02 | CO2 |
| 10 | To interface the ADC with 8051 | 02 | CO2 |
| 11 | To interface real world embedded devices with 8051 mc using simulator. | 02 | CO2 |
| 12 | Case study RTOS- (1) Embedded linux, (2). windows CE | 02 | CO5 |
| 13 | Case Study on design process of an Embedded system. | 02 | CO3 |
| 14 | Classify communication buses used in Embedded System. | 02 | C04 |
| | Total | 32 | |

9. TEACHERS ASSESSMENT (TA): Assessment to be based on one of the following tools and rubrics for evaluation of TA to be well defined by course teacher.

6. Quiz
7. Seminar/ Presentation
8. Assignments

10. IMPLEMENTATION STRATEGY (PLANNING)

1. Teaching Plan
2. Practical/assignments
3. Guest/Expert lectures
4. Slides
5. Case Study
6. Self-Learning Online Resources

11. SUGGESTED LEARNING RESOURCES

| Sr. No. | Title Of Book | Author | Publication |
|----------------|--|---------------------|--------------------|
| 1. | An Embedded Software Primer | David E. Simon | Pearson Education |
| 2. | The 8051 Microcontroller And Embedded Systems | Muhammad Ali Mazidi | Pearson Education |
| 3. | Programming and Customizing the 8051 Microcontroller | Mike Predko | Tata Mc graw Hill |
| 4 | Embedded Systems | Rajkamal | Tata Mc graw Hill |

12. WEB REFERENCES

- 1 www.cis.upenn.edu
- 2 www.nptel.iitm.ac.in
- 3 www.embeddedindia.com
- 4 www.ee.hacettepe.edu.tr





SHRI VILE PARLE KELAVANI MANDAL'S
SHRI BHAGUBHAI MAFATLAL POLYTECHNIC



COMPUTER ENGINEERING DEPARTMENT

13. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

| Sr. No. | TOPIC | | Distribution of Theory Marks | | | |
|---------|--|----|------------------------------|---------|---------|-------------|
| | | | R Level | U Level | A Level | Total Marks |
| 1. | 8051 Microcontroller architecture | 12 | 04 | 06 | 04 | 14 |
| 2. | 8051 Serial and Timer/ Counter Programming | 12 | - | 06 | 06 | 12 |
| 3. | 8051 Interrupts | 12 | 04 | 04 | 04 | 12 |
| 4. | Introduction to embedded system | 10 | 06 | 04 | 02 | 12 |
| 5. | Communication buses & Interrupts Servicing Mechanism | 10 | 04 | 04 | 02 | 10 |
| 6. | RTOS & Interprocess Communication | 8 | 06 | 04 | - | 10 |
| TOTAL | | 64 | 24 | 28 | 18 | 70 |

R Remembering, U Understanding, A Applying, (Bloom's revised taxonomy levels)

NOTE: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of COs. The actual distribution of marks at different taxonomy levels (R, U, A) in the question paper may vary from above table.

14. COURSE EXPERT COMMITTEE MEMBERS

| Sr. No. | | NAME |
|---------|----------|-----------------------------|
| 1 | Internal | Ms. Sharyu Kadam |
| 2 | Internal | Mrs. Prachi Arora |
| 3 | External | Mr. Anil Gurav |
| | | St. Xavier's College, Mahim |





SHRI VILE PARLE KELAVANI MANDAL'S
SHRI BHAGUBHAI MAFATLAL POLYTECHNIC



COMPUTER ENGINEERING DEPARTMENT

1. COURSE DETAILS

| | |
|---|---------------------------|
| Programme: Computer Engineering | Semester: VI |
| Course: Data Visualization Tools | Group: A |
| Course Code: DVT220820 | Duration: 16 Weeks |

2. TEACHING AND EXAMINATION SCHEME

| Scheme of Instructions and Periods per week | | | | | Examination Scheme and Maximum Marks | | | | | | | | |
|---|--------------------|------------------|-------------------|--------------------------|---|-------|-----|----|----|----|----|----|-------|
| Theory Hrs L | Practical Hrs P | Drawing Hrs D | Tutorial Hrs T | Credits (L+P+D +T) | Theory Paper Duration and marks (ESE) | | SSL | TA | TH | TW | PR | OR | TOTAL |
| | | | | | Hours | Marks | | | | | | | |
| - | 02 | - | - | 02 | - | - | - | - | - | 50 | 50 | - | 100 |

3. COURSE OBJECTIVE

This course is designed to provide students with a comprehensive understanding of data visualization tools and their application in various fields. Participants will explore a range of tools and techniques to effectively present data in a visually appealing and informative manner. Through hands-on exercises and real-world examples, students will gain practical skills in selecting the appropriate tools, designing compelling visualizations, and interpreting data insights.

4. SKILL COMPETENCY

The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experiences:

- **Tool Proficiency**
- **Visualization Design**
- **Interpretation Skills**
- **Problem-Solving**

5. COURSE OUTCOMES (COs): At the end of the semester student will be able to: -

| CO No. | COURSE OUTCOME |
|--------|---|
| CO1 | Install visualization tool and set up environment |
| CO2 | Integrate custom visuals on given datasets |
| CO3 | Clean data imported from various sources |
| CO4 | Use slicers in data visualization |
| CO5 | Build interactive dashboard |





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6. CO-PO, CO- PSO MAPPING TABLE

| Course and Code | Course Outcomes | Programme Outcomes | | | | | | | Programme Specific Outcomes | |
|-------------------------------------|-----------------|--------------------|-----|-----|-----|-----|-----|-----|-----------------------------|------|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 |
| Data Visualization Tool (DVT220820) | CO1 | 3 | 2 | 1 | 3 | - | 3 | 2 | 2 | 1 |
| | CO2 | 2 | 2 | 2 | 3 | - | 3 | 3 | 2 | 1 |
| | CO3 | 2 | 2 | 2 | 3 | - | 3 | 3 | 2 | 1 |
| | CO4 | 2 | 1 | 2 | 3 | - | 3 | 2 | 2 | 1 |
| | CO5 | 2 | 3 | 3 | 3 | - | 3 | 2 | 2 | 1 |
| | CO Avg. | 2.2 | 2 | 2 | 3 | - | 3 | 2.4 | 2 | 1 |

7. LIST OF PRACTICALS/ASSIGNMENTS/ TUTORIALS/DRAWINGS

Term Work consists of Journal containing minimum 12 experiments/assignments with approx. no. of hours required and corresponding CO attained are specified here.

| Sr. No. | Title of Experiments | Approx. Hrs. required | CO |
|---------|---|-----------------------|-----|
| 1. | Download and installation of Power BI | 2 | CO1 |
| 2. | Simple Bar Chart and Line Chart: Create a chart representing sales data by region | 2 | CO2 |
| 3. | Map Visualization: Plot sales data on a map to visualize regional performance | 2 | CO2 |
| 4. | Create a table and matrix in Power BI | 2 | CO2 |
| 5. | Create Hierarchies in Power BI | 2 | CO2 |
| 6. | Experiment with custom visuals from the Power BI marketplace to enhance your reports. | 2 | CO2 |
| 7. | Basic Data Import: Import a dataset into Power BI from Excel and find missing values or errors, and clean it by removing duplicates, filling missing values, and correcting errors using Power Query Editor | 2 | CO3 |
| 8. | Implement Drill-down functionality to explore data at different levels of granularity. | 2 | CO4 |
| 9. | Implement basic data filtering using slicers to allow users to filter data by specific criteria such as date range, product category, or region | 2 | CO4 |
| 10. | Apply conditional formatting to highlight performance outliers or trends | 2 | CO4 |
| 11. | Scatter Plot: Explore the relationship between advertising spending and sales | 2 | CO4 |
| 12. | Data Transformation: Use Power Query Editor to perform data transformation tasks such as splitting columns or merging queries. | 2 | CO4 |





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| | | | |
|-----|--|----|---------|
| 13. | Dashboard Creation: Combine multiple visualizations into a cohesive dashboard for executive summaries or regular reporting | 2 | CO5 |
| 14. | Micro project on Power BI | 6 | All COs |
| | Total | 32 | |

8. IMPLEMENTATION STRATEGY (PLANNING)

8. Teaching Plan
9. Minimum no of practical/assignments.
10. Guest/Expert lectures
11. Demonstrations
12. Slides
13. Self-Learning Online Resources

9. SUGGESTED LEARNING RESOURCES

| Sr. No. | Title of Book | Author | Publication |
|---------|--|--------------------------------|-----------------|
| 1. | Mastering Microsoft Power BI | Brett Powell | Packt |
| 2. | Power BI Data Analysis and Visualization | Suren Machiraju, Suraj Gaurav | DEG PRESS |
| 3. | Introducing Microsoft Power BI | Alberto ferari and Macro Russo | Microsoft Press |

10. WEB REFERENCES

1. <https://powerbi-microsoft.com/en-us/desktop>
2. <https://www.microsoft.com/en-us/power-platform/products/power-bi>
3. <https://learn.microsoft.com/en-us/power-bi/fundamentals/power-bi-overview>
4. <https://www.techtarget.com/searchcontentmanagement/definition/Microsoft-Power-BI>
5. <https://www.projectpro.io/article/power-bi-microsoft-projects-examples-and-ideas-for-practice/533>

11. COURSE EXPERT COMMITTEE MEMBERS

| Sr. No. | | NAME |
|---------|-----------------|--|
| 1 | Internal | Mr. Akhilesh R. Gupta |
| 2 | Internal | Mr. Siddhesh U. Masurkar |
| 3 | External | Mr. Vishal Sharma |
| | | Data Scientist, Software Engineer, Esports Analyst |





SHRI VILE PARLE KELAVANI MANDAL'S
SHRI BHAGUBHAI MAFATLAL POLYTECHNIC



COMPUTER ENGINEERING DEPARTMENT

1. COURSE DETAILS

| | |
|--|--------------------------|
| Programme: CSE/ IT | Semester: VI/VI |
| Course: Entrepreneurship Development & Start Up | Group:M |
| Course Code: ESS228924 | Duration:16 Weeks |

2. TEACHING AND EXAMINATION SCHEME

| Scheme of Instructions and Periods per week | | | | | Examination Scheme and Maximum Marks | | | | | | | | |
|---|---------------------------|-------------------------|--------------------------|----------------------|--------------------------------------|-------|-----|----|-----|----|----|----|-------|
| Theory Hrs L | Practical Hrs P | Drawing Hrs D | Tutorial Hrs T | Credits (L+P+D+T) | Theory Paper Duration and marks(ESE) | | SSL | TA | TH | TW | PR | OR | TOTAL |
| | | | | | Hours | Marks | | | | | | | |
| 03 | 02 | - | - | 05 | 03 | 100 | 20 | 10 | @70 | 25 | -- | -- | 125 |

3. COURSE OBJECTIVE

Student will able to developed entrepreneurial abilities by providing background information about support systems, skill sets, financial and risk covering institutions and other for building an enterprise.

4. SKILL COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences.

- **Developed project proposal for start -ups.**

5. COURSE OUTCOMES(COs) At the end of the semester student will be able to: -

| CO No. | COURSE OUTCOME |
|--------|--|
| CO1 | Recognize the qualities of an entrepreneur. |
| CO2 | Identify the business opportunity |
| CO3 | Analyze the financial aspects for the Start-up |
| CO4 | Develop marketing strategy |





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COMPUTER ENGINEERING DEPARTMENT

6. CO-PO, CO-PSO MAPPING TABLE – Computer Engineering

| Course and Code | Course Outcomes | Programme Outcomes | | | | | | | Programme Specific Outcomes | | |
|--|-----------------|--------------------|------|-----|-----|------|------|-----|-----------------------------|------|------|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
| Entrepreneurship Development & Start Up ESS228924 | CO1 | 1 | - | - | - | 1 | 1 | 1 | 1 | 1 | 3 |
| | CO2 | 1 | 2 | 2 | - | 2 | 2 | 1 | 1 | 2 | 3 |
| | CO3 | 1 | 3 | - | 2 | - | - | 1 | 1 | 1 | 3 |
| | CO4 | 1 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 3 |
| | CO Avg | 1 | 2.33 | 2 | 2 | 1.66 | 1.33 | 1 | 1.25 | 1.25 | 3 |

6. CO-PO, CO-PSO MAPPING TABLE – Information Technology

| Course and Code | Course Outcomes | Programme Outcomes | | | | | | | Programme Specific Outcomes | | |
|--|-----------------|--------------------|------|-----|-----|------|------|-----|-----------------------------|------|------|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
| Entrepreneurship Development & Start Up ESS228924 | CO1 | 1 | - | - | - | 1 | 1 | 1 | 1 | 1 | 3 |
| | CO2 | 1 | 2 | 2 | - | 2 | 2 | 1 | 1 | 2 | 3 |
| | CO3 | 1 | 3 | - | 2 | - | - | 1 | 1 | 1 | 3 |
| | CO4 | 1 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 3 |
| | CO Avg | 1 | 2.33 | 2 | 2 | 1.66 | 1.33 | 1 | 1.25 | 1.25 | 3 |





COMPUTER ENGINEERING DEPARTMENT

7.COURSE CONTENTS

| UNIT | TOPIC/Sub-topic | COs |
|------------|---|-----|
| I | <p>Introduction to Entrepreneurship and Start-up:</p> <p>1.1 Definition of Entrepreneurship and Start-up</p> <p>1.2 Qualities of an entrepreneur.</p> <p>1.3 Functions of an entrepreneur</p> <p>1.4 Intrapreneurship</p> <p>1.5 Motivation: Understanding Motivation through Maslow's Need Hierarchy</p> <p>1.6 Roles of entrepreneurs and managers.</p> <p>1.7 Problems and Barriers faced by Entrepreneurs and Start-ups.</p> <p>1.8 Types of Business Structures for start-ups:</p> <ul style="list-style-type: none"> -Sole Proprietorship -Partnership firm -One-person Company -Limited Liability Partnership -Private Limited Company -Public Limited Company | CO1 |
| II | <p>Business/Start-up ideas: Generation and Evaluation</p> <p>2.1 Business Idea Generation:</p> <ul style="list-style-type: none"> - Creativity Process - Innovation - Value creation - Concept of Business Opportunity - Search for Business Opportunity <p>2.2 Idea Evaluation:</p> <ul style="list-style-type: none"> - Dynamics of Project Identification - Design thinking for finding solutions - SWOT analysis for business idea - Prototyping - Value proposition - Test marketing & Customer validation. | CO2 |
| III | <p>Business Plan</p> <p>3.1 Project Report and its contents</p> <ul style="list-style-type: none"> - Information about entrepreneur - Information about project / business - Technical details of proposed project - Financial details of proposed project - CPM, PERT analysis & application - Analysis on profitability and return on investments - Supplementary information <p>3.2 Project appraisal/feasibility</p> | CO2 |





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| | | |
|-----------|--|-----|
| | <ul style="list-style-type: none"> - Steps in project appraisal - Aspects of project appraisal 3.3 Business Location <ul style="list-style-type: none"> - Primary factors for deciding business location - Secondary factors for deciding business location 3.4 Authorities to contact for Various Clearance Certificates. 3.5 Study of balance sheet 3.6 Taxation <ul style="list-style-type: none"> -GST Income Tax | |
| IV | <p>Institutional Support System for Micro, Small and Medium Enterprises:</p> <ul style="list-style-type: none"> 4.1 Small Industries Development Organization (SIDO) 4.2 National small Industries Corporation Limited (NSIC) 4.3 Small Scale Industries Board (SSIB) 4.4 India Investment Centre (IIC) 4.5 Micro, Small and Medium Enterprises – Development Institute (MSME- DI) 4.6 District Industries Centers (DIC) 4.7 Industrial Estates | CO3 |
| V | <p>Startup Funding Stages and Institutional Finance to Entrepreneurs:</p> <p>5.1 Startup Funding Stages:</p> <ul style="list-style-type: none"> - Pre-Seed Funding: The bootstrapping stage - Seed Funding: Product development stage - Series A Funding: First round of VC - Series B Funding: Second round of VC - Series C Funding: Third round of VC - Series D Funding: Special round of funding - IPO: Stock market launch <p>5.2 Institutional Finance to Entrepreneurs:</p> <ul style="list-style-type: none"> - Industrial Development Bank of India (IDBI) -Life Insurance Corporation (LIC) - Small Industries Development Bank of India (SIDBI) -Khadi and Village Industries Commission (KVIC) | CO3 |
| VI | <p>Marketing strategies for Enterprises and Start-ups</p> <ul style="list-style-type: none"> 6.1 Market - Concept, Types 6.2 Micro and Macro Market Environment 6.3 Market Research - Concept, Importance and Process 6.4 Marketing Mix 6.5 Market segmentation 6.6 Digital Marketing: <ul style="list-style-type: none"> - Search engine optimization - Online advertising - Social media marketing - Web analytics - Email marketing - Social media marketing | CO4 |





COMPUTER ENGINEERING DEPARTMENT

8. LIST OF PRACTICALS/ASSIGNMENTS

Term Work consists of Journal containing minimum no of –10 Experiments/assignments.

| Sr. No. | Title of Experiment/Assignment/Exercise/Tutorial/Drawings | Approx.Hrs required | COs |
|---------|--|---------------------|----------------------------|
| 1 | Gather information on Entrepreneurship and Start-up | 2 | CO1 |
| 2 | Develop Business/Start-up ideas: Generation and Evaluation | 2 | CO2 |
| 3 | Prepare Business Plan: Case Study | 4 | CO2 |
| 4 | Classify Institutional Support System for Micro, Small and Medium Enterprises | 2 | CO3 |
| 5 | Identify Startup Funding Stages and Institutional Finance to Entrepreneurs | 4 | CO3 |
| 6 | Select Marketing strategies for Enterprises and Start-ups: Case Studies | 4 | CO4 |
| 7 | Prepare a report on Loan procedure proprietorship | 2 | CO3 |
| 8 | Prepare Balance Sheet: Case Study | 4 | CO3 |
| 9 | To select software product and Services: Case Study | 4 | CO2 |
| 10 | To prepare Project Report on software and services/ Technology hardware and equipment. | 4 | CO1, CO2 CO3, CO4 |
| TOTAL | | 32 | |

9. TEACHERS ASSESSMENT (TA):

Assessment to be based on one of the following tools and rubrics for evaluation of TA to be well defined by course teacher.

1. Quiz
2. Seminar/ Presentation
3. Assignments
4. Case Study

10. IMPLEMENTATION STRATEGY (PLANNING)

1. Teaching/ lab Plan
2. Minimum no of practical/assignments.
3. Industry visit
4. Guest/Expert lectures
5. Demonstrations
6. Slides
7. Self-Learning Online Resources





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COMPUTER ENGINEERING DEPARTMENT

11. SUGGESTED LEARNING RESOURCES

| Sr.No. | Title of Book | Author | Publication |
|--------|--|----------------|---|
| 1 | Entrepreneurship Development | Sangita Sharma | PHI Learning Publication ISBN-978-81-203-5270-4 |
| 2 | Entrepreneurship and Small Business Management | Khanna S. S | S. Chand and Sons, Delhi. ISBN -978-93-5161-094-6 |
| 3 | Entrepreneurship Development | S, Anil Kumar | New Age International, New Delhi. ISBN: 978-81-2241-434-9 |
| 4 | Product Design and Manufacturing | Chitale A.K | PHI Learning Publication ISBN-978-81-203-4873-8 |

12. WEB REFERENCES

1. <http://www.startupindia.gov.in/>
2. <https://www.nstedb.com/index.htm>
3. [NSIC](#): National Small Industries Corporation
4. <https://www.startupindia.gov.in>

13. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

| Unit No. | Unit Title | Teaching Hours | Distribution of Theory Marks | | | |
|----------|---|----------------|------------------------------|---------|---------|-------------|
| | | | R Level | U Level | A Level | Total Marks |
| I | Introduction to Entrepreneurship and Start-up: | 06 | 6 | 4 | --- | 10 |
| II | Business/Start-up ideas: Generation and Evaluation | 08 | 4 | 4 | 4 | 12 |
| III | Business Plan | 08 | 2 | 6 | 4 | 12 |
| IV | Institutional Support System for Micro, Small and Medium Enterprises: | 08 | --- | 4 | 6 | 10 |
| V | Startup Funding Stages and Institutional Finance to Entrepreneurs: | 08 | 2 | 4 | 6 | 12 |
| VI | Marketing strategies for Enterprises and Start-ups | 10 | 2 | 4 | 8 | 14 |
| | TOTAL | 48 | 16 | 26 | 28 | 70 |





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R Remember, U Understand, A Apply and above, (Bloom's revised taxonomy levels)

NOTE: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of COs. The actual distribution of marks at different taxonomy levels (R, U, A) in the question paper may vary from above table

14. COURSE EXPERT COMMITTEE MEMBERS

| Sr. No. | | NAME |
|---------|----------|---------------------------------------|
| 1 | Internal | Mr. Siddhesh Masurkar |
| 2 | Internal | Ms. Pradnya Natekar |
| 3 | External | Mr. Devang Parekh |
| | | Organization: Accenture India, Mumbai |

