ಸ್ಥಾಪನೆ: ೨೦೧೭ Centenary Celebrated Sharnbasveshwar Vidya Vardhaka Sangha's Estd. : 2017

ಶರಣಬಸವ ವಿಶ್ವವಿದ್ಯಾಲಯ
SHARNBASVA UNIVERSITY
ಕಲಬುರಗಿ – ೫೮೫ ೧೦೩
KALABURAGI -585 103

A State Private University approved by Govt. of Karnataka vide Notification No. ED 144 URC 2016 dated 29-07-2017
Recognised by UGC under Section 2f vide No. F.8-29/2017 (CPP-I/PU), dated 20-12-2017 & AICTE, CoA, PCI New Delhi

# CURRICULUM

## Outcome Based Education

## 2022 – 2023

# ARTIFICIAL INTELLIGENCE
# AND
# MACHINE LEARNING

## V & VI SEMESTER B. Tech.

## FACULTY OF ENGINEERING ANF TECHNOLOGY (EXCLUSIVELY FOR WOMEN)

## SHARNBASVA UNIVERSITY, KALABURAGI

## About Sharnbasva University

Sharnbasva University established in the year 2017, is the first private multi-disciplinary university in the entire North Karnataka providing avenues for students to pursue higher education in almost all fields of education such as Engineering, Management, Science, commerce, Architecture, Pharmaceutical Sciences, Humanities, and Social Sciences. Providing quality education at an affordable cost has been the hallmark of the university. The university has set itself on the path to one of the emerging centres of excellence and a world-class University, which is the dream of Poojya Dr. Sharnbaswappa Appa, the visionary chancellor of the youngest private university in the entire state.

The Sharnbasva University is backed by the rich legacy of more than 100 years of providing quality education to the deprived sections of the people in the educationally backward Kalaburagi and neighbouring districts. The Sharnabasaveshwar Vidya Vardak Sangha, under whose aegis the Sharnbasva University is functioning, has the honor of starting the first school exclusively for girls way back in 1934 opening doors of learning to the girls. The legacy of providing optimum importance to girl education has continued to this day and the Sangha was the first to start an exclusive engineering college for women in the entire North Karnataka and the second in the entire Karnataka. This College is now part of Sharnbasva University. The university houses five Center of Excellence (CoE) in Artificial Intelligence, Machine Learning, the Internet of Things, Drone Technology, 5G and 6G Technology Lab.

**The institution offers:**

- 4-year undergraduate program - Bachelor of Technology (in Artificial Intelligence & Data Science, Civil, Computer Science, Computer System Design, Energy Engineering, Electronics & Communication, Electrical & Electronics, Mechanical).

- 4-year undergraduate program (Exclusively for Women) - Bachelor of Technology (in Artificial Intelligence & Machine Learning, Civil, Computer Science, Electronics & Communication, Electrical & Electronics, Mechanical).

- 2-Year Post Graduate Programs - Master of Technology (Structural Engineering, VLSI Design & Embedded Systems, Machine Design, Computer Science and Engineering, Computer Network Engineering, Artificial Intelligence and Data Science, Digital Electronics) and Ph. D Programs

- 2-Year Post Graduate Programs - Master of Technology (Exclusively for Women) (Computer Science and Engineering, Digital Communication and Networking) and Ph. D Programs

- 5 Years Under program – Bachelor of Architecture (B. Arch.)

- 3-Year undergraduate programs – Bachelor of Computer Applications (BCA), – Co-Education and Exclusively for Women, Bachelor of Business Administration (BBA) BBA (HR, Finance and Marketing)– Co-Education and Exclusively for Women, BBA (Logistics), BBA (Tourism & Travel Mgmt.), BBA (Aviation and Air cargo) for Exclusively for Women.

- 2-Year Post Graduate programs - Master of Computer Application (MCA) and Ph. D Programs.

- 2-Year Post Graduate programs - Master of Business Administration (MBA) – Co-Education and Exclusively for Women, MBA (Tourism), MBA (Hospital Administration). Master of Commerce and Ph. D programs.

- 2-Year Post Graduate Programs – Master of Arts (MA) – MA (Kannada, English), MA (Fine Arts), MA (Journalism and Mass Comm.), MA (Music), MA (Visual Arts) and Ph. D Programs.

- 2 Year Post Graduate Programs – Master of Science (M. Sc.) – M. Sc. (Physics), M. Sc. (Mathematics), M. Sc. (Botany), M. Sc. (Zoology) and Ph. D Programs.

**University Vision:**

- Enhancing the horizon of world knowledge by promoting international understanding through imparting quality education and creating value added skill based human resource.
- We aspire to become top ranking National and International Centre of Excellence producting high caliber leaders and captains of Industry.
- Inculcating the spirit of "Vasudaiva Kudumbakam" (The world is one family).
- "Sakala Jeevathmarige Lesane Bayasuva" (Wishing the worldly good and betterment of all the living beings) is our moto.

**University Mission**

- Achieving academic excellence through innovatively designed, research intensive, industry-oriented education.
- Imbibing the culture of independent thinking, independent writing, independent speaking and independent living among the students in all the activities.
- Foster the spirit of National development and develop global competencies. Nurture creativity and encourage entrepreneurship and provide an education with rigor and relevance.
- Provide academically excellent, time efficient, and cost-effective higher education. Provide an education which enhances the ability of students to learn throughout the life.
- Ensure freedom of thought and expression and a campus without discrimination. Encourage the spirit of questioning and ensure close inter-relationship between Teaching, Scholarship and Research.
- Develop and deliver distinctive and value driven academic programme that are flexible and responsible to Local, National and International needs.
- Cultivate academic, business and community driven partnership that positions the University as a leading choice for adult learners.
- To work effectively with other institutions and organisations, where such partnerships can lead to understanding research and teaching.

## About Faculty of Engineering and Technology (Exclusively for Women):

The Faculty of Engineering and Technology (Exclusively for Women) (FETW), formerly known as Godutai Engineering College for Women, was established in 2017. It is the only women's engineering college in the entire northern backward part of Karnataka state, meeting the rapidly growing need for women professionals in technology. Nurturing young minds in an innovative and progressive learning environment, we are committed to promoting technical education as a catalyst for the country's and society's growth and development, a dream of our Chancellor and President, Poojya Dr. Sharnbaswappa Appa. With world-class infrastructure and experienced faculty, the Faculty of Engineering and Technology is the preferred destination for technocrats shaping the future.

FETW offers the following B.Tech. (Undergraduate) programs:

- Artificial Intelligence and Machine Learning (AI & ML) – 60 seats
- Civil Engineering (CV) – 60 seats
- Computer Science and Engineering (CSE) – 150 seats
- Electrical and Electronics Engineering (EEE) – 60 seats
- Electronics and Communication Engineering (ECE) – 120 seats

M. Tech. (Postgraduate) programs:

- Computer Science and Engineering (CSE) – 18 seats
- Digital Communication and Networking (DCN) – 18 seats

Research Programs (Ph.D.):

- Computer Science and Engineering
- Electronics and Communication Engineering
- Electrical and Electronics Engineering
- Basic Sciences (Physics, Chemistry, Mathematics)

**Vision of the Institute**

> **We aspire to become global model for women professional through quality education and ethical values in the field of engineering and technology.**

**Mission of the Institute**

- **To inspire a research culture, encourage entrepreneurial efforts and empower globally to be great leaders.**
- **To create technical women's power to meet the current and future demand of the industry.**
- **To develop women professionals with good academic knowledge, technical skills, strong ethics and above all good human being.**

## About the Department:

The Department of B. Tech. in Artificial Intelligence and Machine Learning (AI and ML) at the Faculty of Engineering and Technology (Exclusively for Women) was established in the year 2021 with an intake of 60 students. It is a four-year full-time undergraduate program recognized by the All-India Council for Technical Education (AICTE). Artificial Intelligence and Machine Learning aim to develop a strong foundation by using principles and technologies that consist of many facets of Artificial Intelligence, including logic, knowledge representation, probabilistic models, and machine learning.

To nourish the young minds, the department has a team of dedicated and experienced faculty with good infrastructure, curriculum, comprehensive hands-on experience, and conducting research in the field of Artificial Intelligence & Machine Learning.

The department has well-equipped laboratories with higher configuration systems along with a smartboard available in the laboratory to provide the best to the students. The department has a wide technical spectrum through the centre of excellence, special labs, industrial tie-ups, collaborations, MOUs, and online forums.

## Vision

To train women professionals to create sustainable, intelligent solutions that work with natural intelligence to empower future generations digitally while protecting social ethics.

## Mission

1. To provide female students with the necessary foundational skills to pursue a successful career in the field of computer science and engineering, with a focus on artificial intelligence and machine learning.
2. To Improve academic outcomes through location-based education and relationships with established research laboratories and enterprises.
3. To Inspire young women to pursue entrepreneurial endeavours and help them grow into influential leaders.

## Program Educational Outcomes (PEOs)

After a few years of graduation with a B. Tech. in Artificial Intelligence and Machine Learning, the girl graduates will be able:

- PEO-1: To analyse the problems by applying the principles of computer science, mathematics, and scientific investigation to build intelligent machines, software, or applications using the latest technologies to solve problems of the real world.
- PEO-2: To start an enterprise to improve the economy of the country by providing support to the customer for a lifelong learning attitude.
- PEO-3: To Pursue higher studies with research potential in the field of Artificial intelligence, Engineering in allied areas and continue to learn by participating in conferences, and seminars, etc.

## Program Outcomes (POs)

On successful completion of the program, the graduates of the B. Tech. in Artificial Intelligence and Machine Learning program will be able to:

- **PO 1: Engineering knowledge:** Apply the knowledge of mathematics, science, and engineering fundamentals for the solution of complex problems in Artificial Intelligence and Machine Learning.
- **PO 2: Problem analysis:** Identity, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions using the first principles of mathematics, nature, and engineering sciences.
- **PO 3: Design/development of solution:** Design solutions for complex engineering problems and design system components, and processes to meet the specifications with consideration for public health and safety, and cultural, societal, and environmental considerations.
- **PO 4: Conduct Investigation of a complex problem:** Use research-based knowledge including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.
- **PO 5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- **PO 6: Engineering and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **PO 7: Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **PO 8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
- **PO 9: Individual and Teamwork:** Function effectively as an individual, and as a member or leader in teams, and multidisciplinary settings.
- **PO 10: Communication:** Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective report documentation. Make effective presentations and give and receive clear instructions.
- **PO 11: Project management and finance:** Demonstrate knowledge and understanding of engineering and management principles and apply these to one's work, as a member and leader in a team. Manage projects in multidisciplinary environments.

- **PO 12: Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## Program-Specific Outcomes (PSOs)

Upon successful completion of the B. Tech. in Artificial Intelligence and Machine Learning (AI and ML) program, graduates will possess the following abilities:

**PSO 1:** Understand, analyze, and develop vital skills in areas related to computer science and artificial intelligence, with a focus on underlying statistical and computational principles. Apply this knowledge to solve practical problems.

**PSO 2:** Demonstrate the ability to implement AI and ML techniques, including search algorithms, neural networks, machine learning, and data analytics, for solving problems and designing novel algorithms. Develop skills essential for a successful career and entrepreneurship.

**PSO 3:** Utilize modern tools and techniques in computer science, artificial intelligence, and data science.

## Semester wise Credit Breakdown for B. Tech. Degree Curriculum Batch 2021-24

| | First | Second | Third | Fourth | Fifth | Sixth | Seventh | Eight | Total Credits |
|---|---|---|---|---|---|---|---|---|---|
| **Basic Sciences (BSC)** | 7 | 7 | 3 | 3 | - | - | - | - | 20 |
| **Engineering Sciences (ESC)** | 10 | 10 | - | - | - | - | - | - | 20 |
| **Humanities, Social Sciences and Management (HSMC)** | 1 | 1 | 1 | 1 | - | 4 | 1 | - | 9 |
| **Ability Enhancement Course (AEC)** | 1 | 1 | 1 | 1 | 1 | 1 | - | - | 6 |
| **Professional Core Courses (PCC)** | - | - | 15 | 15 | 12 | 5 | 12 | - | 59 |
| **Professional Elective Courses (PEC)** | - | - | - | - | 3 | 6 | 3 | - | 12 |
| **Institutional Open Elective Courses (IOE)** | - | - | - | - | 4 | 4 | 4 | - | 12 |
| **Internship (INT)** | - | - | - | - | - | - | - | 7 | 7 |
| **Mini Project / Project Work (PW)** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 15 |
| **Total Credits** | **20** | **20** | **21** | **21** | **21** | **21** | **21** | **15** | **160** |

**Sharnbasva University, Kalaburagi**
**Scheme of Teaching and Examination 2022-23**
**[As Per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS)**
**(Effective from the academic year 2022-23)**

**Programme: B.Tech: Artificial Intelligence And Machine Learning**

**V SEMESTER**

| Sl. No. | Course Code | | Course Title | Teaching Department | Teaching Hours/week | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Theory | Tutorial | Practical/ Drawing | Duration inHours | CIE Marks | SEE Marks | Total Mark | |
| | | | | | L | T | P | | | | | |
| 1 | HSS | 22HSM51 | Management and Entrepreneurship Development | Humanities | 3 | | | 3 | 50 | 50 | 100 | 03 |
| 2 | PCC | 22AM52 | Machine Learning | CSE/AIML | 2 | 1 | | 3 | 50 | 50 | 100 | 03 |
| 3 | PCC | 22CS53 | Computer Networks | CSE/AIML | 2 | 1 | | 3 | 50 | 50 | 100 | 03 |
| 4 | PEC | 22AM54X | Professional Elective Course-I | CSE/AIML | 2 | 1 | | 3 | 50 | 50 | 100 | 03 |
| 5 | OEC | 22AM55X | Open Elective Course-I | CSE/AIML | 2 | 1 | | 3 | 50 | 50 | 100 | 04 |
| 6 | PCC | 22AML56 | Machine Learning Lab | CSE/AIML | | | 2 | 3 | 50 | 50 | 100 | 01 |
| 7 | PCC | 22CSL57 | Computer Networks Lab | CSE/AIML | | | 2 | 3 | 50 | 50 | 100 | 01 |
| 8 | PEC | 22AML58 | System Software and Compiler design Lab | CSE/AIML | | | 2 | 3 | 50 | 50 | 100 | 01 |
| 9 | PW | 22PRJ59 | Project-V | CSE/AIML | | | 2 | 3 | 50 | 50 | 100 | 01 |
| 10 | AEC | 22AM510X | Ability Enhancement Course-V | CSE/AIML | | | 2 | 3 | 50 | 50 | 100 | 01 |
| **Total** | | | | | **11** | **4** | **10** | **30** | **500** | **500** | **1000** | **21** |

Note: PCC- Programme Core Course, PEC- Professional Elective Course, PW-Project Work, HSS-Humanity and Social Science, OEC- Open Elective Course, AEC- Ability Enhancement Course.

Project(PRJ): A Batch of 4 students (Same Branch or Different Branches with a Guide, May undertake one project.

| Open Elective Course-I (offered by the Department to other Department students) | |
|---|---|
| **Course code under 21XX55X** | **Course Title** |
| **22AM551** | Artificial Intelligence |
| **22AM552** | Machine Learning |
| **Ability Enhancement Course-V** | |
| **Course code under 22AEC510X** | **Course Title** |
| **22AM510A** | AWS Cloud |
| **22AM510B** | Power BI |
| **AICTE Activity Points:** In case students fail to earn the prescribed activity points, eighth semester Grade Card shall be issued only after earning the required activity points. Student shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card. | |

**Sharnbasva University, Kalaburagi**
**Scheme of Teaching and Examination 2022-23**
**[As Per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]**
**(Effective from the academic year 2022-23)**

**Programme: B.Tech: Artificial Intelligence And Machine Learning**

**VI SEMESTER**

| Sl. No. | Course Code | | Course Title | Teaching Department | Teaching Hours/week | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Theory Lecture | Tutorial | Practical | Duration in Hours | CIE Marks | SEE Marks | Total Marks | |
| | | | | | L | T | P | | | | | |
| 1 | PCC | 22CS61 | Software Engineering | CSE/AIML | 2 | 1 | | 3 | 50 | 50 | 100 | 03 |
| 2 | PCC | 22AD62 | Big Data Analytics | CSE/AIML | 2 | 1 | | 3 | 50 | 50 | 100 | 03 |
| 3 | PEC | 22AM63X | Professional Elective Course-II | CSE/AIML | 2 | 1 | | 3 | 50 | 50 | 100 | 03 |
| 4 | PEC | 22AM64X | Professional Elective Course-III | CSE/AIML | 2 | 1 | | 3 | 50 | 50 | 100 | 03 |
| 5 | OEC | 22XX65X | Open Elective Course-II | CSE/AIML | 3 | 1 | | 3 | 50 | 50 | 100 | 04 |
| 6 | PCC | 22ADL66 | Big Data Analytics Lab | CSE/AIML | | | 2 | 3 | 50 | 50 | 100 | 01 |
| 7 | PCC | 22AML67 | Professional Elective Course-II Lab | CSE/AIML | | | 2 | 3 | 50 | 50 | 100 | 01 |
| 8 | PEC | 22AML68X | Professional Elective Course-III Lab | CSE/AIML | | | 2 | 3 | 50 | 50 | 100 | 01 |
| 9 | PW | 22PRJ69 | Project-VI | CSE/AIML | | | 2 | 3 | 50 | 50 | 100 | 01 |
| 10 | HSS | 22HSM610 | Research Methodology and Intellectual Property Rights | Humanities | 1 | | | 2 | 50 | 50 | 100 | 01 |
| 11 | AEC | 22AM611X | Ability Enhancement Course-VI | | | | 2 | 3 | 50 | 50 | 100 | 01 |
| **Total** | | | | | **12** | **5** | **10** | **32** | **550** | **550** | **1100** | **22** |

Note: PCC-Professional Core Course, PEC-Professional Elective Course, OEC-Open Elective Course, PW-Project Work, HSS-Humanity and Social Science, AEC- Ability Enhancement Course. Internship-To be carried out during the vacation/s of VI and VII semesters or VII and VIII semesters

Project (PRJ): A Batch of 4 students (Same Branch or Different Branches with a Guide, May undertake one project.

**Open Elective Course-I (offered by the Department to other Department students)**

| Course code under 21XX65X | Course Title |
|---|---|
| **22AM651** | Artificial Intelligence and Machine learning |
| **22AM652** | Fundamentals of Data Science |
| **Ability Enhancement Course-VI** | |
| **Course code under 22AEC611X** | **Course Title** |
| **22AM611A** | AWS Framework |
| **22AM611B** | Generating and Explainable AI |
| **AICTE Activity Points:** In case students fail to earn the prescribed activity points, eighth semester Grade Card shall be issued only after earning the required activity points. Student shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card. | |

# MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

[As per NEP, Outcome Based Education, and Choice Based Credit System (CBCS) Scheme]
SEMESTER-V
w.e.f the academic Years 2024-25

| | | | |
|---|---|---|---|
| Subject Code | 22HSM51 | CIE Marks | 50 |
| Number Lecture Hour/Week | 03 | SEE Marks | 50 |
| Number of Lecture Hours | 40 | Exam Hours | 03 |

**CREDITS-03**

**Course Objectives** The objectives of the course are to enable students to:

1. Understand basic skills of Management.
2. Understand the need for Entrepreneurs and their skills.
3. Identify the Management functions and social responsibilities.
4. Distinguish between management and administration.
5. Understand Project identification and Selection.

| **Module - I** | **Teaching Hours** |
|---|---|
| **Management:** Introduction-Meaning-Nature and characteristics of management, Scope and Functional areas of management- Management as art of science, art or profession-Management & Administration-Roles of Management, Levels of Management, Development of Management Thought-Early management approaches-Modern management approaches.<br><br>**Planning**: Nature, Importance and purpose of planning process objectives-types of plans (meaning only)-decision making, Importance of planning-steps in planning & planning premise- Hierarchy of plans. | 08 Hours |
| **Module - II** | |
| **Organizing and Staffing:** Organization-Meaning, Characteristics, Process of Organizing, Principles of Organizing, Span of Management (meaning and importance only), Departmentalization, Committees–Meaning, Types of Committees; Centralization Vs Decentralization of Authority and Responsibility; **Staffing-**Need and Importance, Recruitment and Selection Process.<br><br>**Directing:** Meaning and Requirements of Effective Direction, Giving Orders; Motivation-Nature of Motivation, Motivation Theories (Maslow's Need-Hierarchy Theory and Herzberg's Two Factor Theory); Communication – Meaning, Importance and Purposes of Communication; Leadership-Meaning, Characteristics, Behavioral Approach of Leadership. | 08 Hours |
| **Module - III** | |
| **Coordination:** Coordination-Meaning, Types, Techniques of Coordination;<br>**Controlling –** Meaning, Need for Control System, Benefits of Control, Essentials of Effective Control System, Steps in Control Process.<br>**Authority delegation:** Meaning, advantage of effective delegation, barriers to effective delegation, guidelines for effective delegation.<br>Decentralization: Decentralization of authority meaning, distinction between delegation and decentralization, the trade-off of centralization and decentralization. | 08 Hours |

| Module - IV | |
|---|---|
| **Entrepreneurship:** Definition of Entrepreneur, Importance of Entrepreneurship, concepts of Entrepreneurship, Characteristics of successful Entrepreneur, Classification of Entrepreneurs, Myths of Entrepreneurship, Entrepreneurial Development models, Entrepreneurial development cycle.<br><br>**Modern Small Business Enterprises:** Role of Small Scale Industries, Impact of Globalization and WTO on SSIs, Concepts and definitions of SSI Enterprises, Government policy and development of the Small Scale sector in India, Growth and Performance of Small Scale Industries in India, Sickness in SSI sector, Problems for Small Scale Industries, Ancillary Industry and Tiny Industry (Definition only) . | 08 Hours |
| **Module - V** | |
| **Projects Management:** A Project. Search for a Business idea: Introduction, Choosing an Idea, Selection of product, The Adoption process, Product Innovation, Product Planning and Development Strategy, Product Planning and Development Process. Concepts of Projects and Classification: Introduction, Meaning of Projects, Characteristics of a Project, Project Levels, Project Classification, Aspects of a Project, The project Cycle, Features and Phases of Project management, Project Management Processes. Project Identification: Feasibility Report, Project Feasibility Analysis. Project Formulation: Meaning, Steps in Project formulation, Sequential Stages of Project Formulation, Project Evaluation.<br>**Project Design and Network Analysis:** Introduction, Importance of Network Analysis, Origin of PERT and CPM, Network, Network Techniques, Need for Network Techniques, Steps in PERT, CPM, Advantages, Limitations and Differences. | 08 Hours |

**Course Outcomes**: After studying this course, students will be able to:

CO-1-Understand the fundamental concepts of Management and Entrepreneurship and opportunities in order to setup a business.

CO-2-Select a best Entrepreneurship model for the required domain of establishment.

CO-3-Compare various types of Entrepreneurs.

CO-4-Awareness about various sources of funding and institutions supporting entrepreneurs.

CO-5-Analyze the Institutional support by various state and central government agencies.

**Text Books:**


1. Principles of Management – P.C Tripathi, P.N Reddy, McGraw Hill Education, 6th Edition, 2017. ISBN-13:978-93-5260-535-4.
2. Entrepreneurship Development Small Business Enterprises- Poornima M Charantimath, Pearson Education 2008, ISBN 978-81-7758-260-4.
3. Dynamics of Entrepreneurial Development and Management by Vasant Desai. HPH 2007, ISBN: 978- 81-8488-801-2.
4. Robert D. Hisrich, Mathew J. Manimala, Michael P Peters and Dean A. Shepherd, "Entrepreneurship", 8th Edition, Tata Mc-Graw Hill Publishing Co.ltd.-new Delhi, 2012


**Reference Books:**


1. Essentials of Management: An International, Innovation and Leadership perspective by Harold Koontz, Heinz Weih rich McGraw Hill Education, 10th Edition 2016. ISBN- 978-93-392-2286-4.

# MACHINE LEARNING

[As per NEP, Outcome Based Education, and Choice Based Credit System (CBCS) Scheme]
SEMESTER-V
w.e.f the academic Years 2024-25

| | | | |
|---|---|---|---|
| **Subject Code** | **22AM52** | **CIE Marks** | **50** |
| **Number of Lecture Hours/Week** | **03** | **SEE Marks** | **50** |
| **Total Number of Lecture Hours** | **40** | **Exam Hours** | **03** |

**CREDITS – 03**

**Course objectives:** This course will enable students

- Define machine learning and problems relevant to machine learning.
- Differentiate supervised, unsupervised and reinforcement learning
- Apply neural networks, Bayes classifier and k nearest neighbor, for problems appear in machine learning.
- Perform statistical analysis of machine learning techniques.

| **Module I** | **Teaching Hours** |
|---|---|
| **Introduction:** What Is Machine Learning (ML)? Uses and Applications with examples, Types of Machine Learning, Main Challenges of Machine Learning Well posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning. Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias. Text Book1, Sections: 1.1 – 1.3, 2.1-2.5, 2.7 | 08 Hours |
| **Module II** | |
| **Supervised Learning:** Decision Tree Learning: Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning. | 08 Hours |
| **Module III** | |
| **Artificial Neural Networks:** Introduction, Neural Network representation, Appropriate problems, Perceptrons, Backpropagation algorithm. | 08 Hours |
| **Module IV** | |
| **Bayesian Learning:** Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting probabilities, MDL principle, Naive Bayes classifier, Bayesian belief networks, EM algorithm. | 08 Hours |
| **Module V** | |
| **Evaluating Hypothesis:** Motivation, estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypothesis, Comparing learning algorithms. Instance Based Learning: Introduction, k-nearest neighbor learning, locally weighted regression, radial basis function, cased-based reasoning, Reinforcement Learning: Introduction, Learning Task, Q Learning | 08 Hours |

**Course Outcomes: After studying this course,**

Students should be able to:

CO1: Identify the problems for machine learning. And select the either supervised, unsupervised or reinforcement learning.

CO2: Explain theory of probability and sta-tistics related to machine learning

CO3: Investigate Perceptron's, Back Propagation Algorithms.

CO4: Investigate Concept Learning, Bayes classifier, EM Algorithm.

CO5: Illustrate Hypothesis, k nearest neighbor, Q Learning.

**Question paper pattern:**

The question paper will have ten questions.

- There will be 2 questions from each module.
- Each question will have questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

**Text Books:**

1. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

**Reference Books:**

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning, 2nd edition, springer series in statistics.
2. Introduction to Machine Learning, Ethem Alpaydin, PHI Learning Pvt. Ltd, 3rd Edition, 2018.
3. Hands-on machine learning with Scikit-Learn and TensorFlow: concepts, tools, and techniques to build intelligent systems, Aurelien Geron, O'Reilly Media, 2019.

**Online course materials and E books**

1. https://www.geeksforgeeks.org/machine-learning/
2. https://github.com/JacobJeppesen/ML-Course
3. https://www.youtube.com/watch?v=rnEEHT9-c5I
4. https://github.com/shahumar/Free-Machine-Learning-Books

**Online Courses and Video Lectures**

1. https://nptel.ac.in/courses/106106139
2. https://onlinecourses.nptel.ac.in/noc23_cs18/preview
3. https://www.udemy.com/topic/machine-learning/?srsltid=AfmBOooXU9sm-LQYwxrx6XWYr6ztdLXOQN66cgmkO67q7gdISuIwEIZ3
4. https://developers.google.com/machine-learning/crash-course

# COMPUTER NETWORKS

[As per NEP, Outcome Based Education, and Choice Based Credit System (CBCS) Scheme]
SEMESTER-V
w.e.f the academic Years 2024-25

| | | | |
|---|---|---|---|
| **Subject Code** | **22CS53** | **CIE Marks** | **50** |
| **Number Lecture Hour/Week** | **03** | **SEE Marks** | **50** |
| **Number of Lecture Hours** | **40** | **Exam Hours** | **03** |

**CREDITS-03**

**Course objectives:**

- Explore basic concepts of data communication
- Understand the working of Datalink Layer
- Learn network layer services and IP versions.
- Discuss transport layer services and understand UDP and TCP protocols.
- Demonstrate the working of different Application layer protocols.

| **Modules** | **Teaching Hours** |
|---|---|
| **Module I** | |
| **Introduction:** Data Communications, Networks, Network Types, Networks Models: Protocol Layering, TCP/IP Protocol suite, The OSI model, Introduction to Physical Layer: Transmission media, Guided Media, Unguided Media: Wireless. Switching: Packet Switching and its types. | 08 Hours |
| **Module II** | |
| **Data Link Layer:** Error Detection and Correction: Introduction, Block Coding, Cyclic Codes. Data link control: DLC Services: Framing, Flow Control, Error Control, Connectionless and Connection Oriented, Data link layer protocols, High Level Data Link Control. Media Access Control: Random Access, Controlled Access. Check Sum and Point to Point Protocol | 08 Hours |
| **Module III** | |
| **Network Layer:** Network layer Services, Packet Switching, IPv4 Address, IPv4 Datagram, IPv6 Datagram, Introduction to Routing Algorithms, Unicast Routing Protocols: DVR, LSR, PVR, Unicast Routing protocols: RIP, OSPF, BGP, Multicasting Routing-MOSPF | 08 Hours |
| **Module IV** | |
| **Transport Layer:** Introduction, Transport-Layer Protocols: Introduction, User Datagram Protocol, Transmission Control Protocol: services, features, segments, TCP connections, flow control, Error control, Congestion control | 08 Hours |
| **Module V** | |
| **Application Layer:** Introduction, Client-Server Programming, Standard Client Server Protocols: World Wide Web and HTTP, FTP, Electronic Mail, Domain Name System (DNS), TELNET, Secure Shell (SSH) | 08 Hours |

**Course Outcomes:**

**CO1: Understand Networking Basics**: Explain data communication, network models, and transmission media.

**CO2: Apply Data Link Concepts**: Implement error control, framing, and media access techniques.
CO3: **Analyze Network Layer**: Evaluate addressing, datagrams, and routing protocols.
**CO4: Comprehend Transport Layer**: Describe TCP/UDP features and control mechanisms.
CO5: **Explore Application Protocols**: Utilize standard client-server protocols and secure communication tools.

**TEXT BOOKS**:

1. Data Communications and Networking, Behrouz A. Forouzan, Fourth Edition TMH.

**REFERENCE BOOKS**:

1. Computer Networks, Andrew S Tanenbaum, 6th Edition. Pearson Education.
2. Computer Networking: A Top-Down Approach Featuring the Internet. James F. Kurose & Keith W. Ross, 3rd Edition, Pearson Education
3. Data communications and Computer Networks, P.C Gupta, PHI. 4. An Engineering Approach to Computer Networks, S. Keshav, 2nd Edition, Pearson Education.

**Web links and Video Lectures (e-Resources):**

1. https://www.digimat.in/nptel/courses/video/106105183/L01.html
2. http://www.digimat.in/nptel/courses/video/106105081/L25.html
3. https://nptel.ac.in/courses/10610

# SYSTEM SOFTWARE AND COMPILER DESIGN

[As Per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme] (Effective from the academic year 2022-2023)

**SEMESTER – V**

| | | | |
|---|---|---|---|
| **Subject Code** | 22AM542 | **CIE Marks** | **50** |
| **Number of LectureHours/Week** | 3:0:0 | **SEE Marks** | **50** |
| **Total Number of Lecture Hours** | 40 | **Exam Hours** | **03** |

**CREDITS-03**

**Prerequisites:**

Automata Theory and Formal Languages: Understanding finite automata, regular expressions, context- free grammars, and formal language theory provides a foundation for understanding compiler design and parsing techniques.

**Course objectives:**

This course will enable students to:

- Define System Software.
- Familiarize with source files, object files, and executable file structures and libraries
- To Teach concepts of language translation and phases of compiler design
- To demonstrate the common forms of parsers
- To demonstrate intermediate code using technique of syntax-directed translation

| Modules | Teaching Hours |
|---|---|
| **Module I** | |
| Introduction to System Software, Machine Architecture of SIC and SIC/XE. **Assemblers:** Basic assembler functions, machine-dependent assembler features, machine-independent assembler features, and assembler design options. Basic Loader Functions<br>**RBT: L1, L2, L3** | 10 Hours |
| **Module II** | |
| **Introduction to Compiler:** Language Processors, The structure of a compiler, The evolution of Programming Language, The Science of Building Compilers, Applications of Compiler Technology. **Lexical Analysis:** The role of lexical analyzer, Input buffering, Specifications of token, Recognition of tokens.<br>**RBT: L1, L2, L3** | 10 Hours |
| **Module III** | |
| Syntax Analysis: Introduction, Writing a Grammar, Top-Down Parsing: RD Parsing, First and Follow, LL(1) Grammar, Error Recovery in Predictive Parsing, Bottom-Up Parsers: Parsing, Handle Pruning, Shift Reduce Parsing, Conflicts During Shift Reduce Parsing, Why LR Parsers?, Items and LR(0) Automaton.<br>**RBT: L1, L2, L3** | 10 Hours |
| **Module IV** | |

| | |
|---|---|
| Lex and Yacc –The Simplest Lex Program, Grammars, Parser-Lexer Communication, A YACC Parser, The Rules Section, Running LEX and YACC, LEX and Hand-Written Lexers, Using LEX – Regular Expression, Examples of Regular Expressions, A Word Counting Program, Using YACC – Grammars, Recursive Rules, Shift/Reduce Parsing, What YACC Cannot Parse, A YACC Parser- The Definition Section, The Rules Section, The LEXER, Compiling and Running a Simple Parser, Arithmetic Expressions and Ambiguity.<br>**Textbook 3: Chapters 1,2 and 3.**<br>**RBT: L1, L2, L3** | 10 Hours |
| **Module V** | |
| Syntax Directed Translation: SDD, Evaluation Orders for SDDs, Application of Syntax Directed Translation, Intermediate code generation: Variants of Syntax Tree,Three Address Code, Code generation: Issue in the Design of a Code Generator.<br>**Textbook 2: Chapters 5.1, 5.2, 5.3, 6.1, 6.2, 8.1**<br>**RBT: L1, L2, L3** | 08 Hours |

**Course outcomes:**

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

- Understand the concepts of assemblers, loaders, and linkers.
- Describe the front-end and back-end phases of the compiler and their importance to students.
- Understand the concepts of compilers and design top-down and bottom-up parsers.
- Utilize Lex and Yacc tools for implementing different concepts of system software.
- Design and develop lexical analyzers, parsers, and code generators.

**Textbooks:**


1. System Software by Leland. L. Beck, D Manjula, 3rd edition, 2012
2. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers-Principles, Techniques and Tools, Pearson, 2nd edition, 2007
3. Doug Brown, John Levine, Tony Mason, Lex & Yacc, O'Reilly Media, October 2012.


**Reference Books:**


1. Systems programming – Srimanta Pal, Oxford University Press, 2016
2. System programming and Compiler Design, K C Louden, Cengage Learning
3. System software and operating system by D. M. Dhamdhere TMG
4. Compiler Design, K Muneeswaran, Oxford University Press 2013.

# MICROCONTROLLER AND MICROPROCESSOR

[As per NEP, Outcome Based Education, and Choice Based Credit System (CBCS) Scheme]
SEMESTER-V
w.e.f the academic Years 2024-25

| | | | |
|---|---|---|---|
| Subject Code | 22EC551 | CIE Marks | 50 |
| Number of Lecture Hours/Week | 04 | SEE Marks | 50 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |

**CREDITS-04**

**Course objectives:** Students will be taught to:

1. Understand the basics of microcontroller, Embedded systems and architecture of 8051microcontrollers.
2. Explain and analyze the instruction sets of 8051microcontrollers and also to write the Assembly Level Programs using 8051 Instruction set.
3. Understand and write peripheral programming for timers, serial port and Interrupt system of 8051.
   Analyze the Application and Interfacing of 8051Microcontroller to I/O devices.
4. To develop an Understand the basics of microprocessors. architecture of 8086 microprocessors.
5. Analyze and write the Assembly language programs of 8086

| **Module I** | **Teaching Hours** |
|---|---|
| **8051 Microcontroller:** Microprocessor Vs Microcontroller, Embedded Systems, Embedded Microcontrollers, 8051 Architecture- Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing. | **10 Hours** |
| **Module II** | |
| **8051 Instruction Set:** Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions. Simple Assembly language program examples (without loops) to use these instructions. | **10 Hours** |
| **Module III** | |
| **8051 Interrupts and Interfacing Applications**: 8051 Interrupts. 8051 Assembly language programming to generate an external interrupt using a switch, 8051 C programming to generate a square waveform on a port pin using a Timer interrupt. Interfacing 8051 to ADC-0804, DAC, LCD and Stepper motor and their 8051 Assembly language interfacing programming | **10 Hours** |
| **Module IV** | |
| **8086 Architecture:** 8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086, interrupts of 8086. | **10 Hours** |
| **Module V** | |
| **Instruction Set and Assembly Language Programming of 8086**: Instruction formats,<br>Addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs<br>involving Logical, Branch and Call Instructions, Sorting, String Manipulations. | **08 Hours** |

**Course outcomes:** At the end of the course, students will be able to:

CO1. Explain basics of microcontrollers, microprocessor, architecture of both 8051 Microcontroller, and microprocessors

CO2. Write 8051 application specific programs using 8051 instructions set.

CO3. Analyze the interfacing of 8051microcontroller to various I/O devices.

CO4. Apply the 8086-instruction set to write the programs.

CO5. Investigate the performance of all the microprocessors starting from Pentium IV to i7 and submit a report.

**Text Books:**

1. **"The 8051 Microcontroller and Embedded Systems – using Assembly and C", Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006.**
2. **"The 8051 Microcontroller", Kenneth. J Ayala,3rd Edition, Thomson /Cengage Learning.**
3. **Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, MHE, 2nd Edition 2006.**

**Reference Book:**

1. **"The 8051 Microcontroller Based Embedded Systems", Manish K Patel, McGraw Hill, 2014, ISBN:978-93-329-0125-4.**
2. **"Microcontrollers: Architecture, Programming, Interfacing and System Design", Raj Kamal, Pearson Education,2005.**
3. **Microprocessors and Interfacing, D. V. Hall, MGH, 2nd Edition 2006.**

**MACHINE LEARNING LAB**
**[As per Choice Based Credit System (CBCS) scheme]**
**(Effective from the academic year 2021 -2022)**
**SEMESTER – V**

| | | | |
|---|---|---|---|
| **Subject Code** | **22AML56** | **CIE Marks** | **50** |
| **Number of Lecture Hours/Week** | **02** | **SEE Marks** | **50** |
| **Total Number of Lecture Hours** | **30** | **Exam Hours** | **03** |

**CREDITS – 01**

**Objectives:** 1. Make use of Data sets in implementing the machine learning algorithms 2. Implement the machine learning concepts and algorithms in any suitable language of choice.

Description (If any):

1. The programs can be implemented in either JAVA or Python.
2. For Problems 1 to 6 and 10, programs are to be developed without using the built-in classes or APIs of Java/Python.
3. Data sets can be taken from standard repositories (https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students.

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples.
2. implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm.
4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a Bayesian network considering medical data.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.
9. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set and print both correct and wrong predictions.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

**Course Outcomes:** At the end of the course students will be able to
**After studying this course, students will be able to:**
CO1: Understand the implementation procedures for the machine learning algorithms.
CO2. Design Java/Python programs for various Learning algorithms.
CO3. Apply appropriate data sets to the Machine Learning algorithms.
CO4. Identify and apply Machine Learning algorithms to solve real world problems.

# Computer Networks Lab

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

**(Effective from the academic year 2022-2023)**

**SEMESTER– V**

| | | | |
|---|---|---|---|
| **Subject Code** | 22CSL57 | **CIE Marks** | 50 |
| **Number of Laboratory Hours/Week** | 02 | **SEE Marks** | 50 |
| **Total Teaching hours** | 30 | **Exam Hours** | 03 |

**CREDITS–01**

**Course objectives:** This course will enable students

Course Objectives:

1. Explain the ns3 simulator, installation and its application.
2. Illustrate the creation of point-to-point link, TCP, UDP protocols its connection.
3. Demonstrate the connection establishment of network computing devices.
4. Discuss tracking, testing, analyzing the network.

1. Using TCP/IP Socket programming implement a program to transfer the contents of a requested file from server to the client using TCP/IP sockets.
2. Implement the data link layer farming methods such as character, character stuffing and bit stuffing.
3. Implement on a data of set of characters the three CRC polynomials-CRC 12, CRC 16 and CRC CCIP.
4. Write a program for frame sorting techniques used in buffers.
5. Write a program for Hamming Code generation for error detection and correction.
6. Take an example subnet graph with weights indicating delay between nodes. Now obtain routing table at each node using distance vector routing algorithm.
7. Using bucket algorithm, design a program to achieve traffic management at flow level by implementing closed loop control technique.
8. Using RSA algorithm encrypt a text data and decrypt the same.
9. a) Write aNS3 program to connect two nodes with a point-to-point link, which have unique interface. Analyze the network performance using UDP client server.
   b) Write NS 3 Program to configure two nodes on an 802.11b physical layer, with802.11b NICs in Ad hoc mode, and by default, sends one packet of 1000(application)bytes to the other node. The physical layer is configured to receive at a fixed RSS (regardless of the distance and transmit power); therefore, changing position of the nodes has no effect. Analyze the performance.
10. a Configure network topology using switch and router (LAN, Internet).
    b Configure network topology to implement VLAN using packet tracer.

**Course Outcomes:** At the end of the course students will be able to

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

CO1: Demonstrate various networking concepts through a series of experiments for communication.

CO2: Develop Computer network programs using various software tools like NS3, Packet tracer, Net Anim etc.

CO3: Debug and troubleshoot software issues effectively,

CO4: Analyze the data and interpret the results.

CO5: Prepare a well-organized laboratory report.

**SYSTEM SOFTWARE AND COMPILER DESIGN LAB**

**SEMESTER – V**

| | | | |
|---|---|---|---|
| **Subject Code** | **22AML58** | **CIE Marks** | 50 |
| **Number of Lecture Hours/Week (L:T:P)** | 0:0:2 | **SEE Marks** | 50 |
| **Total Number of Lecture Hours** | 30 HOURS | **Exam Hours** | 03 |

**CREDITS-01**

**Course Objectives**: Objectives of the course are to

1. To make students familiar with Lexical Analysis and Syntax Analysis phases of Compiler Design and implement programs on these phases using LEX & YACC tools and/or C/C++/Java
2. To understand the various phases in the design of a compiler.
3. To understand the design of top-down and bottom-up parsers.
4. To understand syntax directed translation schemes.

**PART A**

**Execute the following programs using LEX:**

1. a. Program to count the number of characters, words, spaces and lines in a given input file.
   b. Program to count the numbers of comment lines in a given C program. Also eliminate them and copy the resulting program into separate file.
2. a. Program to recognize a valid arithmetic expression and to recognize the identifiers and operators present print them separately.
   b. Write a LEX Program to scan reserved word & Identifiers of C Language language.
3. Program to recognize and count the number of identifiers in a given input file.

**Execute the following programs using YACC:**

4. a. Program to evaluate an arithmetic expression involving operators +, -, * and /.
   b. Program to recognize a valid variable, which starts with a letter, followed by any number of letters or digits.
5. a. Program to recognize the grammar (anb, n>= 10).
   b. Program to recognize strings 'aaab', 'abbb', 'ab' and 'a' using the grammar (anbn, n>= 0).

**PART B**

6. Design, develop and implement program to construct Predictive / LL(1) Parsing Table for the grammar rules:

$$A \rightarrow aBa\ ,$$
$$B \rightarrow bB \mid \varepsilon\ .$$

Use this table to parse the sentence: abba$

7. Design, develop and implement program to demonstrate Shift Reduce Parsing technique for the grammar rules: $E \rightarrow E$

$$+\ T \mid T$$
$$T \rightarrow T$$
$$*\ F \mid F,$$

F→ $(E) \mid id$ and parse the sentence: id + id * id.

8. Design, develop and implement syntax-directed definition of "if E then S1" and "if E then

S1 else S2"

9. Write a yacc program that accepts a regular expression as input and produce its parse tree as output.
10. Design, develop and implement a program to generate the machine code using Triples for the statement A = -B * (C +D) whose intermediate code in three-address form:

T1 = -B, T2 = C + D, T3 = T1 + T2, A = T3

| CO# | Course Outcomes |
|---|---|
| 1. | Implement and demonstrate Lexer and Parser |
| 2. | To understand the various phases in the design of a compiler. |
| 3. | To understand the design of top-down and bottom-up parsers. |
| 4. | To understand syntax directed translation schemes. |
| 5. | To develop client-server application using web technologies |

# POWER BI

[As per NEP, Outcome Based Education, and Choice Based Credit System (CBCS) Scheme]

SEMESTER-V

| | | | |
|---|---|---|---|
| Subject Code | 22AM510B | CIE Marks | 50 |
| Number Lecture Hour/Week | 01 | SEE Marks | 50 |
| Number of Lecture Hours | 20 | Exam Hours | 03 |

**CREDITS-01**

**Course Objectives** The objectives of the course is to enable students to:

- Effective use of Business Intelligence (BI) technology (Tableau) to apply data visualization
- To discern patterns and relationships in the data.
- To build Dashboard applications.
- To communicate the results clearly and concisely.
- To be able to work with different formats of data sets.

1. Understanding Data, what is data, where to find data, Foundations for building Data Visualizations,
Creating Your First visualization?
2. Getting started with Tableau Software using Data file formats, connecting your Data to Tableau,
creating basic charts (line, bar charts, Tree maps), Using the Show me panel.
3. Tableau Calculations, Overview of SUM, AVR, and Aggregate features, Creating custom calculations
and fields.
4. Applying new data calculations to your visualizations, Formatting Visualizations, Formatting Tools
and Menus, Formatting specific parts of the view.
5. Editing and Formatting Axes, Manipulating Data in Tableau data, Pivoting Tableau data.
6. Structuring your data, Sorting and filtering Tableau data, Pivoting Tableau data.
7. Advanced Visualization Tools: Using Filters, Using the Detail panel, using the Size panels,
customizing filters, Using and Customizing tooltips, Formatting your data with colors.
8. Creating Dashboards & Storytelling, creating your first dashboard and Story, Design for different
displays, adding interactivity to your Dashboard, Distributing & Publishing your Visualization.
9. Tableau file types, publishing to Tableau Online, Sharing your visualizations, printing, and Exporting.
10. Creating custom charts, cyclical data and circular area charts, Dual Axis charts.

## Course Objectives:

**CO1:** Demonstrate the effective use of Business Intelligence (BI) tools, such as Tableau, for creating data visualizations.
**CO2:** Analyze datasets to identify patterns and relationships for data-driven insights.
**CO3:** Design and develop interactive dashboards for effective decision-making.
**CO4:** Communicate analytical results with clarity and conciseness to diverse audiences.
**CO5:** Integrate and process datasets in various formats for comprehensive data analysis.

**Reference Books:**

1. Microsoft Power BI cookbook, Brett Powell, 2nd edition.
2. R Programming for Data Science by Roger D. Peng (References)
3. The Art of R Programming by Norman Matloff Cengage Learning

# Software Engineering

**[As Per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS)Scheme]**

| | | | |
|---|---|---|---|
| **Course Code** | 22CS61 | **CIE Marks** | 50 |
| **Number Lecture Hour/Week** | 03 | **SEE Marks** | 50 |
| **Number of Lecture Hours** | 40 | **Exam Hours** | 03 |

**CREDITS-03**

**Course objectives:**

- Understand fundamental concepts of software engineering.
- Provide comprehensive understanding of the requirements engineering process and system modeling techniques.
- Impart knowledge of architectural and object-oriented design principles.
- Understand the basics of software project management for effective project delivery.
- Learn modern software development practices and testing techniques.

| **Module -1** | **Hours** |
|---|---|
| **Introduction:** Need for software engineering, Professional and ethical responsibility, case studies, Software Process models, Process Iteration, Process Iteration continued, Process Activities, Software requirements: Functional and Non-functional requirements, User requirements, System requirements, Interface specification, The software requirements document. | 08 |
| **Module -2** | |
| **Requirements engineering process:** Feasibility studies, Requirement's elicitation and analysis, Requirements validation, Requirements management.<br>**System models:** Context models, Behavioral models, Data models, Object models, Structured methods. | 08 |
| **Module -3** | |
| **Architectural Design:** Architectural Design Decisions, System organization Design and IMPLEMENTATION<br>Modular Decomposition styles, Control styles<br><br>**Object oriented design**: Objects and Object Classes, An object-oriented design process Design evolution. | 08 |
| **Module-4** | |
| **Software Project Management:** The Management Spectrum, Product, process and project, The W5HH principle, Critical practices, Estimation for Software Project: Software Project estimation, Decomposition Techniques, Empirical Estimation models<br>**Project Scheduling:** Basic Concepts, Project Scheduling, Defining Task set and Task network, Scheduling<br>**Risk Management**: Reactive versus proactive strategies, Software Risks, Risk identification, Risk mitigation, monitoring and management, The RMMM plan. | 08 |
| **Module-5** | |

| | |
|---|---|
| **Rapid software development**: Agile methods, Extreme programming, Rapid application development<br>**Software evolution**: Legacy system evolution<br>**Verification and Validation**: Planning verification and validation, Software inspections, Automated static analysis, Verification and formal methods<br>**Software testing:** System testing, Component testing, Test case design, Test automation. | 08 |

**Course Outcomes:**

CO1: Apply software engineering concepts for software systems.

CO2: Demonstrate understanding of requirements engineering and apply system modeling techniques to analyze, specify, and represent software system requirements.

CO3: Utilize architectural and object-oriented design principles to create well-structured software systems.

CO4: Apply software project management skills to deliver projects effectively.

CO5: Implement software development strategies, and testing techniques to ensure quality and adaptability in software projects.

**Text Books:**

1. Software Engineering- Sommerville, 9th edition, Pearson Education.
2. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, Mc Graw Hill
   International Edition.

**References:**

1. Software Engineering theory and Practice Shari Lawrence Pflieger, Joanne M Atlec 3rd edition Pearson Education.
2. Software Engineering Principles and Practice Waman S Javadekar 1st edition Tata McGraw Hill.

**Question paper pattern**

- The question paper will have TEN questions, Two questions from each module.
- The students will have to answer 5 full questions, selecting one full question from each module.
- Each full question carries 20 marks
- Each full question will have sub questions covering all topics under a module.

# Bigdata Analytics

[As Per NEP, Outcome Based Education (OBE) and Choice Based Credit System(CBCS)Scheme]

| | | | |
|---|---|---|---|
| Subject Code | 22AD62 | CIE Marks | 50 |
| Number of Lecture Hours/Week | 3 | SEE Marks | 50 |
| Total Number of Lecture Hours | 40 | Exam Hours | 03 |

**CREDITS – 03**

**Course objectives:**

- To implement MapReduce programs for processing big data.
- To realize storage and processing of big data using MongoDB, Pig, Hive and Spark.
- To analyze big data using machine learning techniques.

| Module I | Teaching Hours |
|---|---|
| Classification of data, Characteristics, Evolution and definition of big data, What is Big data, Why Big data, Traditional Business Intelligence Vs Big Data, Typical data warehouse and Hadoop environment. Big Data Analytics: What is Big data Analytics, Classification of Analytics, Importance of Big Data Analytics, Technologies used in Big data Environments, Few Top Analytical Tools, NoSQL, Hadoop.<br>TB1: Ch 1: 1.1, Ch2: 2.1-2.5,2.7,2.9-2.11, Ch3: 3.2,3.5,3.8,3.12, Ch4: 4.1,4.2 | 8 Hours |
| Module II | |
| Introduction to Hadoop: Introducing hadoop, Why hadoop, Why not RDBMS, RDBMS Vs Hadoop, History of Hadoop, Hadoop overview, Use case of Hadoop, HDFS (Hadoop Distributed File System), Processing data with Hadoop, Managing resources and applications with Hadoop YARN(Yet Another Resource Negotiator). Introduction to Map Reduce Programming: Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression. | 8 Hours |
| Module III | |
| Introduction to MongoDB: What is MongoDB, Why MongoDB, Terms used in RDBMS and MongoDB, Data Types in MongoDB, MongoDB Query Language. | 8 Hours |
| Module IV | |
| Introduction to Hive: What is Hive, Hive Architecture, Hive data types, Hive file formats, Hive Query Language (HQL), RC File implementation, User Defined Function (UDF). Introduction to Pig: What is Pig, Anatomy of Pig, Pig on Hadoop, Pig Philosophy, Use case for Pig, Pig Latin Overview, Data types in Pig, Running Pig, Execution Modes of Pig, HDFS Commands, Relational Operators, Eval Function, Complex Data Types, Piggy Bank, User Defined Function, Pig Vs Hive. | 8 Hours |
| Module V | |
| Spark and Big Data Analytics: Spark, Introduction to Data Analysis with Spark. 2 Text, Web Content and Link Analytics: Introduction, Text Mining, Web Mining, Web Content and Web Usage Analytics, Page Rank, Structure of Web and Analyzing a Web Graph. | 8 Hours |
| Question paper pattern: | |

- The question paper will have ten questions.
- There will be 2 questions from each module.
- Each question will have questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Seema Acharya and Subhashini Chellappan "Big data and Analytics" Wiley India Publishers, 2nd Edition, 2019.
2. Rajkamal and Preeti Saxena, "Big Data Analytics, Introduction to Hadoop, Spark and Machine Learning", McGraw Hill Publication, 2019.

**Reference Books:**

1. Adam Shook and Donald Mine, "MapReduce Design Patterns: Building Effective Algorithms and Analytics for Hadoop and Other Systems" - O'Reilly 2012
2. Tom White, "Hadoop: The Definitive Guide" 4th Edition, O'reilly Media, 2015.
3. Thomas Erl, Wajid Khattak, and Paul Buhler, Big Data Fundamentals: Concepts, Drivers & Techniques, Pearson India Education Service Pvt. Ltd., 1st Edition, 2016.
4. John D. Kelleher, Brian Mac Namee, Aoife D'Arcy -Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, MIT Press 2020, 2nd Edition.

E-books and Online course materials

1. https://www.kaggle.com/datasets/grouplens/movielens-20m-dataset
2. https://www.youtube.com/watch?v=bAyrObl7TYE&list=PLEiEAq2VkUUJqp1k-g5W1mo37urJQOdCZ
3. https://www.youtube.com/watch?v=VmO0QgPCbZY&list=PLEiEAq2VkUUJqp1kg5W1mo37urJQOdCZ&in dex=4
4. https://www.youtube.com/watch?v=GG-VRm6XnNk
5. https://www.youtube.com/watch?v=JglO2Nv_92A
6.

**Course Outcomes**

CO1**:** Identify and list various Big Data concepts, tools and applications.
CO2: Develop programs using HADOOP framework.
CO3: Perform CRUD operations (Create, Read, Update, Delete) using MongoDB commands.
CO4: Make use of Hadoop Cluster to deploy Map Reduce jobs, PIG, HIVE programs.
CO5: Perform basic data analysis using Spark and demonstrate Text, Web Content and Link Analytics

# Internet of Things

[As Per NEP, Outcome Based Education (OBE) and Choice Based Credit System(CBCS)Scheme]

| | | | |
|---|---|---|---|
| Subject Code | 22AD632 | CIE Marks | 50 |
| Number of Lecture Hours/Week | 3 | SEE Marks | 50 |
| Total Number of Lecture Hours | 40 | Exam Hours | 03 |

**CREDITS – 3**

**Course objectives:**

- Understand about the fundamentals of Internet of Things and its building blocks along with their characteristics.
- Understand the role of smart objects in IoT.
- Understand the protocols and standards designed for IoT and the current research on it.
- Study of network analytics for IoT
- Understand the architecture of smart cities and transportation systems powered by IoT

| Module I | Teaching Hours |
|---|---|
| Introduction to IoT: Definition, Genesis of IoT, IoT and digitization, IoT Impact, Convergence of IT and OT, Challenges.<br>IoT Network Architecture and Design:<br>Comparing IoT Architectures, Simplified IoT Architecture, IoT Functional Stack, IoT Data Management and Compute Stack. | 10 Hours |
| Module II | |
| Smart Objects: Sensors, Actuators and Smart Objects; Sensor Networks<br>**Connecting Smart Objects:** Communication Criteria, IoT Access Technologies | 8 Hours |
| Module III | |
| **IP as IoT Network Layer:**<br>Advantages of Internet Protocol (IP), Adaptation of IP, Need for Optimization-Constrained Nodes and Constrained Networks; 6LoWPAN, 6TiSCH, RPL<br>**Application Protocols for IoT:**<br>Transport Layer, IoT Application Transport Methods-SCADA, IoT Application Layer Protocols-COAP, MQTT | 8 Hours |
| Module IV | |
| **Data Analytics for IoT:**<br>Introduction, Edge Streaming Analytics, Network Analytics Securing IoT | 8 Hours |
| Module V | |
| **Smart and Connected Cities:**<br>Smart City IoT Architecture, Smart City Security Architecture, Case study<br>**Transportation**:<br>Challenges, IoT Architecture for Transportation, Case study | 6 Hours |

Question paper pattern:

- The question paper will have ten questions.
- There will be 2 questions from each module.
- Each question will have questions covering all the topics under a module.

- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1stEdition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743)

**Reference Books:**

1. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.
2. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014.

Online Courses and Video Lectures

1. **https://onlinecourses.nptel.ac.in/noc22_cs53/preview**
2. **https://www.javatpoint.com/internet-of-things-applications**
3. **https://www.geeksforgeeks.org/top-applications-of-iot-in-the-world/**

**Course Outcomes**

CO1: Gain knowledge of the key concepts, building blocks, and characteristics of IoT, forming a solid foundation for understanding the IoT ecosystem.
CO2: Identify and analyze the role of smart objects in IoT
CO3: Explain and apply various protocols and standards developed for IoT
CO4: Apply network analytics to monitor, optimize, and secure IoT networks by assessing traffic patterns and performance metrics.
CO5: Demonstrate knowledge of IoT architectures used in smart cities and transportation systems, and evaluate their impact through case studies and practical applications.

# Full Stack Web Development

[As Per NEP, Outcome Based Education (OBE) and Choice Based Credit System(CBCS)Scheme]

| | | | |
|---|---|---|---|
| Course Code | 22AM641 | CIE Marks | 50 Marks |
| Number of LectureHours/Week | 2:1:0 | SEE Marks | 50 Marks |
| Total Number ofLecture Hours | 40 | Exam Hours | 3 hours |

CREDITS – 3

Course Objectives:

CO1: To Compose forms and tables using HTML and CSS
CO2: Illustrate Models, Views and Templates with their connectivity in Django for full stack web development.
CO3: Demonstrate the use of state management and admin interfaces automation in Django
CO4: To store and model data in a no sql database.
CO5: Learn DevOps for CI/CD using containers, container orchestration and pipelines.

| Module I | Teaching Hours |
|---|---|
| Introduction to HTML, what is HTML and Where did it come from? HTML Syntax, Semantic Markup, Structure of HTML Documents, Quick Tour of HTML Elements, HTML5 Semantic Structure Elements, Introduction to CSS, what is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling.<br><br>Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks. | 8 Hours |
| Module II | |
| Web framework, MVC Design Pattern, Django Evolution, Views, Mapping URL to Views, Working of Django URL Confs and Loose Coupling, Errors in Django, Wild Card patterns in URLS.<br>Template System Basics, Using Django Template System, Basic Template Tags and Filters, MVT<br>Development Pattern, Template Loading, Template Inheritance, MVT Development Pattern. | 8 Hours |
| Module III | |
| Configuring Databases, Defining and Implementing Models, Basic Data Access, Adding Model String. Representations, Inserting/Updating data, Selecting and deleting objects, Schema Evolution<br>Activating Admin Interfaces, Using Admin Interfaces, Customizing Admin Interfaces, Reasons to use Admin Interfaces. | 8 Hours |
| Module IV | |
| Form Processing, Creating Feedback forms, Form submissions, custom validation, creating Model Forms, URLConf Ticks, Including Other URLConfs.<br><br>MongoDB: Basics, Documents, Collections, Databases, Query Language, Installation, The Mongo Shell, MongoDB CRUD Operations, Create, Read, Projection, Update, Delete, Aggregate, MongoDB Node.js, Driver, Schema Initialization, Reading from MongoDB, Writing to MongoDB. | 8 Hours |
| Module V | |
| DevOps: Continuous Integration and Continuous Delivery CI/CD: Jenkins Creating pipelines, Setting up runners Containers and container orchestration (Dockers and Kubernetes) for application development and deployment; Checking build status; Fully Automated Deployment; Continuous monitoring with Nagios; Introduction to DevOps on | 8 Hours |

| | |
|---|---|
| Cloud. | |

Question paper pattern:

- The question paper will have ten questions.
- There will be 2 questions from each module.
- Each question will have questions covering all -the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:


1. Randy Connolly, Ricardo Hoar, “Fundamentals of Wed Development”, 1stEdition, Pearson Education India. (ISBN:978-9332575271)
2. Jon Duckett, "JavaScript & jQuery: Interactive Front-End Web Development", Wiley, 2014.
3. Vasan Subramanian, Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node. Apress, 2019.
4. Adrian Holovaty, Jacob Kaplan Moss, The Definitive Guide to Django: Web Development Done Right, Second Edition, Springer-Verlag Berlin and Heidelberg GmbH & Co. KG Publishers, 2009
5. Thomas Uphill, John Arundel, Neependra Khare, Hideto Saito, Hui-Chuan Chloe Lee “DevOps: Puppet, Docker, and Kubernetes”, Ke-Jou Carol Hsu, Packet, Sricharan Vadapalli, DevOps: Continuous Delivery, Integration, and Deployment with DevOps: Dive, Packet, 2018.


Reference Books:


1. Aidas Bendroraitis, Jake Kronika, Django 3 Web Development Cookbook, Fourth Edition, Packt Publishing, 2020


E-books and Online course materials:

- https://github.com/vasansr/pro-mern-stack
- https://nptel.ac.in/courses/106106156
- https://archive.nptel.ac.in/courses/106/105/106105084/

Course Outcome:

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

1. Apply Javascript to build dynamic and interactive Web projects .
2. Implement user interface components for JavaScript-based Web using React.JS
3. Designing of Models and Forms for rapid development of web pages.
4. Apply Express/Node to build web applications on the server side.
5. Demonstrate modularization and packing of the front-end modules and use CI/CD.

# Embedded Systems

[ As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS Scheme]

| | | | |
|---|---|---|---|
| **Course Code** | 22EC651 | **CIE Marks** | 50 |
| **Number of Lecture Hours/Week** | 4 | **SEE Marks** | 50 |
| **Total Number of Lecture Hours** | 50 | **Exam Hours** | 03 |

**CREDITS– 04**

**Course Learning Objectives:** This course will enable students to**:**

1. Understand the basic hardware components and their selection method based of the characteristics and attributes of an embedded system.
2. Understand typical Embedded system with its components.
3. Develop the hardware software co-design and firmware design approaches.
4. Explain the need of real time operating system for embedded system applications
5. Understand the integration, testing of Embedded hardware and firmware and Embedded development Life cycle.

| **Module 1** | **Teaching Hours** |
|---|---|
| **Introduction To Embedded Systems:** History of embedded systems, Classification of embedded systems based on generation and complexity, Purpose of embedded system, characteristics of embedded systems and quality attributes of an embedded system, Embedded system-Application specific and Domain specific. | **10Hrs** |
| **Module 2** | |
| **Typical Embedded System:** Core of the embedded system-general purpose and domain specific processors, ASICs, PLDs, COTs; Memory-ROM, RAM, memory according to the type of interface, memory shadowing, memory selection for embedded systems, Sensors, actuators, I/O components: seven segment LED, relay, piezo buzzer, push button switch, Onboard communication interfaces, External communication interfaces, other sub-systems: reset circuit, brownout protection circuit, oscillator circuit real time clock, watch dog timer. | **10 Hrs** |
| **Module 3** | |
| **Hardware Software Co-Design and Program Modeling:** Fundamental issues in hardware software co-design and Computational models in Embedded design.<br>**Embedded Firmware Design And Development:** Embedded firmware design approaches-super loop based approach, operating system based approach; embedded firmware development languages-assembly language based development, high level language based development. | **10 Hrs** |
| **Module 4** | |
| **RTOS Based Embedded System Design:** Operating system basics, types of operating systems, tasks, process and threads, multiprocessing and multitasking, task scheduling: non-pre-emptive and pre-emptive scheduling; task communication-shared memory, message passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/ Synchronization Issues, Task Synchronization Techniques and How to choose an RTOS. | **10 Hrs** |
| **Module 5** | |

| | |
|---|---|
| **Integration and testing of Embedded hardware and firmware.**<br>**Embedded system Development Environment** – Block diagram (excluding Keil), Disassembler/decompiler, simulator, emulator and debugging techniques.<br>**The Embedded product development life cycle (EDLC):** What is EDLC? Why EDLC?, objectives of EDLC, Different phases of EDLC, EDLC approaches. (Modeling the EDLC) | **10 Hrs** |

**Course outcomes: After studying this course, students will be able to:**

CO-1-Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems and its applications

CO-2-Apply the knowledge of Microcontrollers to understand the basics of typical embedded system and its design components.

CO-3-Analyze the typical embedded system components.

CO-4-Develop the hardware /software co-design and firmware design approaches.

CO-5-Investigate the process of embedded product development life cycle.

**Text Book:**

1. Shibu K V, ―Introduction to Embedded Systems‖, Tata McGraw Hill Education Private Limited, 2nd Edition.

**Reference Books:**

1. James K. Peckol, "Embedded systems- A contemporary design tool", John Wiley, 2008, ISBN: 978-0- 471-72180-2.
2. Yifeng Zhu, "Embedded Systems with Arm Cortex-M Microcontrollers in Assembly Language and C", 2nd E -Man Press LLC ©2015 ISBN:0982692633 9780982692639.
3. Embedded real time systems by K.V. K. K Prasad, Dreamtech publications, 2003.
4. Embedded Systems by Rajkamal, 2nd Edition, McGraw hill Publications, 2010

# Web Development Laboratory

[As Per NEP, Outcome Based Education (OBE) and Choice Based Credit System(CBCS)Scheme]

| | | | |
|---|---|---|---|
| **Course Code** | 22AML66 | CIE Marks | 50 Marks |
| **Number of Lecture Hours/ Weeks** | 2 | SEE Marks | 50 Marks |
| **Total Number of Lecture Hours** | 30 | Exam Hours | 3 hours |

CREDITS – 01

Course objectives:

1. To develop full stack applications with clear understanding of user interface, business logicand data storage.
2. To design and develop user interface screens for a given scenario
3. To develop the functionalities as web components as per the requirements
4. To implement the database according to the functional requirements
5. To integrate the user interface with the functionalities and data storage.

| Sl.No. | List of Experiments: |
|---|---|
| 1. | Develop a portfolio website for yourself which gives details about yourself for a potentialrecruiter |
| 2. | Write a program to create a voting application using React JS |
| 3. | Create a web application to manage the TO-DO list of users, where users can login andmanage their to-do items |
| 4. | Create a simple micro blogging application (like twitter) that allows people to post theircontent which can be viewed by people who follow them. |
| 5. | Create a food delivery website where users can order food from a particular restaurant listedin the website. |
| 6. | Develop a classifieds web application to buy and sell used products. |
| 7. | Develop a leave management system for an organization where users can apply different types of leaves such as casual leave and medical leave. They also can view the available number of days. |
| 8. | Develop a simple dashboard for project management where the statuses of various tasks are available. New tasks can be added and the status of existing tasks can be changed among Pending, In Progress or Completed. |
| 9. | Develop an online survey application where a collection of questions is available and usersare asked to answer any random 5 questions. |
| 10. | Write a program to create and Build a Password Strength Check using Jquery. |

Course Outcomes:

1. Design full stack applications with clear understanding of user interface, business logic anddata storage.
2. Design and develop user interface screens.
3. Implement the functional requirements using appropriate tool.
4. Design and develop database based on the requirements.
5. Integrate all the necessary components of the application.

**Conduct of Practical Examination:**

- Experiment distribution
  a) For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.
- Marks Distribution
  a) For laboratories having only one part – Procedure + Execution + Viva-Voce: 8+35+7 = 50 Marks.
  b) For laboratories having PART A and PART B
     i. Part A – Procedure + Execution + Viva = 3 + 14+ 3 = 20 Marks.
     ii. Part B – Procedure + Execution + Viva = 5 + 21 + 4 = 30 Marks.

# Big Data Analytics Laboratory

[As Per NEP, Outcome Based Education (OBE) and Choice Based Credit System(CBCS)Scheme]

| | | | |
|---|---|---|---|
| **Course Code** | 22ADL67 | **CIE Marks** | 50 |
| **Number of Lecture Hours/Week** | 02 | **SEE Marks** | 50 |
| **Total Number of Lecture Hours** | 30 | **Exam Hours** | 3 |

**CREDITS – 01**

**Course Learning objectives:** This course will enable students to:

- Enable learners to install and configure the Hadoop framework, understand and perform fundamental file management operations in the Hadoop Distributed File System (HDFS)
- Equip learners with the skills to analyze and process large-scale datasets using big data tools such as MapReduce, MongoDB, and Apache Pig
- Enable learners to utilize Hive, Hadoop, and Spark for efficient data processing and analysis, and to apply tools such as CDH and HUE for managing big data workflows, executing queries, and generating analytical reports from large datasets.

**PART-A**

| | |
|---|---|
| 1. | Install Hadoop and Implement the following file management tasks in Hadoop: Adding files and directories, retrieving files, deleting files and directories.<br>**Hint:** A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities. |
| 2. | Develop a MapReduce program to implement Matrix Multiplication |
| 3. | Develop a Map Reduce program that mines weather data and displays appropriate messages indicating the weather conditions of the day. |
| 4. | Develop a MapReduce program to find the tags associated with each movie by analyzing movie lens data. |
| 5. | Implement Functions: Count – Sort – Limit – Skip – Aggregate using MongoDB |
| 6. | Develop Pig Latin scripts to sort, group, join, project, and filter the data. |
| 7. | Use Hive to create, alter, and drop databases, tables, views, functions, and indexes. |
| 8. | Implement a word count program in Hadoop and Spark. |
| 9. | Use CDH (Cloudera Distribution for Hadoop) and HUE (Hadoop User Interface) to analyze data and generate reports for sample datasets |

**Course Outcomes:** After studying this course, students will be able to:

CO1: Install and configure Hadoop, perform essential file management operations in HDFS, and develop MapReduce programs to solve real-world problems such as matrix multiplication and weather data analysis.
CO2: Analyze and process large-scale datasets using tools such as MapReduce, MongoDB, and Apache Pig by implementing data operations like filtering, aggregation, sorting, and transformation to extract meaningful insights.
CO3: Utilize Hive, Hadoop, and Spark for data processing and analysis, and leverage tools like CDH and HUE to manage big data workflows, perform queries, and generate analytical reports from large datasets.

**Suggested Learning Resources:**

Tom White, "Hadoop: The Definitive Guide" Fourth Edition, O'reilly Media, 2015

**Conduct of Practical Examination:**

- Experiment distribution
  a) For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.
- Marks Distribution
  a) For laboratories having only one part – Procedure + Execution + Viva-Voce: 8+35+7 = 50 Marks.
  b) For laboratories having PART A and PART B
     iii. Part A – Procedure + Execution + Viva = 3 + 14+ 3 = 20 Marks.
     iv. Part B – Procedure + Execution + Viva = 5 + 21 + 4 = 30 Marks.

# Internet of Things Laboratory

[As Per NEP, Outcome Based Education (OBE) and Choice Based Credit System(CBCS) Scheme]

| | | | |
|---|---|---|---|
| **Course Code** | 22ADL682 | **CIE Marks** | 50 |
| **Number of Lecture Hours/Week** | 02 | **SEE Marks** | 50 |
| **Total Number of Lecture Hours** | 30 | **Exam Hours** | 3 |

**CREDITS – 01**

**Course Learning objectives:** This course will enable students to:

- Gain foundational knowledge of Arduino and Raspberry Pi platforms, including their architecture, programming environment, and basic functionalities.
- Learn to interface various sensors with microcontrollers to collect and process environmental data.
- Create visual representations of sensor data using OLED displays and 7-segment displays.

**PART-A**

| | |
|---|---|
| 1. | (a)To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to 'turn ON' LED for 1 sec after every 2 seconds.<br>(b) To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to 'turn ON' LED when push button is pressed or at sensor detection. |
| 2. | (a) To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.<br>(b) To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it. |
| 3. | To interface motor using relay with Arduino/Raspberry Pi and write a program to 'turn ON' motor when push button is pressed. |
| 4. | To interface Light sensor to Arduino/Raspberry Pi and write a program to print Light sensor readings. |
| 5. | Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thingspeak cloud. |
| 6. | Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud. |
| 7. | Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker. |
| 8. | To interface Smart gas leakage email alert using things Speak. |
| 9. | Write a program on Arduino/Raspberry Pi to Weather display system using DHT11 and LCD. |
| 10. | Object distance display using 7-segment display and Ultrasonic sensor & read the sensor data when specified key is pressed. |

**Course Outcomes:** After studying this course, students will be able to:

CO1: Demonstrate the ability to use Arduino and Raspberry Pi platforms for various projects, showcasing familiarity with their programming and interfacing capabilities.
CO2: Design and implement control systems that utilize push buttons and relays to operate devices (like motors) based on sensor inputs.

CO3: Create effective visual displays of sensor data using OLED and 7-segment displays, enhancing the presentation and interpretation of information.
CO4: Demonstrate the ability to retrieve and process temperature and humidity data from the ThingSpeak cloud
CO5: Implement weather display system that integrates DHT11 sensor data with an LCD, enhancing skills in real-time data acquisition and user interface design for IoT applications.

**Suggested Learning Resources:**

- Internet of Things: A Hands-on Approach Arshdeep Bahga, Vijay Madisetti Universities Press 2015.
- Building the Internet of Things with Ipv6 and MIPv6: The Evolving World of M2M Communications: Daniel Minoli Wiley 2013.

**Conduct of Practical Examination:**

- Experiment distribution
  a) For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.
- Marks Distribution
  a) For laboratories having only one part – Procedure + Execution + Viva-Voce: 8+35+7 = 50 Marks
  b) For laboratories having PART A and PART B
     i. Part A – Procedure + Execution + Viva = 3 + 14+ 3 = 20 Marks.
     ii. Part B – Procedure + Execution + Viva = 5 + 21 + 4 = 30 Marks.

RESEARCH METHODOLOGY & INTELLECTUAL PROPERTY RIGHTS

[As Per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

| | | | |
|---|---|---|---|
| Subject Code | 22HSM610 | CIE Marks | 50 |
| Number of Lecture Hours/Week | 01 | SEE Marks | 50 |
| Total Number of Lecture Hours | 16 | Exam Hours | 03 |

CREDITS – 01

Course objectives: This course will enable students

- To Understand the knowledge on basics of research and its types.
- To Learn the concept of Literature Review, Technical Reading, Attributions and Citations.
- To learn Ethics in Engineering Research.
- To Discuss the concepts of Intellectual Property Rights in engineering.

| Module I | Teaching Hours |
|---|---|
| Introduction: Meaning of Research, Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research, Finding and Solving a Worthwhile Problem. Ethics in Engineering Research, Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship. | 03 Hours |
| Module II | |
| Literature Review and Technical Reading, New and Existing Knowledge, Analysis and Synthesis of Prior Art Bibliographic Databases, Web of Science, Google and Google Scholar,<br>Effective Search: The Way Forward Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading, Taking Notes While Reading, Reading Mathematics and Algorithms, Reading a Datasheet. Attributions and Citations: Giving Credit Wherever Due,<br>Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions, What Should Be Acknowledged, Acknowledgments in, Books Dissertations, Dedication or Acknowledgments. | 03 Hours |
| Module III | |
| Introduction To Intellectual Property:<br>Role of IP in the Economic and Cultural Development of the Society, IP Governance, IP as a Global Indicator of Innovation.<br>Patents: Conditions for Obtaining a Patent Protection, To Patent or Not to Patent an Invention. Rights Associated with Patents. Enforcement of Patent Rights. Inventions Eligible for Patenting. Non-Patentable Matters. Patent Infringements. Avoid Public Disclosure of an Invention before Patenting. Process of Patenting. Choice of Application to be Filed. Patent Application Forms. Jurisdiction of Filing Patent Application. Publication. Examination. Grant of a Patent. Validity of Patent Protection. Commercialization of a Patent. Need for a Patent Attorney/Agent. Can a Worldwide Patent be Obtained. Do I Need First to File a Patent in India. Patent Related Forms. Fee Structure. Types of Patent Applications. Commonly Used Terms in Patenting. National Bodies Dealing with Patent Affairs. Utility Models. Prior Art Search. | 03 Hours |
| Module IV | |

| | |
|---|---|
| Copyrights and Related Rights:<br>Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements. Copyright Infringement is a Criminal Offence. Copyright Infringement is a Cognizable Offence. Fair Use Doctrine. Copyrights and Internet. Non-Copyright Work. Copyright Registration. Judicial Powers of the Registrar of Copyrights. Fee Structure. Copyright Symbol. Validity of Copyright. Copyright Profile of India. Copyright and the word 'Publish'. Transfer of Copyrights to a Publisher. Copyrights and the Word 'Adaptation'. Copyrights and the Word 'Indian Work'. Joint Authorship. Copyright Society. Copyright Board. Copyright Enforcement Advisory Council (CEAC). International Copyright Agreements, Conventions and Treaties.<br>Trademarks: Eligibility Criteria. Who Can Apply for a Trademark. Acts and Laws. Designation of Trademark Symbols. Classification of Trademarks. Registration of a Trademark is Not Compulsory. Validity of Trademark. Types of Trademark Registered in India. Trademark Registry. Process for Trademarks Registration. | 03 Hours |
| Module V | |
| Industrial Designs:<br>Eligibility Criteria. Acts and Laws to Govern Industrial Designs. Design Rights. Enforcement of Design Rights. Non-Protectable Industrial Designs India. Protection Term. Procedure for Registration of Industrial Designs. Prior Art Search. Application for Registration. Duration of the Registration of a Design. Importance of Design Registration. Cancellation of the Registered Design. Application Forms. Classification of Industrial Designs. Designs Registration Trend in India. International Treaties.<br>Geographical Indications: Acts, Laws and Rules Pertaining to GI. Ownership of GI. Rights Granted to the Holders. Registered GI in India. Identification of Registered GI. Classes of GI. Non-Registerable GI. Protection of GI. Collective or Certification Marks. Enforcement of GI Rights. Procedure for GI Registration Documents Required for GI Registration. GI Ecosystem in India. | 03 Hours |
| Question paper pattern:<br>• The question paper will have ten questions.<br>• There will be 2 questions from each module.<br>• Each question will have questions covering all the topics under a module.<br>The students will have to answer 5 full questions, selecting one full question from each module. | |
| Text Books:<br>1. Dipankar Deb • Rajeeb Dey, Valentina E. Balas "Engineering Research Methodology", ISSN 1868-4394 ISSN 1868-4408 (electronic), Intelligent Systems Reference Library, ISBN 978-981-13- 2946-3 ISBN 978-981-13-2947-0 (eBook), https://doi.org/10.1007/978-981-13-2947-0<br>2. Intellectual Property A Primer for Academia by Prof. Rupinder Tewari Ms. Mamta Bhardwa<br>Reference Book:<br>1. David V. Thiel "Research Methods for Engineers" Cambridge University Press, 978-1-107-03488- 4 – 2. Intellectual Property Rights by N.K.Acharya Asia Law House 6th Edition. ISBN: 978-93-81849-30-9 | |
| Course Outcomes : After studying this course, students will be able to:<br>CO1: To know the meaning of engineering research.<br>CO2: To know the procedure of Literature Review and Technical Reading.<br>CO3: To know the fundamentals of patent laws and drafting procedure<br>CO4: Understanding the copyright laws and subject matters of copyrights and designs<br>CO5: Understanding the basic principles of design rights . | |

**GENERATIVE AI AND PROMPT ENGINEERING**

[As Per NEP, Outcome Based Education (OBE) and Choice Based Credit System(CBCS)Scheme]

| | | | |
|---|---|---|---|
| **Course Code** | 22AAM611A | **CIE Marks** | 50 |
| **Number of Lecture Hours/Week** | 01 | **SEE Marks** | 50 |
| **Total Number of Lecture Hours** | 30 | **Exam Hours** | 3 |

**CREDITS – 01**

**Course Learning objectives:** This course will enable students to:

- Understand the principles and concepts behind generative AI models
- Explain the knowledge gained to implement generative models using Prompt design frameworks.
- Apply various Generative AI applications for increasing productivity.
- Develop Large Language Model-based Apps

**PART-A**

| | |
|---|---|
| 1. | Explore pre-trained word vectors. Explore word relationships using vector arithmetic. Perform arithmetic operations and analyze results. |
| 2. | Use dimensionality reduction (e.g., PCA or t-SNE) to visualize word embeddings for Q 1. Select 10 words from a specific domain (e.g., sports, technology) and visualize their embeddings. Analyze clusters and relationships. Generate contextually rich outputs using embeddings. Write a program to generate 5 semantically similar words for a given input. |
| 3. | Train a custom Word2Vec model on a small dataset. Train embeddings on a domain-specific corpus (e.g., legal, medical) and analyze how embeddings capture domain-specific semantics |
| 4. | Use word embeddings to improve prompts for Generative AI model. Retrieve similar words using word embeddings. Use the similar words to enrich a GenAI prompt. Use the AI model to generate responses for the original and enriched prompts. Compare the outputs in terms of detail and relevance. |
| 5. | Use word embeddings to create meaningful sentences for creative tasks. Retrieve similar words for a seed word. Create a sentence or story using these words as a starting point. Write a program that: Takes a seed word. Generates similar words. Constructs a short paragraph using these words. |
| 6. | Use a pre-trained Hugging Face model to analyze sentiment in text. Assume a real-world application, Load the sentiment analysis pipeline. Analyze the sentiment by giving sentences to inpu |
| 7. | Summarize long texts using a pre-trained summarization model using Hugging face model. Load the summarization pipeline. Take a passage as input and obtain the summarized text. |
| 8. | Install langchain, cohere (for key), langchain-community. Get the api key (By logging into Cohere and obtaining the cohere key). Load a text document from your google drive. Create a prompt template to display the output in<br>a particular manner. |
| 9. | Take the Institution name as input. Use Pydantic to define the schema for the desired output and create a custom output parser. Invoke the Chain and Fetch Results. Extract the below Institution related details from Wikipedia: The founder of the Institution. When it was founded. The current branches in the institution. How many employees are working in it. A brief 4-line summary of the institution |

**Course Outcomes:** After studying this course, students will be able to:

CO1: Develop the ability to explore and analyze word embeddings, perform vector arithmetic to investigate word relationships, visualize embeddings using dimensionality reduction techniques
CO2: Apply prompt engineering skills to real-world scenarios, such as information retrieval, text generation.
CO3: Utilize pre-trained Hugging Face models for real-world applications, including sentiment analysis and text summarization.
CO4: Apply different architectures used in large language models, such as transformers, and understand their advantages and limitations.

**Suggested Learning Resources: Books:**

1. Modern Generative AI with ChatGPT and OpenAI Models: Leverage the Capabilities of Ope LLM for

Productivity and Innovation with GPT3 and GPT4, by Valentina Alto, Packt Publishing Ltd, 202

2. Generative AI for Cloud Solutions: Architect modern AI LLMs in secure, scalable, and ethical

environments, by Paul Singh, Anurag Karuparti, Packet Publishing Ltd, 2024.

**Web links and Video Lectures (e-Resources):**

- https://www.w3schools.com/gen_ai/index.php
- https://youtu.be/eTPiL3DF27U
- https://youtu.be/je6AlVeGOV0
- https://youtu.be/RLVqsA8ns6k
- https://youtu.be/0SAKM7wiC-A
- https://youtu.be/28_9xMyrdjg
- https://youtu.be/8iuiz-c-EBw
- https://youtu.be/7oQ8VtEKcgE
- https://youtu.be/seXp0VWWZV0

**Conduct of Practical Examination:**

- Experiment distribution
  - b) For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.
  - c) For laboratories having PART A and PART B: Students are allowed to pick one experiment from PART A and one experiment from PART B, with equal opportunity.
- Marks Distribution
  - c) For laboratories having only one part – Procedure + Execution + Viva-Voce: 8+35+7 = 50 Marks

d) For laboratories having PART A and PART B

iii. Part A – Procedure + Execution + Viva = 3 + 14+ 3 = 20 Marks

iv. Part B – Procedure + Execution + Viva = 5 + 21 + 4 = 30 Marks

**AWS FRAMEWORK**

[As Per NEP, Outcome Based Education (OBE) and Choice Based Credit System(CBCS)Scheme

| | | | |
|---|---|---|---|
| **Subject Code** | 22AAM611A | **CIE Marks** | 50 |
| **Number of Lecture Hours/Week** | 02 | **SEE Marks** | 50 |
| **Total Number of Lecture Hours** | 20 | **Exam Hours** | 3 |

**CREDITS – 01**

**Course Learning objectives:** This course will enable students to:

- Implement and evaluate the algorithms in and AWS programming language.
- Understand the evaluation of different algorithms.

**PART-A**

| | |
|---|---|
| 1 | Lab 1: Introduction to AWS IAM. |
| 2 | Lab2: Build your VPC and Launch a Web Server. |
| 3 | Lab3: Introduction to Amazon EC2. |
| 4 | Lab 4: Working with EBS. |
| 5 | Lab5: Build Your DB Server and Interact with Your DB Using an App. |
| 6 | Lab 6: Scale and Load Balance Your Architecture. |

**Course Outcomes:** After studying this course, students will be able to:

CO1: Implement and demonstrate AWS algorithms.
CO2: Evaluate different algorithms.