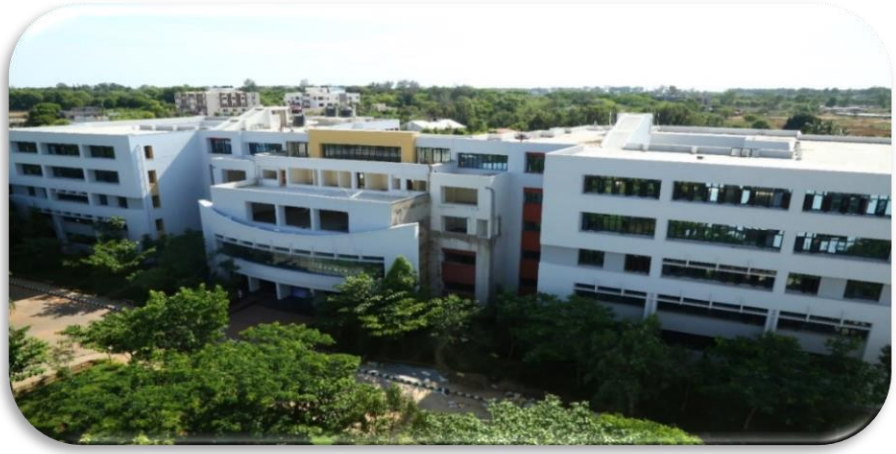
# BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

**(Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE New Delhi,
Accredited by NAAC with 'A' Grade and 7 Programs accredited by NBA)
Avalahalli, Doddaballapura Main Road, Yelahanka, Postbox No: 6443
Web: https://bmsit.ac.in, e-mail: principal@bmsit.in, Ph: 080-68730444
Bengaluru – 560064**



## Autonomous

## Governing Regulations for B.E, M.Tech, MCA and Research Programs

**(With Effect from Academic Year – 2021-22)**

# FOUNDERS

**Founder**
**Dharmaprakasha Rajakarya Prasaktha**
**Late. Sri B. M. Sreenivasaiah**

**Founder of BMS Educational Trust (BMSET)**
**Year of Establishment – 1946**

**Late Sri. B. S. Narayan**
**Former Donor Trustee**
**Vision and Mission of BMS Educational Trust**

**Vision:**
"Promoting Prosperity of Mankind by Augmenting Human Resource Capital Through Quality Technical Education and Training"

**Mission:**
"Accomplish Excellence in the Field of Technical Education Through Education Research and Service Needs of Society"

# BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

**(Proposed to be Autonomous Under VTU, Approved by AICTE New Delhi,
Accredited by NAAC with 'A' Grade and 7 Programs accredited by NBA)
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Bengaluru – 560064**

## Autonomous

## Regulations Governing B.E, M.Tech, MCA and Research Programs

## (With Effect from Academic Year - 2021-22)

# BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

**(Autonomous Institute affiliated to VTU)**

**Scheme of Teaching and Examination: Effective from AY 2021 – 22**

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

**UG PROGRAM: BE Artificial Intelligence and Machine Learning (AIML)** — **Semester: III**

| Sl. No | Course Category | Course Code | Course Title | Teaching Dept. | Teaching Hours /Week | | | | Credits | Examination | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | PW | | Duration | CIE Marks | SEE Marks | Total Marks |
| 1 | BS | 21MTA31 | Fourier Series, Numerical Methods, Statistics and Probability | MAT | 3 | 1 | 1 | 0 | 4 | 3 | 50 | 50 | 100 |
| | | 21MTB31 | Advanced Engineering Mathematcis-1 | MAT | 3 | 1 | 1 | 0 | 4 | 3 | 50 | 50 | 100 |
| 2 | HS | 21KSK32 | Samskrutika Kannada | HS | 1 | 0 | 0 | 0 | 1 | 1 | 50 | 50 | 100 |
| | | 21KBK32 | Balake Kannada | | | | | | | | | | |
| | | OR | | | | | | | | | | | |
| | | 21CIP32 | Constitution of India and Professional Ethics | | | | | | | | | | |
| 3 | UHV | 21UHV33 | Universal Human Values - I | HS | 1 | 0 | 0 | 0 | 1 | 1 | 50 | 50 | 100 |
| 4 | INT | 21INT34 | INTERNSHIP -I | AIML | 0 | 0 | 0 | 4 | 2 | 3 | 100 | -- | 100 |
| 5 | PC | 21CS35 | Data Structures and its Applications | AIML/ CSE/ISE | 3 | 0 | 0 | 0 | 3 | 3 | 50 | 50 | 100 |
| 6 | PC | 21AM36 | Principles of Artificial Intelligence and its Applications | AIML | 3 | 0 | 0 | 0 | 3 | 3 | 50 | 50 | 100 |
| 7 | PC | 21CS37 | Discrete Mathematical Structures | AIML/ CSE/ISE | 3 | 0 | 0 | 0 | 3 | 3 | 50 | 50 | 100 |
| 8 | PC | 21AML38A | Data Structures and Applications Lab | AIML/ CSE/ISE | 0 | 0 | 2 | 0 | 1 | 3 | 50 | 50 | 100 |
| 9 | PC | 21AML38B | Artificial Intelligence Laboratory | AIML | 0 | 0 | 2 | 0 | 1 | 3 | 50 | 50 | 100 |
| 10 | PC | 21AML38C | Digital System Design Laboratory | AIML | 0 | 0 | 2 | 0 | 1 | 3 | 50 | 50 | 100 |
| | | | | **TOTAL** | **14** | **1** | **7** | **4** | **20** | **---** | **550** | **450** | **1000** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | NCMC | 21DIP31A | Diploma Mathematics-I | MAT | 3 | 0 | 0 | 0 | 3 | 100 | -- | 100 |

- For Lateral Entry Students assessment of Internship – I to be conducted during the intervening vacation of 3rd and 4th semester.
- The Assessment Pattern of 1/2/3 credit courses shall be done as per the VTU guidelines.
- BS – MTX (X- Variable) Eg: Core Branches; ME, CV, EEE, ETE, ECE – MTA, Digital Branches: CSE, ISE & AIML – MTB.
- Additional Mathematics I and II shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree.

- Successful completion of the course Additional Mathematics II shall be indicated as satisfactory in the grade card. Non completion of the courses diploma Mathematics II shall be indicated as unsatisfactory.

**B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**
**Choice Based Credit System (CBCS)**
SEMESTER – III

**Adavanced Engineering Mathematics - I (3:1:1) 4**
(Common to CSE/ISE/AI&ML)
(Effective from the academic year 2021-22)

| | | | |
|---|---|---|---|
| Course Code | **21MTB31** | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P) | 3:1:1 | SEE Marks | 50 |
| Total Number of Contact Hours | 50 | Exam Hours | 03 |

**Course Objectives:**

This course aims to prepare the students to:

1. Apply the concept of Fourier series, probability distribution and statistical methods to analyze problems arising in Science and Engineering field.
2. Apply the knowledge of interpolation and numerical integration techniques whenever analytical methods fail or become complicated to offer solutions.
3. Apply the concept of Numerical Techniques, and probability distribution to analyze problems arising in Science and Engineering field.

**Module – I**

**Introduction:** Understanding of Transform Calculus, Numerical methods &their applications in Engineering, Economics and Statistics.

**Statistical Methods:** Correlation-Karl Pearson's coefficient of correlation – problems, Regression lines-lines of regression (without proof) –Problems.

**Curve fitting:** Curve fitting by the method of least squares- fitting of the curves of the form, $y = ax + b, y = ax^2 + bx + c$ and $y = ae^{bx}$.

**Time Series Forecasting:** Exponential smoothing, moving average models

**Self-Learning Component:** Fitting of the curves $y = a\,x^b$ and $y = a\,b^x$.

**Lab Session 1:**

1. Determination of polynomial using method of Least Square Curve Fitting.
2. Relation between variables: correlation, Regression.

**(10 Hours)**

**Module – II**

**Finite Differences:** Forward and backward differences, Newton's forward and backward interpolation formulae, Divided differences- Newton's divided difference formula, Lagrange's interpolation formula and inverse interpolation formula (all formulae without proof) -problems.

**Numerical Integration:** Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rules, Weddle's rule (without proof ) – problems.

**Self-Learning Component:** Trapezoidal rule.

**Lab Session 2:**

1. Numerical solution using Newton's Forward / Backward interpolation formula.
2. Numerical integration using Simpson's One-third rule.

**(10 Hours)**

**Module – III**

**Fourier Series:** Dirichlet's conditions, Fourier Series of periodic functions of period $2\pi$ and arbitrary period. Half range Fourier Series, Practical harmonic analysis over the period $2\pi$.

**Self-Learning Component:** Complex Fourier Series.

**Lab Session 3:**

1. Obtain the Fourier series of a function.
2. Finding Fourier series by practical Harmonic Analysis**.** **(10 Hours)**

**Module – IV**

**Probability Distribution:** Random variables (discrete and continuous), probability mass/density functions. Binomial distribution, Poisson distribution, Hypergeometric distribution, Exponential distribution, Normal distributions, Gamma distribution, problems.

**Self-Learning Component –** Uniform distribution

**Lab Session 4:**

1. Fitting the probability distributions: Binomial, Poisson.
2. Fitting the probability distributions: Exponential and Normal distributions.

**(10 Hours)**

**Module – V**

**Joint Probability Distribution:** Joint Probability distribution for two discrete and continuous random variables, marginal distribution, expectation, covariance, correlation coefficient. Conditional probability, Conditional expectation and variance (only for discrete random variable).

**Self-Learning Component** – Joint Probability distribution for discrete multi random variables.

**Lab Session 5:**

1. Fitting the Joint Probability distribution for two discrete random variables.
2. Fitting the Joint Probability distribution for two discrete random variables.

**Summary:** The student will be able to analyze and apply various concepts related to Fourier series, Numerical techniques and Probability distribution.

**(10 Hours)**

**Course outcomes:**

The students will be able to:

CO1: Make use of the concepts of method of least squares, correlation and regression analysis to fit a suitable mathematical model for the statistical data

CO2: Apply the knowledge of Numerical Methods in the modeling of various physical and engineering phenomena.

CO3: Apply Fourier series to study the behavior of periodic functions arising in wave and heat propagation, signals, and systems.

CO4: Analysis various probability distributions occurring in digital signal processing, information theory and design engineering.

**Question paper pattern:**

**SEE** will be conducted for 100 marks.

- **Part A:** First question with 20 MCQs carrying 1 mark each.
- **Part B:** Each full question is for 16 marks. (Answer five full questions out of 10 questions with intra modular choice). In every question, there will be a maximum of three sub-questions.

**CIE** will be announced prior to the commencement of the course.

- 25 marks for test. Average of three tests will be taken.
- 25 marks for Alternate Assessment Method.

**Text books:**


1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd ed., 2015.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th ed., 2015.
3. A.J. Hayter, Probability and Statistics for Engineers, Cengage Learning, 4th ed., 2017.
4. D. C. Montgomery, G. C. Runger, Applied Statistics and Probability for Engineers, John Wiley & Sons, 6th ed., 2016.


**References:**


1. N.P. Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publishers, 11th ed., 2018.
2. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill, 6th ed., 2010.
3. H. K. Dass and Er. RajnishVerma, Higher Engineering Mathematics, 1st edition, S. Chand and Company Pvt. Ltd., 3rd ed., 2014.
4. S. S. Sastry, Advanced Engineering Mathematics, PHI, 2009.

**B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**
**Choice Based Credit System (CBCS)**
SEMESTER – III/IV

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ **Samskrutika Kannada (1:0:0):1**
(Effective from the academic year 2021-2022)

| | | | |
|---|---|---|---|
| ವಿಷಯ ಸಂಕೇತ Course Code | **21KSK32/42** | ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನದ ಅಂಕಗಳು CIE Marks | **50** |
| ಒಂದು ವಾರಕ್ಕೆ ಬೋಧನಾ ಅವಧಿ Teaching hours/Week (L: T:P) | **1:0:0** | ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯ ಅಂಕಗಳು SEE Marks | **50** |
| ಒಟ್ಟು ಬೋಧನಾ ಅವಧಿ Total Number of contact hours | **13** | ಪರೀಕ್ಷೆಯ ಅವಧಿ Exam Hours | **02** |

**ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು**

1. ವೃತ್ತಿಪರ ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿವಾಗಿ ಪರಿಚಯಿಸಿ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಢಿಸುವುದು.
3. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳು ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.

**ಘಟಕ–1**

**ಲೇಖನಗಳು:**

ಕರ್ನಾಟಕ ಏಕೀಕರಣ: ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ–ಜಿ.ವೆಂಕಟಸುಬ್ಬಯ್ಯ
ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ–ಡಾ.ಎಲ್.ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ.ವಿ.ಕೇಶವಮೂರ್ತಿ **2 ಗಂಟೆಗಳು**

**ಘಟಕ–2**

**ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ:**

ವಚನಗಳು–ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ
ಕೀರ್ತನೆಗಳು–ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ–ಪುರಂದರದಾಸರು
ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ–ಕನಕದಾಸರು **3 ಗಂಟೆಗಳು**

**ಘಟಕ–3**

**ಆಧುನಿಕ ಕಾವ್ಯ ಭಾಗ:**

ಡಿ.ವಿ.ಜಿ.ಯವರ ಮಂಕು ತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಆಯ್ದ ಕೆಲವು ಭಾಗಗಳು.
ಹೊಸ ಬಾಳಿನ ಗೀತೆ: ಕುವೆಂಪು **2 ಗಂಟೆಗಳು**

**ಘಟಕ–4**

**ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ, ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ:**

ಡಾ.ಸರ್.ಎಂ.ವಿಶ್ವೇಶ್ವರಯ್ಯ:ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ–ಎ.ಎನ್.ಮೂರ್ತಿರಾವ್
ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ–ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ **4 ಗಂಟೆಗಳು**

**ಘಟಕ–5**

**ಪ್ರವಾಸ ಕಥನ:**

ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ: ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ **2 ಗಂಟೆಗಳು**

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಅನುಕೂಲಗಳು ಮತ್ತು ಫಲಿತಾಂಶಗಳು: ಅಠಣಢಿಜ ಠಣಣಛಿಠಟಜ

1. ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯವಾಗುತ್ತದೆ.
2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳು ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಆಸಕ್ತಿಯು

ಮೂಡುತ್ತದೆ.

3. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.
4. ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ, ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ

**Question paper pattern:**

- **SEE** will be conducted for 100 marks. The same will be reduced to 50 Marks.
- **There shall be 100** MCQs, each carrying 1 mark.
- **CIE** will be announced prior to the commencement of the course.
- 50 marks for test. Average of three tests will be taken and reduced to 25.
- 25 marks for Alternate Assessment Method.

**Textbook:**

**ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ**

ಡಾ.ಹಿ.ಚಿ ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ,
ಪ್ರಸಾರಾಂಗ ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ

**B.E COMPUTER SCIENCE AND ENGINEERING**
**Choice Based Credit System (CBCS)**
SEMESTER – III/IV

**ಬಳಕೆ ಕನ್ನಡ Balake Kannada (1:0:0):1**

(Common to all Branches)
(Effective from the academic year 2021-22)

| | | | |
|---|---|---|---|
| ವಿಷಯ ಸಂಕೇತ Course Code | **21KBK32/42** | ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನದ ಅಂಕಗಳು: CIE Marks | **50** |
| ಒಂದು ವಾರಕ್ಕೆ ಬೋಧನಾ ಅವಧಿ Teaching hours/Week (L: T:P) | **1:0:0** | ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯ ಅಂಕಗಳು :SEE Marks | **50** |
| ಒಟ್ಟು ಬೋಧನಾ ಅವಧಿ Total Number of contact hours | **13** | ಪರೀಕ್ಷೆಯ ಅವಧಿ Exam Hours | **02** |

**ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು Course Learning Objectives:**

1. To Create awareness regarding the necessity of learning local language for comfortable and healthy life.
2. To enable learners to Listen and understand the Kannada language properly.
3. To speak, read and write Kannada language as per requirement.
4. To train the learners for correct and polite conversation.

**Module-I**

Introduction, Necessity of learning a local language. Methods to learn the Kannada language. Easy learning of a Kannada Language: A few tips. Hints for correct and polite conservation, Listening and Speaking Activities Key to Transcription.

ವೈಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯಸೂಚಕ/ಸಂಬಂಧಿತ ಸರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು

Personal Pronouns, Possessive Forms, Interrogative words

**(3 Hours)**

**Module-II**

ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು

Possessive forms of nouns, dubitive question and Relative nouns

ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು

ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು – Qualitative, Quantitative and Color Adjectives, Numerals ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ (ಅ, ಅದು, ಅವು, ಅಲ್ಲಿ) Predictive Forms, Locative Case

**(3 Hours)**

**Module-III**

ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು Dative cases and Numerals

ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು Ordinal numerals and Plural makers

ನ್ಯೂನ/ನಿಷೇದಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು ಮತ್ತು ವರ್ಣ ಗುಣವಾಚಕಗಳು Defective /Negative Verbs and Colour Adjectives

**(3 Hours)**

**Module-IV**

ಅಪ್ಪಣೆ/ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತ್ತು ಒತ್ತಾಯ ಅರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು Permission, Commands, encouraging and urging words (Imperative words and sentences)

ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು Accusative Cases and

| | |
|---|---|
| Potential Forms used in General Communication | **(2 Hours)** |
| **Module-V** | |
| "ಇರು ಮತ್ತು ಇರಲ್ಲ" ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾ ಪದಗಳು Helping verbs "iru and iralla" Corresponding Future and Negation Verbs<br>ಹೋಲಿಕೆ(ತರತಮ), ಸಂಬಂಧಸೂಚಕ ಮತ್ತು ವಸ್ತು ಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ನಿಷೇದಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ Comparitive, Relationship, Identification and Negation words | **(2 Hours)** |

**ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಅನುಕೂಲಗಳು ಮತ್ತು ಫಲಿತಾಂಶಗಳು: Course outcomes**

**At the end of the Course, The Students will be able**

1. To understand the necessity of learning of local language for comfortable life.
2. To Listen and understand the Kannada language properly.
3. To speak, read and write Kannada language as per requirement.
4. To communicate (converse) in Kannada language in their daily life with Kannada speakers.
5. To speak in polite conversation.

**Question paper pattern:**

- **SEE** will be conducted for 100 marks. The same will be reduced to 50 Marks.
- **There shall be 100** MCQs, each carrying 1 mark.
- **CIE** will be announced prior to the commencement of the course.
- 50 marks for test. Average of three tests will be taken and reduced to 25.
- 25 marks for Alternate Assessment Method.

**Textbook:**

**ಬಳಕೆ ಕನ್ನಡ**

**ಲೇಖಕರು: ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ**

**ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ**

**ಕೃಷ್ಣಪ್ಪ .ಎಸ್**
**ಕನ್ನಡ ಉಪನ್ಯಾಸಕರು**

ವಿಷಯ ಸಂಕೇತ Course Code

**B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**
**Choice Based Credit System (CBCS)**
SEMESTER – III

**Constitution of India and Professional Ethics (1:0:0) 1**
(Common to all Branches)
(Effective from the academic year 2021-2022)

| | | | |
|---|---|---|---|
| Course Code | **21CIP32/42** | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P) | 1-0-0 | SEE Marks | 50 |
| Total Number of Lecture Hours | 13 | Exam Hours | 02 |

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

1. Familiarise with the Indian Constitution and have legal knowledge enabling them to take competitive exams and understand complex political issues.
2. Understand engineering ethics and responsibility and raise awareness and consciousness of the issues related to the profession, liability, risk and safety at work place.

**Module – 1**

**Preamble:** Significance and Scope of the course, Importance of the course in societal, political and economic growth of the nation.

**Introduction and Basic information about the Indian Constitution:**
Introduction, Definition and significance of the Indian Constitution, Historical Background of the Indian Constitution. Framing of the Indian constitution: Role of the Constituent Assembly, Preamble and Salient features of the Constitution of India.

**(2 Hours)**

**Module – 2**

**Fundamental Rights, Directive Principles of State Policy and Fundamental Duties:**
Fundamental Rights and its limitations, Directive Principles of State Policy: Importance and its relevance. Fundamental Duties and their significance. Case Studies

**(3 Hours)**

**Module – 3**

**Union Administration:**
The Union Executive-The President and The Vice President, The Prime Minister and The Council of Ministers, The Union Legislature -Lok Sabha & Rajya Sabha, The Union Judiciary-The Supreme Court of India and its jurisdiction. **(3 Hours)**

**Module – 4**

**State Administration, Elections, Constitutional Amendments, Emergency Provisions and Special Constitutional Provisions:**

The State Executive-The Governors, The Chief Ministers and The Council of Ministers, The State Legislature- Legislative Assembly and Legislative Council, The State Judiciary- The State High Courts and its jurisdiction.

Elections-Electoral Process in India, Election Commission of India: Powers & Functions, Constitutional Amendments- methods and Important Constitutional Amendments i.e 42nd, 44th, 61st,74th, 76th, 77th, 86th ,91st, 100, 101st, 118th , Emergency Provisions-types and its effect, Special Constitutional Provisions for Schedule Castes, Schedule Tribes & Other Backward Classes Women & Children.

**(3 Hours)**

**Module – 5**

**Professional Ethics:**

Definition of Ethics, Scope and Aim of Professional and Engineering Ethics, Code of ethics as defined in the Institution of Engineers (India), Responsibilities of Engineers and impediments to responsibilities, Honesty, Integrity and Reliability of Engineers, Risk, Safety and Liability in Engineering, Case Studies.

**(2 Hours)**

**Course outcomes:** The students will be able to:

CO1. Understand and have constitutional knowledge and legal literacy
CO2. Understand Engineering and Professional ethics and responsibilities of Engineers.

**Question paper pattern:**

- **SEE** will be conducted for 100 marks. The same will be reduced to 50 Marks.
- **There shall be 100** MCQs, each carrying 1 mark.
- **CIE** will be announced prior to the commencement of the course.
- 50 marks for test. Average of three tests will be taken and reduced to 25.
- 25 marks for Alternate Assessment Method.

**Textbooks**

1. Durga Das Basu, Introduction to the Constitution of India, Lexis Nexis, 20th Edn, 2011.
2. Shubham Singles, Charles E. Haries and Et al, Constitution of India and Professional Ethics, Cengage Learning India Private Limited, Latest Edition, 2018.

**References**

1. M. Govindarajan, S. Natarajan, V. S. Senthilkumar, Engineering Ethics, Prentice –Hall of India Pvt. Ltd. New Delhi, 2004.
2. M. V. Pylee, An Introduction to Constitution of India, Vikas Publishing,2002.

**B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**
**Choice Based Credit System (CBCS)**
SEMESTER – III

**Universal Human Values- I (1:0:0) 1**
(Effective from the academic year 2021-2022)

| | | | |
|---|---|---|---|
| Course Code | **21UHV33** | CIE Marks | 50 |
| Teaching Hours/Week (L: T:P) | 1-0-0 | SEE Marks | 50 |
| Total Number of Lecture Hours | 13 | Exam Hours | 02 |

**Course objectives:**

This introductory course is intended to

1. Develop a holistic perspective based on self-exploration about themselves (human being).
2. Understand harmony in the human being.
3. Strengthening of self-reflection.
4. Develop commitment and courage to act.

**Module – 1**

**Preamble:** Significance and Scope of the course, Importance of the course in societal, political and economic growth of the nation.

**Introduction to Value Education:** Understanding Value Education; Need and Basic guidelines for Value Education; Scope and Process.

**Self-exploration as the Process for Value Education:** What is self- exploration; Process of self- exploration.

**Case study and Group Discussion** **(2 Hours)**

**Module – 2**

**Basic Human Aspirations:** Continuous happiness and prosperity; Exploring happiness and prosperity; Methods to Fulfill the Basic Human Aspirations; Need for right understanding; Relationship and Physical Facilities.

**Case study and Group Discussion** **(2 Hours)**

**Module – 3**

**Understanding human being as co-existence of the self and the Body**: Understanding and distinguishing between the Needs of the Self and the Body- Quantitative, Qualitative, Knowing, Assuming, Recognizing and fulfilling in self and in body.

**Case study and Group Discussion** **(3 Hours)**

**Module – 4**

**Harmony in self:** Understanding self; Activities in self; Power of expectation, thought and desire; Conflicts or contradictions in self as a result of pre-conditioned desire; Realisation and Understanding.

**Case study and Group Discussion** **(3 Hours)**

**Module – 5**

**Harmony with Body:** Harmony of self with the body-Sanyama and Svasthya; Understanding and living with Sanyama; Nurturing of the body; Protection of the body; Right utilization of the body; Correct appraisal of our physical needs.

**Case study and Group Discussion** **(3 Hours)**

**Course outcomes: The students will be able to:**

1. Understand the role of value education, self-exploration and harmony in self and with body.
2. Distinguish between values and skills, Self and the Body, Intention and Competence of an individual.

**Question paper pattern:**

- **SEE** will be conducted for 100 marks. The same will be reduced to 50 Marks.
- **There shall be 100** MCQs, each carrying 1 mark.
- **CIE** will be announced prior to the commencement of the course.
- 50 marks for test. Average of three tests will be taken and reduced to 25.
- 25 marks for Alternate Assessment Method.

**Textbooks**


1. The Textbook *A Foundation Course in Human Values and Professional Ethics*, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN978-93-87034-47-1
2. The Teacher's Manual for *A Foundation Course in Human Values and Professional Ethics*, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, NewDelhi, 2019. ISBN 978-93-87034-53-2


**References**


1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. Slow is Beautiful - Cecile Andrews
4. Vivekananda - Romain Rolland (English)


**Relevant websites, documentaries**

1. Value Education websites, http://uhv.ac.in,
2. Story of Stuff, *http://www.storyofstuff.com*

**B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**
**Choice Based Credit System (CBCS)**
SEMESTER – III

**Internship - I** (0:0:0:2) 2
(Effective from the academic year 2021-22)

| | | | |
|---|---|---|---|
| Course Code | 21INT34 | CIE Marks | 100 |
| Teaching Hours/Week (L:T:P:PW) | 0:0:0:4 | SEE Marks | - |

**Schedule:**

- During the intervening vacation of II and III semester for students admitted to I semester.
- During the intervening vacation of III and IV semester for lateral entry diploma students admitted to III semester.

**Course Outcomes:**

**CO1.** Acquire academic/ career/ personal overall skill/ knowledge development.
**CO2.** Perceive ample opportunities for professional growth and achievement with relevance to society and environment.
**CO3.** Expose to real job world environment and gain practical knowledge with experience.
**CO4.** Build leadership qualities, teamwork, collaborations, cooperation, and facility in using virtual workspace.
**CO5.** Intensify creativity, artistry, curiosity, imagination, innovation and personal expression.
**CO6.** Write report in technical work/ project with presentation.

**List of Activities – A Proposal**

1. Activities concerned with the works of Indian scholars like Charaka and Susruta, Aryabhata, Bhaskaracharya, Chanakya, Madhava, Patanjali, Panini and Thiruvalluvar, among numerous others
2. Activities such as training with higher Institutions or Soft skill training organized by Training and Placement Cell of the respective institutions.
3. Contribution at incubation/ innovation /entrepreneurship cell of the institute.
4. Participation in conferences/ workshops/ competitions etc.
5. Learning at Departmental Lab/Tinkering Lab/ Institutional workshop.
6. And working for consultancy/ research project with-in the institute.
7. Learning MS Word, Excel, Microsoft equations, MS drawing tools, MS Power point, etc.
8. Coding.
9. Mini projects using commercially available assembled electronic products.
10. Debates, quizzes, and group discussions: On technical topics already studied (both in Kannada and English).
11. Essay competitions: Both in Kannada and English on technical topics already studied.
12. Survey and study of published literature on the assigned topic: Technical paper survey, Preparation of synopsis. Exposure to technical paper publications.
13. Athletics and Sports.
14. Photography.
15. Cultural activities; Drama, Dance,
16. Short film production: Contemporary aspects, Technical aspects etc.
17. Music Competition (Vocal and Instrumental): Classical – Indian and western, Sugamasangeetha (Bhava Geethegalu), Folk songs, film songs etc.
18. Internship in Disaster Management.
19. Solar energy connected activities that help common man.
20. Working with Smart City Administration.
21. Hackathon (it is a design sprint-like event in which computer programmers and others involved in software development, including graphic designers, interface designers, project managers, and others, often including domain experts, collaborate intensively on software projects).
22. Industrial Safety, Fire Safety, Electrical Safety, Chemical Process Safety, Food Safety etc.
23. Internship and project work in Indian Knowledge System related Areas/Topics.
24. Industrial visits/Small Scale Industries/ Factories/ Cottage Industries/substation visit/short project tour, etc., and submission of report.

**CO-PO Mapping**

| Course Outcomes | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PO1 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | | | | | | 2 | | | |
| **CO2** | | | | | | 2 | | | | | 2 | |
| **CO3** | | | 2 | 2 | | | 3 | 2 | | | | |
| **CO4** | | | | | | | | | 3 | 3 | 2 | 2 |
| **CO5** | | | | | 2 | | | | 3 | | | 2 |
| **CO6** | | | | | | | | | 2 | 3 | | |
| **Average** | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 2 | 2 |

**Rubrics for Internal Evaluation (Total Marks: 100)**

| Indicator | Poor | Average | Good | Excellent |
|---|---|---|---|---|
| **Acquired skills or knowledge (10 Marks)** **(CO1)** | Not gained any skill / knowledge. OR Attended a few sessions. **0-1 Marks** | Partial skill/Knowledge gained. Only Block Diagram/Notes/ Description. **2-4 Marks** | Average skill/knowledge gained. Lack of Technical/ Knowledge. **5-7 Marks** | Complete skill/knowledge gained. All Skills Acquired. **8-10 Marks** |
| **Weekly report (10 Marks)** **(CO6)** | Weekly report not submitted. OR Few days report was submitted. **0-1 Marks** | One Weekly report submitted. **2-4 Marks** | Two weekly reports submitted. **5-7 Marks** | All three weekly reports submitted. **8-10 Marks** |
| **Presentation (10 Marks)** **(CO5)** | Absence for presentation. OR Presented after the due date. **0-1 marks** | Information is lacking/ unclear and communicated in such a way that the audience cannot understand the purpose of the evidence of work and internship experiences. **2-4 Marks** | Information is not presented in a clear manner and many details are missing related to the evidence work and internship experiences. **5-7 Marks** | Information is presented in such a way that the audience can understand the purpose of the evidence of work and internship experiences. **8-10 Marks** |
| **Practical Knowledge (10 Marks)** | Not gained any practical knowledge. OR | Partial practical Knowledge gained. Less hands-on experience. | Average practical knowledge gained. | Complete practical knowledge gained. |

| | | | | |
|---|---|---|---|---|
| **(CO3)** | Able to define basic concepts.<br>**0-1 Marks** | **2-4 Marks** | Only few models are exhibited.<br>**5-7 Marks** | **8-10 Marks** |
| **Societal and environmental relevance (10 Marks)**<br>**(CO2)** | No relevance to society or environment (At-least one relevance).<br>**0-1 Marks** | Partial relevance to society or environment.<br>**2-4 Marks** | Average relevance to society or environment.<br>**5-7 Marks** | Directly Relevant to society or environment.<br>**8-10 Marks** |
| **Viva (10 Marks)**<br>**(CO4)** | Does not know any information.<br>OR<br>Fair leadership quality/ teamwork/ cooperation.<br>**0-1 Marks** | Provides irrelevant information for all questions.<br>Good leadership quality/ teamwork/ cooperation.<br>**2-4 Marks** | Provides incomplete information for all questions.<br>Better leadership quality/ teamwork/ cooperation.<br>**5-7 Marks** | Provides complete information for all questions.<br>Outstanding leadership quality/ teamwork/ cooperation.<br>**8-10 Marks** |
| **Report (40 Marks)**<br>**(CO6)** | Does not submit the report.<br>**0 Marks** | Report submitted does not fulfill the prescribed format/ submission after one weeks of the deadline.<br>**1-24 Marks** | Report submitted partially fulfills the prescribed format/ submission after one weeks of the deadline.<br>**25-32 Marks** | Report submitted fulfills the prescribed format / submission in par with the deadline.<br>**33-40 Marks** |

**CIE and SEE Details for Scheme 2021**

| **Course** | **CIE (Minimum Passing Marks 40% of Max Marks)** | | **SEE (Minimum Passing Marks 35% of Max Marks)** | |
|---|---|---|---|---|
| | **Max Marks** | **Min Passing marks** | **Max Marks** | **Min Passing marks** |
| **Inter/Intra Institutional Internship** | **100** | **40** | **-** | **-** |

**B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**
**Choice Based Credit System (CBCS)**
SEMESTER – III

**Data Structure and Applications (2:2:0) 3**
(Effective from the academic year 2021-2022)

| | | | |
|---|---|---|---|
| Course Code | **21CS35** | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P) | 2:2:0 | SEE Marks | 50 |
| Total Number of Contact Hours | 26(L) + 26(T) | Exam Hours | 03 |

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

1. Explain fundamentals of data structures and their applications essential for programming/problem Solving.
2. Utilize an appropriate data structure like Stack, Queues, Lists, Trees and Graphs to solve a given problem.
3. Demonstrate sorting and searching algorithms.

**Module – I**

**Preamble:** Data Structures are a specialized means of organizing and storing data in computers in such a way that we can perform operations on the stored data more efficiently. Data structures have a wide and diverse scope of usage across the fields of Computer Science and many other fields of Engineering. Data Structures are the main part of many computer science algorithms as they enable the programmers to handle the data in an efficient way. It plays a vital role in enhancing the performance of a software.

**Introduction:** Significance and scope of Data Structures, Data Structures and Algorithms in Economic growth of Nation, Impact of Data Structures and Algorithms on societal problems, sustainable solutions, Career perspective of Data Structures and Algorithms, current innovations in Data Structures.

**Data Structures:** Definition, Classification and Operations, Dynamic memory allocation, Self-referential structures.

**Arrays:** Introduction, Linear arrays, Representation of linear arrays in memory, Traversing linear arrays, Inserting and Deleting, Bubble sort, Linear Search, Binary Search, Dynamic Arrays, Multidimensional arrays, Sparse matrices, Polynomials.

**(11 Hours)**

**Module – II**

**Stacks:** Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays.

**Stack Applications:** Polish notation, Infix to postfix conversion, evaluation of postfix expression, Multiple Stacks and Queues. Programming Examples.

**(10 Hours)**

**Module – III**

**Queues:** Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays, De-queues, Priority Queues.

**Recursion** - Factorial, GCD, Fibonacci Sequence, Tower of Hanoi, Ackerman's function.

**(10 Hours)**

**Module – IV**

**Linked Lists:** Definition, Representation of linked lists in Memory, Memory allocation; Garbage Collection.

**Linked list operations:** Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, Circular linked lists, and header linked lists. Linked Stacks and Queues. Applications of Linked lists – Polynomials, Sparse matrix representation. Programming Examples.

**(10 Hours)**

**Module – V**

**Trees:** Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Tree.

**Binary Trees:** Binary Tree Traversals - Inorder, postorder, preorder; Additional Binary tree operations. Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees-Evaluation of Expression, Programming Examples.

**Graphs:** Definitions, Terminologies, Matrix and Adjacency List Representation Of Graphs, Depth First Search.

**Hashing:** Definition, Hashing Functions, Hash Table, Separate chaining, Linear Probing.

**Recap:** Summary of the Course

**(11 Hours)**

**Course Outcomes:**

The students will be able to:

CO1 : Illustrate different types of linear data structures, its operations and algorithms to solve a given problem.

CO2 : Illustrate different types of non-linear data structures, its operations and algorithms to solve a given problem.

CO3 : Examine any given problem, recommend and implement solutions using suitable data structures.

CO4 : Design and implement applications using suitable data structures.

**Question paper pattern:**

- **SEE** will be conducted for 100 marks.
- **Part A:** First question with 20 MCQs carrying 1 mark each.
- **Part B:** Each full question is for 16 marks. (Answer five full questions out of 10 questions with intra modular choice). In every question, there will be a maximum of three sub-questions.
- **CIE** will be announced prior to the commencement of the course.
- 25 marks for test. Average of three test will be taken.
- 25 marks for Alternate Assessment Method.

**Text books**


1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, Universities Press, 2nd edition, 2019
2. Seymour Lipschutz, Data Structures, Schaum's Outline Series, 1st Edition, 2014.


**References**


1. Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, Cengage Learning, 2nd edition, 2014.
2. Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, McGraw Hill, 2nd Edition, 2013.

**B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**

Choice Based Credit System (CBCS)

**SEMESTER – III**

**Principles of Artificial Intelligence and its Applications (3:0:0) 3**

(Effective from the academic year 2021-22)

| | | | |
|---|---|---|---|
| Subject Code | **21AM36** | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P) | 3:0:0 | SEE Marks | 50 |
| Total Number of Contact Hours | 40 | Exam Hours | 3 |

**Course Objectives:**

This course will enable students to:

1. Identify the problems where AI is required and the different methods available
2. Compare and contrast different AI techniques available.
3. Define and apply learning algorithms
4. Understand the basics and function of Python Programming Language.

**Module – 1**

**Preamble:** Significance and Scope of the course, Impact of the course on Societal and Ethical Problems/ Sustainable Solutions/ National Economy, Career Perspective, Innovations (Current), Research status/trends.. AI in transforming the world, Impact of AI on international trade, National strategy for AI,

**Introduction**: Artificial Intelligence, Philosophical Foundations of Artificial Intelligence, weak AI and strong AI, Ethics and Risk of developing AI, Applications of Artificial Intelligence, Agents and Environments, Intelligent Agents, Structure of Intelligent Agents.

(8 Hours)

**Module – 2**

**Problem Solving:** Solving problems by searching, Problem solving agents, searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimization problems, constraint satisfaction, Means End Analysis, Adversarial Search, Games, Optimal Decision in Games, Alpha – Beta pruning.

(8 Hours)

**Module – 3**

**Knowledge and Reasoning:** Knowledge based Agents, The Wumpus world, Logic, Propositional Logic: A very simple logic, Propositional theorem proving, first order logic, Representation revisited, Syntax and semantics of first order logic, using first order logic Knowledge in first order logic.

(7 Hours)

**Module – 4**

**Slot Filler Structures**: Weak slot filler structures, Semantic Nets, Frames, Strong filler structures.

**Planning, Understanding and Expert System:** Overview, Block world Problem example, components of a planning system, Goal stack planning, Nonlinear planning using constraint posting, hierarchical planning, other planning techniques.

(7 Hours)

**Module – 5**

**Introduction to Python:** The way of the program, Variables, expressions and statements, Functions, Conditionals and recursion, Fruitful functions, Strings, Lists, Dictionaries, Tuples

(10 Hours)

Recap/ Summary of the Course

**Course outcomes:**

The students will be able to:

| | |
|---|---|
| CO1 | Identify and represent AI based problems. |
| CO2 | Apply appropriate search techniques to solve AI problems. |
| CO3 | Discover how to carry out knowledge inferences over production based and frame-based system. |
| CO4 | Design and develop Expert Systems with case studies for various applications. |
| CO5 | Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions |

**Question Paper pattern**

- **SEE** will be conducted for 100 marks.
- **Part A:** First question with 20 MCQs carrying 1 mark each.
- **Part B:** Each full question is for 16 marks. (Answer five full questions out of 10 questions with intra modular choice). In every question, there will be a maximum of three sub-questions.
- **CIE** will be announced prior to the commencement of the course.
- 25 marks for test. Average of three test will be taken.
- 25 marks for Alternate Assessment Method.

**Textbooks:**


1. Stuart Russell, Peter Norvig, Artificial Intelligence – A Modern Approach, Pearson Education, Third Edition,2015
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, McGraw-Hil, Third Edition l, 2010.
3. Allen B. Downey, “Think Python: How to Think like a Computer Scientist”, 2nd Edition, O’Reilly Publishers, 2016.


**Reference Book:**


1. G. Luger, “Artificial Intelligence: Structures and Strategies for complex problem Solving”, Pearson Education, Fourth Edition-2002.
2. E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson Education,2008.
3. Dan W. Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall of India.
4. D W Rolston, "Artificial Intelligence and Expert Systems”, Mc Graw hill

**B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**
**Choice Based Credit System (CBCS)**
SEMESTER – III

**Discrete Mathematical Structures (3:0:0) 3**
(Effective from the academic year 2021-2022)

| | | | |
|---|---|---|---|
| Course Code | **21CS37** | CIE Marks | 50 |
| Teaching Hours/Week (L: T:P) | 3:0:0 | SEE Marks | 50 |
| Total Number of Contact Hours | 40 | Exam Hours | 03 |

**Course Objectives:**

This course will enable students to:

1. Understand an intense foundational introduction to fundamental concepts in discrete mathematics.
2. Interpret and solve the language associated with logical reasoning, relations, and functions.
3. Depict mathematical induction to analyzes recursive and non-recursive concepts
4. Verify the graph theory fundamental concepts with respect to various real time problems.

**Module – I**

**Preamble:** Discrete Mathematics course introduces students to the mathematics of discrete structures which build the mathematical foundation of Information Technology. Discrete mathematics has wide variety of application in problem analysis, decision making and provides adequate basics for the IT students who will be taking advanced courses like Security, Machine Learning and the Theory of Computing. The concepts of counting, mathematical induction, functions, relations, and graph theory provides an applied introduction to model mathematical concepts to the real word applications.

**Introduction:** Significance and scope of discrete mathematics in economic growth of nation, Impact of discrete mathematics on societal problems, sustainable solutions, Career perspective of discrete mathematics, current innovations in discrete mathematics.

**Fundamental Principles of Counting:** Overview, The rule of sum and product, Permutations, Combinations, The binomial theorem, Multinomial Theorem, and Combinations with repetition.

**Set Theory:** Sets and Subsets, Set operations, Laws of set theory.

**The Principles of Inclusion and Exclusion:** Generalization of the principle, Derangements- Nothing is in its right place.

**(08 Hours)**

**Module – II**

**Fundamentals of Logic:** Basic connectives and Truth tables, Tautologies, Logical Equivalence: The laws of logic, Logical implications, Rules of inference. Open statement, Quantifiers, and Predicate Calculus: Definition and the use of Quantifiers, Definitions, and the proofs of theorems.

**(08 Hours)**

**Module –III**

**Relations:** Properties of relations, Equivalence relations, Partitions, Partial orders, Hasse diagrams, and Extremal elements in posets.

**Functions:** Types of function, Properties of functions, The pigeonhole principle, Composition of functions, Inverse functions and Invertible Functions.

**(08 Hours)**

**Module – IV**

**Mathematical Induction, Recursive Definitions and Recurrence Relations:**
Method of mathematical induction, Recursive definition, Rook polynomials, and Arrangements with forbidden positions. First order linear recurrence relation-Formulation problems and examples. Second order linear homogeneous recurrence relations with constant coefficients.

**(08 Hours)**

**Module – V**

**Introduction to Graph Theory:** Definitions and Examples, Subgraphs-Spanning subgraph, Induced subgraph, Special subgraphs, Complements of a subgraph, and Graph of isomorphism, Vertex degree, Euler trails and Circuits, Shortest path.

**Trees:** Definitions, Properties and Examples, Routed Trees- Binary tree, Balanced tree, Full binary Tree, Sorting-Merge sort, Weighted trees, Optimal tree and Prefix codes.

**Recap**/Summary of the Course

**(08 Hours)**

**Course Outcomes:**

The Students should be able to

CO1: Outline the fundamental concepts of discrete mathematical structures.

CO2: Apply the concepts of discrete mathematical structures for effective computation and relating problems in Engineering domain.

CO3: Analyze the concepts of discrete mathematics to various fields of Engineering.

CO4: Design mathematical solutions for solving various real time problems.

**Question paper pattern:**

- **SEE** will be conducted for 100 marks.
- **Part A:** First question with 20 MCQs carrying 1 mark each.
- **Part B:** Each full question is for 16 marks. (Answer five full questions out of 10 questions with intra modular choice). In every question, there will be a maximum of three sub-questions.
- **CIE** will be announced prior to the commencement of the course.
- 25 marks for test. Average of three test will be taken.
- 25 marks for Alternate Assessment Method.

**Text books**


1. Ralph P. Grimaldi and B V Ramana, Discrete and Combinatorial Mathematics- An Applied Introduction, Pearson Education, Asia, Fifth edition – 2007. ISBN 978-81-7758-424-0.
2. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata – McGraw Hill, 35TH reprint 2008. ISBN 13:978-0-07-463113-3.


**References**


1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata – McGraw Hill, Sixth Edition, Sixth reprint 2008. ISBN-(13):978-0-07-064824-1.
2. C. L. Liu and D P Mohapatra, Elementary Discrete Mathematics, Tata- McGraw Hill, Sixth Edition, ISBN: 10:0-07-066913-9.

**B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**
**Choice Based Credit System (CBCS)**
SEMESTER – III

**Data Structures and Applications Laboratory (0:0:2) 1**
(Effective from the academic year 2021-2022)

| | | | |
|---|---|---|---|
| Course Code | **21AML38A** | CIE Marks | 50 |
| Teaching Hours/Week (L: T:P) | 0:0:2 | SEE Marks | 50 |
| Total Number of Contact Hours | 26 | Exam Hours | 3 |

**Course Objectives:**
This course enables students to:
1. Develop linear data structures and their applications such as stacks, queues and lists.
2. Develop non-linear data structures and their applications such as trees and graphs sorting and searching algorithms.

**Descriptions:** Design, develop, and implement the specified Data Structure as given in the list given below using C Language under LINUX /Windows environment.

**Programs List**

| | |
|---|---|
| 1. | Design, Develop and Implement a menu driven Program in C for the following Array operations<br>a. Creating an Array of N Integer Elements<br>b. Display of Array Elements with Suitable Headings<br>c. Inserting an Element (ELEM) at a given valid Position (POS)<br>d. Deleting an Element at a given valid Position(POS)<br>e. Exit.<br>Support the program with functions for each of the above operations. |
| 2. | Design, Develop and Implement a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX)<br>a. Push an Element on to Stack<br>b. Pop an Element from Stack<br>c. Demonstrate Overflow and Underflow situations on Stack<br>d. Display the status of Stack<br>e. Exit<br>Support the program with appropriate functions for each of the above operations. |
| 3. | Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, %( Remainder), ^(Power) and alphanumeric operands. |
| 4. | Design, Develop and Implement a Program in C for evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^. |

| | |
|---|---|
| 5. | Design, Develop and Implement a menu driven Program in C for the following operations on Circular QUEUE of integers (Array Implementation of Queue with maximum size MAX)<br>a. Insert an Element on to Circular QUEUE<br>b. Delete an Element from Circular QUEUE<br>c. Demonstrate Overflow and Underflow situations on Circular QUEUE<br>d. Display the status of Circular QUEUE<br>e. Exit<br>Support the program with appropriate functions for each of the above operations. |
| 6. | Design, Develop and Implement a menu driven Program in C for the following operations on Double Ended QUEUE of integers (Array Implementation of Queue with maximum size MAX)<br>a. Perform Insertion / Deletion at front of QUEUE<br>b. Perform Insertion / Deletion at rear of QUEUE<br>c. Display the status of Circular QUEUE<br>d. Exit<br>Support the program with appropriate functions for each of the above operations. |
| 7. | Design, Develop and Implement a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Branch, Sem, PhNo<br>a. Create a SLL of N Students Data by using front insertion.<br>b. Display the status of SLL and count the number of nodes in it<br>c. Perform Insertion / Deletion at End of SLL<br>d. Perform Insertion / Deletion at Front of SLL(Demonstration of stack)<br>e. Exit |
| 8. | Design, Develop and Implement a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, PhNo<br>a. Create a DLL of N Employees Data by using end insertion.<br>b. Display the status of DLL and count the number of nodes in it<br>c. Perform Insertion and Deletion at End of DLL<br>d. Perform Insertion and Deletion at Front of DLL<br>e. Demonstrate how this DLL can be used as Double Ended Queue<br>f. Exit. |
| 9. | Design, Develop and Implement a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers<br>a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2<br>b. Traverse the BST in Inorder, Preorder and Post Order<br>c. Search the BST for a given element (KEY) and report the appropriate message<br>d. Exit. |

| | |
|---|---|
| 10. | Design, Develop and Implement a Program in C for the following operations on Graph(G) of Cities<br>a. Create a Graph of N cities using Adjacency Matrix.<br>b. Print all the nodes reachable from a given starting node in a digraph using DFS method. |

**Course Outcomes:**

The student should be able to:

CO1: Write programs to implement different types of data structures.

CO2: Demonstrate the working of different types of data structures

**Assessment Patterns**

- **CIE (50 marks)**
- **SEE(50 marks)**

Conduct of Practical Examination:

All laboratory experiments are to be included for practical examination.

Experiment distribution

- For questions having only one part: Students are allowed to pick one experiment from the lot and are given equal opportunity.
- Change of experiment is allowed only once and marks allotted for procedure part to be made zero.

**Marks Distribution :**

For questions having only one part – Procedure + Execution + Viva-Voce: =100 Marks (will be reduced to 50).

**B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**
Choice Based Credit System (CBCS)
**SEMESTER - III**

**Artificial Intelligence Laboratory (0:0:2) 1**
(Effective from the academic year 2021-22)

| | | | |
|---|---|---|---|
| Course Code | **21AML38B** | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P) | 0-0-2 | SEE Marks | 50 |
| Total Number of Contact Hours | 26 | Exam Hours | 3 |

**Course objectives:**
This course enables students to:

1. Understand Python language to develop AI based applications.
2. Study various techniques and algorithms of Artificial Intelligence.
3. Develop the skills in applying appropriate Artificial Intelligence algorithms for solving practical problems.

**Practice programs in Python: Students can be encouraged to do practice problems, some practice problems are listed here**

1. Write a program to demonstrate different number datatypes in python.
2. Write a program to create, concatenate and print a string and accessing substring from a given string.
3. Write a program to demonstrate working with tuples in python
4. Write a program to demonstrate working with dictionaries in python
5. Write a python program to that accepts length of three sides of a triangle as inputs. The program should indicate whether the triangle is a right-angled triangle (use Pythagorean theorem):
6. Write a python program to implement List operations (Nested List, Length, Concatenation, membership, Iteration, Indexing and Slicing)
7. Write a python program to implement List methods (Add, Append, Extend & Delete)..
8. Write a python program to define a module and import a specific function in that module to another program.
9. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
10. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.

**List of Artificial Intelligence programs to be implemented in Python**

**PART A**

1. Implement and Demonstrate Depth First Search Algorithm for Water Jug Problem,
2. Implement Breadth First Search Algorithm for Missionaries-Cannibals Problems.
3. Implement AO* algorithm for real world problem.
4. Implement and demonstrate the Game playing strategies for Tic-Tac-Toe game.
5. Implement 8-Puzzle problem.
6. Implement problem-solving strategies: either using Forward Chaining or Backward Chaining.
7. Implement Travelling Salesman Problem for real world scenario.
8. Implement propositional logic resolution reasoning system.

**Course outcomes:**

The student should be able to:

- Identification of appropriate algorithms for solving of real-world problems
- Apply Artificial intelligence algorithms to real-world problems.
- Analyze Artificial intelligence techniques in high-performance computing environment to solve real-world problems.

**Assessment Patterns**

- **CIE (50 marks)**
- **SEE (50 marks)**

Conduct of Practical Examination:

All laboratory experiments are to be included for practical examination.

Experiment distribution

- For questions having only one part: Students are allowed to pick one experiment from the lot and are given equal opportunity.
- For questions having part A: Students are allowed to pick one experiment from part A.
- Change of experiment is allowed only once and marks allotted for procedure part to be made zero

**Marks Distribution:**

For questions having only one-part PART –A: Procedure + Conduction + Viva: 10 + 35 +05 (50) Marks.

**B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**
Choice Based Credit System (CBCS)
**SEMESTER – III**

**Digital System Design Laboratory (0:0:2) 1**
(Effective from the academic year 2021-22)

| | | | |
|---|---|---|---|
| Subject Code | **21AML38C** | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P) | 0:0:2 | SEE Marks | 50 |
| Total Number of Contact Hours | 26 | Exam Hours | 3 |

**Course Objectives:**

This course will enable students to

1. Students will learn and understand the Basics of digital electronics and able to design basic logic circuits
2. Know the concepts of Combinational circuits.
3. Understand the concepts of flip-flops, registers, and counters

**Theoretical concepts on Computer architecture**

1. Instruction Set Characteristics, Instruction Set Design Considerations.
2. Addressing Schemes.
3. Basic Processor Design – RISC, CISC
4. Computer Architecture Fundamentals.
5. Simple CPU Instruction Set Design.
6. GPU Architecture.

**PART A: Digital design HARDWARE PROGRAMS:**

1. Implementation of 4-bit parallel adder using 7483 IC.
2. Given a 4-variable logic expression, simplify it using Entered Variable Map and realize the simplified logic expression using 8:1 multiplexer IC.
3. Design and realization One Bit and Two-Bit Magnitude Comparator using Basic Gates.
4. Design and verify the Truth Table of 3-bit Parity Generator and 4-bit Parity Checker using basic Logic Gates with an even parity bit.
5. Realize a J-K Master / Slave Flip-Flop using NAND gates and verify its truth table.
6. Design and implement a mod-n (n<=8) synchronous up counter using J-K Flip-Flop ICs and demonstrate its working.
7. 14. Design and implement an asynchronous counter using decade counter IC to count up from 0 to n (n<=9) and demonstrate on 7-segment display (using IC- 7447).

**Course Outcomes:**

The students will be able to:

CO1: Understand and explore the basic concepts of logic families, Boolean algebra, combinational , sequential circuits and computer architectures.
CO2: Apply the concepts of simplification to realize the digital circuits.
CO3: Analyze and evaluate different techniques to realize the digital circuits.
CO4: Design and develop digital circuits for various applications.

**Assessment Patterns**

- **CIE (50 marks)**
- **SEE (50 marks)**

Conduct of Practical Examination:
All laboratory experiments are to be included for practical examination.
Experiment distribution

- For questions having only one part: Students are allowed to pick one experiment from the lot and are given equal opportunity.

- For questions having part A: Students are allowed to pick one experiment from part A.
- Change of experiment is allowed only once and marks allotted for procedure part to be made zero

**Marks Distribution:**

For questions having only one-part PART –A: Procedure + Conduction + Viva:10+35 +05 (50) Marks.

**B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**

Choice Based Credit System (CBCS)

**SEMESTER – III**

**Diploma Mathematics- I (0:0:0) NIL**

COMMON TO ALL BRANCHES

(Effective from the academic year 2021-22)

| Course Code | **21DIP31A** | CIE Marks | 100 |
|---|---|---|---|
| Teaching Hours/Week (L:T:P) | 3:0:0 | SEE Marks | - |
| Total Number of Contact Hours | 30 | Exam Hours | 3 |

**Course Objectives:**

This course will enable students to:

1. To enable students to apply knowledge of mathematics in various engineering fields by making them to learn the basic tools of vector differentiation, calculus and elementary Linear Algebra.
2. To familiarize the important tools of Differential and Integral Calculus required to analyze the engineering problems.

**Module – I**

**Introduction:** Understanding the importance of the study of Complex Trigonometry, Calculus, Linear algebra and its applications in the field of Science, Engineering and Economics.

**Differential Calculus-I: Differentiation:** Polar curves: angle between the radius vector and tangent, angle between two curves, pedal equation-problems; Maclaurin's series of single variable. **(6 Hours)**

**Module – II**

**Differential Calculus-II:** Partial differentiation, Total derivatives-differentiation of composite functions, Jacobians-simple problems. **(6 Hours)**

**Module – III**

**Vector Differentiation:** Velocity and acceleration of a particle moving on a space curve. Scalar and vector point functions. Gradient, Divergence, Curl-simple problems. Solenoidal and irrotational vector fields-Problems. **(6 hours)**

**Module – IV**

**Linear Algebra:** Introduction - Rank of matrix by elementary row operations - Echelon form. Gauss elimination method and approximate solution by Gauss-Seidel method. Eigen values and Eigen vectors of a square matrix of 2×2 & Rayleigh's power method -problems. (6 hours)

**Module – V**

**Integral Calculus:** Reduction formulae for $\int Sin^n x dx$, $\int Cos^n x dx$ (proofs with limits between 0 and π/2), $\int Sin^m x Cos^n x dx$ (m & n are positive integers) (proof without limits) and problems on these Reduction formulae with limits. Double and triple integration-Simpleexamples. **Recap**/Summary of the Course**.** **(6 hours)**

**Course outcomes:**

The students will be able to:

CO1: Use derivatives to calculate rate of change of functions of a single and multivariate variable.

CO2: Analyze position, velocity and acceleration in two and three dimensions of vector Valued functions.

CO3: Learn techniques of integration including the evaluation of double and triple integrals.
CO4: Solve system of Linear equations by using Matrix Algebra.

**Question paper pattern:**

**CIE** will be announced prior to the commencement of the course.

- 75 marks for test. Average of three tests will be taken.
- 25 marks for Alternate Assessment Method.

**Textbooks:**


1. B.S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2015.
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill, 2010.
3. C. Pandurangappa, Advanced Mathematics II (Lateral entry bridge course textbook), 3rd Edition, Sanguine Publishers, 2015.


**References:**


1. N.P. Bali, Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publishers, 2014.
2. E. Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2015.
3. H.K. Dass, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Private Ltd. , 2014.
4. S. Pal and S.C. Bhunia, Engineering Mathematics, 3rd edition, Oxford University Press, 2016.