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)

August 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"

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(With Effect from Academic Year - 2021-22)

August - 2022

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(Autonomous Institute affiliated to VTU)

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

Choice Based Credit System (CBCS)

Common to CSE/ISE

UG PROGRAM: BE Computer Science and Engineering (CSE) | **Semester: IV**

Sl. No	Course Category	Course Code	Course Title	Teaching Dept.	Teaching Hours /Week			Credits	Examination			
					L	T	P		Duration	CIE Marks	SEE Marks	Total Marks
1	BS	21MTB41	Advanced Engineering Mathematics - II	MAT	3	1	1	4	3	50	50	100
2	HS	21KSK42	Samskrutika Kannada	HS	1	0	0	1	1	50	50	100
		21KBK42	Balake Kannada									
		OR										
		21CIP42	Constitution of India and Professional Ethics									
3	UHV	21UHV43	Universal Human Values - II	HS	1	0	0	1	1	50	50	100
4	HS	21HSS44	Environmental Studies	HS	2	0	0	2	2	50	50	100
5	PC	21CS45	Microcontroller and Embedded System	CSE	3	0	0	3	3	50	50	100
6	PC	21CS46	Design and Analysis of Algorithms	CSE	2	2	0	3	3	50	50	100
7	PC	21CS47	Software Engineering	CSE	3	0	0	3	3	50	50	100
8	PC	21CSL48A	Microcontroller and Embedded System Laboratory	CSE	0	0	2	1	3	50	50	100
9	PC	21CSL48B	Design and Analysis of Algorithms Laboratory	CSE	0	0	2	1	3	50	50	100
10	PC	21CSL48C	Object Oriented Programming using JAVA Laboratory	CSE	0	0	2	1	3	50	50	100
				TOTAL	**15**	**3**	**7**	**20**	**----**	**500**	**500**	**1000**

Course Prescribed to Lateral entry Diploma holders admitted to III Semester B.E.												
1	NCMC	21DIP41A	Diploma Mathematics- II	MAT	3	0	0	0	3	100	--	100

- For Lateral Entry Students assessment of Internship – I to be conducted during 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.
- Diploma 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 Diploma Mathematics II shall be indicated as satisfactory in the grade card. Non completion of the courses Diploma Mathematics II shall be indicated as unsatisfactory.

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SEMESTER – IV

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

Course Code	21MTB41	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:1:1	SEE Marks	50
Total Number of Contact Hours	50	Exam Hours	3

Course Objectives:

This course will enable students to:

1. Solve the first and second orders ordinary differential equations numerically.
2. Familiarize students with the concepts of Complex Analysis
3. Acquire the knowledge of Optimization techniques to solve the linear programming problems by using various methods.
4. Apply the concept of probability in Stochastic Process and Queuing theory problems.
5. Analyze the statistical data for testing of hypothesis and to draw the conclusions.

Module – I

Introduction: Understanding the importance of the study of Complex Analysis, Transformations, Numerical techniques, Statistics, Probability and Sampling Distributions and their applications in the field of Science, Engineering, Business & Research.

Numerical Methods: Numerical solution of algebraic and transcendental equations by Regula Falsi method and Newton Raphson method.

Numerical solution of ordinary differential equations of first order and first degree, Taylor's series method, modified Euler's method. 4^{th} order Runge -Kutta method, Milne's predictor and corrector methods.

Self-Learning Component: Picard's method

Lab Session 1:

1. Solution of differential equation using Euler Method, 4th order Runge- Kutta method.
2. Determination of roots of a polynomial by Newton Raphson method, Regula Falsi method

(10 Hours)

Module – II

Complex Variables: Analytic functions - Cauchy-Riemann equations in Cartesian and Polar forms, Construction of analytic functions by Milne's method. Complex line integrals - Cauchy's theorem and Cauchy's integral formula.

Transformation: Conformal transformation, discussion of transformations: $w = z^2, w = e^z, w = z + \frac{1}{z}$ $(z \neq 0)$. Bilinear transformation-problems.

Self-Learning Component: Residue, poles, Cauchy's Residue theorem (without proof) and problems.

Lab Session 2:

1. Conformal mapping using matlab for $W = e^z, W = z^2,\ W = z + \frac{1}{z}$ $(z \neq 0)$, complex valued functions.
2. Compute residues and poles for complex functions. **(10 Hours)**

Module – III

Linear Programming Problems (LPP): Mathematical Formulation of LPP, Graphical solution of LLP, Simplex method, Big M method and Game theory: Introduction, Two Person Zero-Sum Game.

Self Learning Component: Linear Programming method for solving games.

Lab Session 3:

1. Maximization/Minimization of functions using
    a) Graphical Method
    b) Simplex Method
    c) Big M Method **(10 hours)**

Module – IV

Stochastic process and Queueing Theory: Stochastic processes, Probability Vector, Stochastic matrices, Regular stochastic matrices, Markov chains, Higher transition probabilities, Stationary distribution of Regular Markov chains and absorbing states.

Queuing theory: Introduction, Poisson processes, Concepts and M/M/1 queuing systems, Transient and Steady state solution of M/M/1 queue, Performance measure of M/M/1 queue, problems.

Self Learning Component: M/M/1/N queuing systems.

Lab Session 4:

1. Modeling of Markov process and basic queuing systems. **(10 hours)**

Module – V

Sampling and Statistical Inference: Sampling, Sampling distributions, Test of hypothesis for means, Confidence limits for means, Z-test, Student's t-distribution, Chi-square distribution as a test of goodness of fit.

Self Learning Component: ANOVA Table.

Lab Session 5:

Testing of hypothesis by

1. Z-test
2. Student's t-distribution
3. Chi-square distribution

Summary of the course: Various numerical techniques to solve ordinary differential equations, LPP, Stochastic process, Sampling and Statistical inferences. **(10 hours)**

Course outcomes:

The students will be able to

CO1: Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods.

CO2: Explain the concepts of analytic functions, describe conformal and Bilinear transformation arising in field theory and signal processing.

CO3: Optimize the linear programming problem by using various methods.

CO4: Apply the concept of probability in Stochastic Process and queuing problems.

CO5: Demonstrate the validity of testing the hypothesis.

CIE will be conducted for 100 marks.

- Three Unit Tests each of **20 Marks** (Duration 01 hour).
- Two assignments each of 10 Marks.

- Two alternate assessment tools (AATs) from the list shall be planned to attain the COs and POs for **20 Marks** (duration 01 hours).
- The sum of three tests, two assignments, and AATs will be out of 100 marks and will be scaled down to 50 marks.

Textbooks:

1. B.S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2015.
2. E. Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2015.
3. S. D. Sharma, Operations Research, Kedar Nath, 2010.

References:

1. N. P. Bali, Manish Goyal, A Text Book of Engineering Mathematics, 7th Edition, Laxmi Publishers, 2014.
2. H. K. Dass, Er. Rajnish Verma, Higher Engineering Mathematics, 3rd Edition, S. Chand publishing, 2014.
3. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill, 2010.
4. Robert J. Vanderbei, Linear Programming Foundations and Extensions, 3rd Edition, Springer, 2007.

B.E COMPUTER SCIENCE AND ENGINEERING
Choice Based Credit System (CBCS)
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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: **Course outcomes**

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)
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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
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

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SEMESTER – IV

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. Familiarize 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

Module – I

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 – II

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 – III

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 – IV

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

Elections-Electoral Process in India, Election Commission of India: Powers & Functions, Constitutional Amendments- methods and Important Constitutional Amendments ie 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 – V

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.

Textbooks:

1. Thomas H. Cormen, Charles, E. Leiserson, Ronal L. Rivest, Clifford Stein, Introduction to Algorithms -. ISBN: 9788120340077, Prentice Hall Of India, 3rd Edition, 2017.

2. Durga Das Basu, Introduction to the Constitution of India, Lexis Nexis, 20th Edn, 2011.

3. 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.

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Choice Based Credit System (CBCS)
SEMESTER – IV

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

Course Code	21UHV43	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 family, society and nature/existence.
2. Understand harmony in the family, society and nature/existence
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.

Harmony in the Family: Understanding values in human relationships; Family as basic unit; Harmony in family, Recognizing feelings in relationships-trust, respect, affection, care, guidance, reverence, glory, gratitude and love.

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

Module – II

Harmony in Society: Extending relationship from family to society; Comprehensive human goal, Five dimensions of human endeavor; Harmony from family order to World family order.

Case study and Group Discussion

(2 Hours)

Module – III

Harmony in the Nature: Understanding the harmony in the Nature; Interconnectedness, self-regulation and mutual fulfillment; four orders of nature; Recyclability, Natural characteristics.

Case study and Group Discussion

(3 Hours)

Module – IV

Harmony in Existence: Understanding existence as co-existence; Space; Co-existence of units in space, various attributes of units and space, Role of a human being in existence.

Case study and Group Discussion

(2 Hours)

Module – V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values; Definitiveness of Ethical Human Conduct; Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in professional ethics, Holistic Technologies.

Typical Case Studies, Strategies for Transition towards Value-based Life and Profession **Case study and Group Discussion**

(3 Hours)

Course outcomes: The students will be able to:

CO1. Understand the role of a human being in ensuring harmony in family, society and nature, significance of value inputs in a classroom and start applying them in their life and profession

CO2. Distinguish between values and skills, ethical and unethical practices, happiness and accumulation of physical facilities, Intention and Competence of an individual etc and start working out the strategy to actualize a harmonious environment wherever they work

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. ISBN 978-93-87034-47-1
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, New Delhi, 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. Small Is Beautiful: A Study of Economics as if People Mattered, E. F. Schumacher, 1973, Blond & Briggs, UK
4. Vivekananda - Romain Rolland (English)

Relevant websites, documentaries :

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

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SEMESTER – IV

Environmental Studies (2:0:0) 2
(Common to all Branches)
(Effective from the academic year 2021-22)

Course Code	21HSS44	CIE Marks	50
Teaching Hours/Week (L:T:P)	2:0:0	SEE Marks	50
Total Number of Contact Hours	26	Exam Hours	02

Course Objectives:

This course will enable students to:

1. Recognize the ecological basis for regional and global Environmental issues, and lead by example as an environmental steward.
2. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
3. Analyze the trans-national character of environmental problems and ways of addressing them, including interactions across local to global scales.
4. Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work as environmentalists.

Module – 1

Introduction: Relevance of the Subject to Historical and real-time Global, Economic and Societal Scenario. Internship and Job Opportunities in the current scenario.

Ecosystems (Structure and Function): Forest, Desert, Wetlands, Riverine, Oceanic and Lake.
Biodiversity: Types, Value; Hot-spots; Threats to Biodiversity.

(5 Hours)

***Field work:** Visit to a local area to document environmental assets: river / forest / grassland / hill

Module – 2

Environmental Pollution & Abatement (with Case-studies): Surface and Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution.

(5 Hours)

***Field work:** Visit to a local polluted Site-Urban/Rural/Industrial/Agricultural, so as to observe and document environmental pollution and recommend remedial measures.

Module – 3

Waste Management & Public Health Aspects: Bio-medical Wastes; Solid waste; Hazardous wastes; E-wastes; Industrial and Municipal Sludge.

(5 Hours)

***Field work:** Visit to a local polluted Site-Urban/Rural/Industrial/Agricultural, so as to observe and document environmental impacts and recommend remedial measures.

Module – 4

Global Environmental Concerns (Concept, policies and case-studies): Ground water depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Fluoride problem in drinking water; Cloud Seeding, and Carbon Trading.

(5 Hours)

***Field work:** Visit to a Green Building, followed by understanding of process and its brief documentation.

Module – 5

Latest Developments in Environmental Pollution Mitigation (Concept and Applications): G.I.S. and Remote Sensing, Environment Impact Assessment (E.I.A.), Environmental Management Systems (E.M.S.), ISO14001.

Case Studies: Environmental Stewardship, Environmental NGOs.

***Field work:** Visit to an Environmental Engineering Laboratory / Water Treatment Plant/Wastewater treatment Plant, followed by understanding of process and its brief documentation

Summary of the Course

(6 Hours)

(*Note: Any 1 among the 5 Field works is mandatory from the Exercises discussed in across the
5 modules, and Students have to submit a report)

Course outcomes:
The students will be able to:

CO1:	Appraise the significance of ecological systems under the ambit of environment.
CO2:	Analyze for the consequences owing from anthropogenic interactions on the environmental processes.
CO3:	Recommend solutions in the Anthropocene Epoch, with an in-depth understanding of the interdisciplinary facets of environmental issues.
CO4:	Elucidate the trans-national character of environmental problems and ways of addressing them.
CO5:	Appraise latest developments, concerns and ethical challenges associated with Environmental Protection.

Teaching Practice:

- Classroom teaching (Chalk and Talk)
- ICT – Power Point Presentation
- Audio & Video Visualization Tools
- Case Studies: Real-life Article Inferential Discussion
- Site-visit and Reporting

Question paper pattern:

- SEE will be conducted for 50 marks, and will comprise of 50 MCQs. The duration of exam is 2 hours.
- CIE will be conducted for 40 marks. It will be for 1-hour duration; it shall consist of 40

MCQs, each carrying 1 mark.

- CIE will be announced prior to the commencement of the course.
- Two assignments ought to be submitted each of 10 Marks
- One alternate assessment tools (AATs) from the list shall be planned to attain the COs and POs for 20 Marks (duration 01 hours)
- The average of three tests, two assignments, and AATs will be out of 100 marks and will be scaled down to 50 marks.

Text Books

1. Rajesh Gopinath and N. Balasubramanya, "Environmental science and Engineering", 1st Edition, City of Publisher, Cengage Learning India Private Limited, 2018.
2. J. S. Singh, S. P. Singh and S. R. Gupta, "Ecology, Environmental Science and Conservation", India, S. Chand Publishing, 2017.

References:

1. M. Gadgil and R. Guha, "This Fissured Land: An Ecological History of India", Univ. of California Press, 1993.
2. E. P. Odum and H. T. Odum, "Fundamentals of Ecology", Philadelphia: Saunders Publisher, 1971.
3. M. L. Mckinney, "Environmental Science systems & Solutions", Web enhanced Edition, City of Publisher, R. M. Publisher, 1996.

B.E COMPUTER SCIENCE AND ENGINEERING
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SEMESTER – IV

Microcontroller and Embedded Systems (3:0:0) 3
(Effective from the academic year 2021 -2022)

Course Code	21CS45	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. Understand the fundamentals of ARM based systems, basic hardware components, selection methods and attributes of an embedded system.
2. Program ARM controller using the various instructions
3. Identify the applicability of the embedded system
4. Comprehend the real time operating system used for the embedded system

Module – I

Preamble: This course is to make the students understand the architecture, programming, and interfacing of a system design of microprocessors and microcontrollers. Embedded systems are special-purpose computing systems embedded in application environments or in other computing systems and provide specialized support. The decreasing cost of processing power, combined with the decreasing cost of memory and the ability to design low-cost systems on chip, has led to the development and deployment of embedded computing systems in a wide range of application environments.

Microprocessors Versus Microcontrollers, ARM Embedded Systems: The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software. ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions.

(9 Hours)

Module – II

Introduction to the ARM Instruction Set: Data Processing Instructions, Program, Instructions, Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants. ARM programming using Assembly language: Writing Assembly code.

(8 Hours)

Module – III

Embedded System Components: Embedded vs. General computing system, History of embedded systems, Classification of Embedded systems, Major applications areas of embedded systems, purpose of embedded systems. Core of an Embedded System including all types of processor/controllers.

(7 Hours)

Module – IV

Embedded System Design Concepts and its Components: Memory, Sensors, Actuators, LED, 7 segment LED display, stepper motor, Keyboard, Communication Interface (onboard and external types), Embedded firmware, Other system components. Characteristics and Quality Attributes of Embedded Systems, Operational quality attributes, non-operational quality attributes, Embedded Systems-Application and Domain specific.

(7 Hours)

Module – V

RTOS and IDE for Embedded System Design: Hardware Software Co-Design and Program. Modelling, embedded firmware design and development, how to choose an RTOS, Embedded system Development Environment – Block diagram (excluding Keil), Disassembler / decompile.

(9 Hours)

Course Outcomes:

The students will be able to:

CO1: Designate the architectural features and instructions of ARM micro controller

CO2: Apply the knowledge gained for Programming ARM for different applications.

CO3: Interpret the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.

CO4: Analyze to understand the different concepts of a RTOS for embedded system applications.

CO5: Develop the knowledge of the hardware /software co-design and firmware design Approaches.

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.Andrew N Sloss, Dominic Symes and Chris Wright, ARM system developers guide, Elsevier, Morgan Kaufman publishers, 2008.

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

References:

1.Raghunandan. G.H, Microcontroller (ARM) and Embedded System, Cengage learning Publication, 2019

2. The Insider's Guide to the ARM7 Based Microcontrollers, Hitex Ltd., 1st edition, 2005

3. Steve Furber, ARM System-on-Chip Architecture, Second Edition, Pearson, 2015.

4. Raj Kamal, Embedded System, Tata McGraw-Hill Publishers, 2nd Edition, 2008.

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SEMESTER – IV

Design and Analysis Algorithm (2:2:0) 3
(Effective from the academic year 2021 -2022)

Course Code	21CS46	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	3

Course Objectives:

This course will enable students to:

1. Understand various computational problem-solving techniques.
2. Apply appropriate Algorithmic techniques to solve a given problem.
3. Analyze the algorithms with respect to time and space.
4. Estimate the computational complexity of different algorithms.
5. Develop programs for real world applications using efficient algorithms.

Module – I

Preamble: The advancement in science and technology enhance the performance of processor, which proportionally affect the characteristics of computer system, such as security, scalability and reusability. Important problems such as sorting, searching, string processing, graph problems, Combinational problems, numerical problems are basic motivations for designing algorithm and analyzing it. Since algorithm design techniques are growing at a fast pace, it has become important for IT professionals to upgrade their knowledge in order to meet growing industry demand.

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

What is an Algorithm? Algorithm Specification, The Analysis Framework, Performance Analysis: Space complexity, Time complexity, Asymptotic Notations: Big-Oh notation (O), Omega notation (Ω), Theta notation (θ), and Little- oh notation (o), Mathematical analysis of Non-Recursive and recursive Algorithms with Examples. Important Problem Types: Sorting, Searching, String processing, Graph Problems, Combinatorial Problems.

(11 Hours)

Module – II

Divide and Conquer: General method, Binary search, Finding the maximum and minimum, Merge sort, Quick sort, Strassen's matrix multiplication, Advantages and Disadvantages of divide and conquer.

Decrease and Conquer Approach: Topological Sort.

(10 Hours)

Module – III

Greedy Method: The General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines.

Minimum cost spanning trees: Prim's Algorithm, Kruskal's Algorithm. Single source shortest paths: Dijkstra's Algorithm.

Transform and Conquer Approach: Heaps and Heap Sort.

(10 Hours)

Module – IV

Dynamic Programming: General method with Examples, Multistage Graphs, Warshall's Algorithm, Floyd's Algorithm, Optimal Binary Search Trees, Knapsack problem, Travelling Salesperson problem.

(10 Hours)

Module – V

Backtracking: General method, N-Queens problem, Sum of subsets problem, Graph Coloring, Hamiltonian cycles.

Branch and Bound: Assignment Problem, Travelling Salesman problem.

NP-Complete and NP-Hard problems: Basic concepts, nondeterministic algorithms, P, NP, NP-Complete, and NP-Hard classes.

Recap/Summary of the Course

(11 Hours)

Course Outcomes: The student will be able to:

- **CO1**: Discuss computational solution to well-known problems like searching, sorting etc.
- **CO2**: Apply different algorithmic technique for problem solving.
- **CO3**: Analyze the asymptotic performance of algorithms.
- **CO4**: Design and implement applications using suitable algorithmic techniques.

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. Anany Levitin, Introduction to the Design and Analysis of Algorithms -, Pearson Education Limited. 3rd Edition, 2019.
2. Ellis Horowitz, Satraj Sahni and Rajasekaran, Computer Algorithms/C++, Universities Press 2nd Edition, 2014

References:

1. Thomas H. Cormen, Charles, E. Leiserson, Ronal L. Rivest, Clifford Stein, Introduction to Algorithms -. ISBN: 9788120340077, Prentice Hall Of India, 3rd Edition, 2017.

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SEMESTER – IV

Software Engineering (3:0:0) 3

(Effective from the academic year 2021 -2022)

Course Code	21CS47	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 principles, concepts, methods, and techniques of the Software Engineering.
2. Recognize the processes required for developing the quality software.
3. Discover the various roles, ethical and social responsibilities of a Software Engineer.
4. Relate the significance of working in a team for productive software application development.

Module – I

Preamble: Software engineering is important because it formalizes the development process for large technology projects. Moore's Law asserts that the growth and speed of technology are exponential. So in the coming years, software engineering will become even more crucial to delivering technological improvements. Specific software is needed in almost every industry, in every business, and for every function. Computer software is the product that software professionals build and then support over the long term. It encompasses programs that execute within a computer of any size and architecture, content that is presented as the computer programs execute and descriptive information in both hard copy and virtual forms that encompasses virtually and electronic media.

The Nature of software, The changing nature of software

Introduction: Professional software development; Software engineering ethics, case studies. **Software processes:** Software Process Models; Process activities; Coping with change; process improvement.

(9 Hours)

Module – II

Requirements Engineering: functional and non-functional requirements, **Dependability properties, Availability and reliability, safety requirements, security requirements.** Requirements Engineering Processes, Requirements elicitation, **Developing use cases,** Requirements specification, Requirements validation, Requirements change.

(8 Hours)

Module – III

System models: Context models, Interaction models, Structural Models, Behavioural Models; **Architectural design:** Architectural design decisions, Architectural views, Architectural Patterns**.** **Design and Implementation:** Object-oriented design using UML, Design Patterns.

(7 Hours)

Module – IV

Agile Software Development: Agile methods, Agile development techniques, Agile project management. **Software Testing strategies:** A strategic approach to software testing, strategic issues, test strategies for conventional software, validation testing, system testing
Software Evolution: Legacy systems, Software maintenance.

(7 Hours)

Module – V

Project Management Concepts: The management spectrum, People, The product, The process, The project, W^5HH Principle. **Project Scheduling:** Basic concepts, Project scheduling, Defining a task set for the software project, Defining a task network, Scheduling. **Risk Management:** Reactive versus proactive strategies, Software Risks, Risk Identification, Risk Mitigation, Monitoring and Management, The RMMM plan
Recap: Summary of the Course.

(9 Hours)

Course Outcomes: The students will be able to:

CO1: Apply the principles, concepts, methods, and techniques of the Software Engineering.
CO2: Use the techniques, skills and modern engineering tools necessary for engineering practice.
CO3: Analyse the components and process of a given scenario pertaining to it's realistic constraints.

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.

Text books:

1. Ian Somerville, Software Engineering, Person Education Ltd 10th Edition, 2019.
2. Roger. S. Pressman, Software Engineering-A Practitioners Approach, McGraw-Hill, 8th Edition, m 2019.

References:

1. Pankaj Jalote, An Integrated Approach to Software Engineering, 3rd Edition, Narosa Publications, 2005.
2. Stephen R. Schacht, Object Oriented & Classical Software Engineering, Tata McGraw-Hill, 6th Edition, 2005

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

Microcontroller and Embedded Systems Laboratory (0:0:2)1
(Effective from the academic year 2021 -2022)

Course Code	21CSL48A	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	24	Exam Hours	3

Course Objectives:
This course will enable students to:
1. Writing Assembly Language Program (ALP) using ARM7TDMI/LPC2148
2. Conduct the experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler

PART-A: Descriptions

Conduct the following experiments by writing program using ARM7TDMI/LPC2148 using an evaluation board/simulator and the required software tool.

1	Write a program to find the sum of first 10 integer numbers.
2	Write a program to find factorial of a number.
3	Write a program to add an array of 16 bit numbers and store the 32 bit result in internal RAM.
4	Write a program to find the largest/smallest number in an array of 32 numbers.
5	Write a program to arrange a series of 32 bit numbers in ascending/descending order.

PART-B: Descriptions

Conduct the following experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler.

6	Display “Hello World” message using Internal UART.
7	Interface and Control a DC Motor.
8	Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction.
9	Interface a DAC and generate Triangular and Square waveforms.
10	Determine Digital output for a given Analog input using Internal ADC of ARM controller.
11	Interface a 4x4 keyboard and display the key code on an LCD.
12	Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in between.

Course Outcomes: The student should be able to:

CO1: Apply assembly language instructions to the program written in ARM7.
CO2:Analyze the functioning of hardware devices and interfacing them into ARM7 Processor.
CO3:Conduct experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler.

Question paper pattern:

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

Conduct of Practical Examination:

- All laboratory experiments from Part A and Part B are to be included for practical Examination.

Marks Distribution :

A. Part A – Procedure + Execution + Viva = 6 + 28 + 6 = 40 Marks
B. Part B – Procedure + Execution + Viva = 9 + 42 + 9 = 60 Marks

(Final SEE which will be conducted for 100 Marks will be reduced to 50 Marks).

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

Design and Analysis of Algorithms Laboratory (0:0:2) 1
(Effective from the academic year 2021 -2022)

Course Code	21CSEL48B	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. Design and implement various algorithms in C/C++.
2. Employ various Algorithm Techniques for problem solving.
3. Measure and compare the performance of different algorithms.

Descriptions: Design, develop, and implement the specified algorithms for the following problems using C/C++ Language under LINUX /Windows environment.

Programs List

1.	Write C/C++ programs to perform Linear and Binary search of an element from a set of n elements. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C/C++ how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case. Compare the performance of both the algorithms.
2.	Write C/C++ programs to sort a given set of n integer elements using Quick Sort method and compute its time Complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C/C++ how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
3.	Write C/C++ programs to Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 5000, and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C/C++ how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
4.	Implement in C/C++, the 0/1 Knapsack problem using (a) Dynamic Programming method (b) Greedy method.
5.	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm. Write the program in C/C++.
6.	Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union-Find algorithms in your program. Write the program in C/C++.

7.	Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm. Write the program in C/C++.
8.	Write C/C++ programs to (a) Implement All-Pairs Shortest Paths problem using Floyd's algorithm. (b) Implement Travelling Sales Person problem using Dynamic programming.
9.	Implement the C/C++ programs to: a) Obtain the Topological ordering of vertices in a given digraph. b) Compute the transitive closure of a given directed graph using Warshall's Algorithm.
10.	Design and implement in C/C++ to find a subset of a given set S = {Sl, S2.. Sn} of n positive integers whose SUM is equal to a given positive integer d. For example, if S = {1, 2, 5, 6, 8} and d= 9, there are two solutions {1,2,6}and {1,8}. Display a suitable message, if the given problem instance doesn't have a solution.

Course Outcomes: The student should be able to:

CO1: Write programs to implement various algorithmic techniques for solving problems.

CO2: Demonstrate the theoretical and practical time complexities of the algorithms.

Assessment Patterns

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

Conduct of Practical Examination:

All laboratory experiments are to be included for practical examination.

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

Marks Distribution :

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

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

Object Oriented Programming using JAVA Laboratory (0:0:2) 1

(Effective from the academic year 2021 -2022)

Course Code	21CSL48C	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	30	Exam Hours	3

Preamble: This course explains the fundamental ideas behind the object oriented approach to programming. Knowledge of java helps to create the latest innovations in programming. Like the successful computer languages that came before, java is the blend of the best elements of its rich heritage combined with the innovative concepts required by its unique environment. This course involves OOP concepts, java basics, inheritance, polymorphism, interfaces, inner classes, packages, Exception handling, multithreading, collection framework, files, JDBC and GUI components.

Course Objectives:

This course will enable the students to:

1. Learn fundamental features of object-oriented language and JAVA
2. Set up Java JDK environment to create, debug and run simple Java programs
3. Create multi-threaded programs and event handling mechanisms
4. To familiarize with use of java language at Projects level.

Module I

Classes, Inheritance, Exceptions, Packages and Interfaces: Classes: Classes fundamentals; Declaring objects; Constructors, this keyword, garbage collection. Inheritance: inheritance basics, using super, creating multi-level hierarchy, method overriding. Exception handling: Exception handling in Java.

Module II

Multi-Threaded Programming, Event Handling: Multi-Threaded Programming: What are threads? How to make the classes threadable; Extending threads; Implementing runnable;

LAB EXPERIMENTS: PART-A

1. Create a Java class called Student with the following details as variables within it.
    a. USN
    b. Name
    c. Branch
    d. Phone

    Write a Java program to create *n Student objects* and print the USN, Name, Branch, and Phone of these objects with suitable headings.

2. Write a Java program to implement the Stack using arrays. Write Push(), Pop(), and Display() methods to demonstrate its working.

3. A Design a superclass called Staff with details as ***StaffId***, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a Java program to read and display at least 3 staff objects of all three categories.

4. Write a Java class called Customer to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as <name, dd/mm/yyyy> and display as <name, dd, mm, yyyy> using StringTokenizer class considering the delimiter character as "/".

5. A Write a Java program to read two integers a and b. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero.

STUDY EXPERIMENT / PROJECT: PART -B

Develop a Java application project using the concepts learnt in the theory and exercises with a good look and feel effects.

Note:

1. In the examination each student picks one question from part A.
2. A team of two or three students must develop the mini project. However during the examination, each student must demonstrate the project individually.
3. The team must submit a brief project report (15-20 pages) that must include the following
    a. Introduction
    b. Requirement Analysis
    c. Software Requirement Specification
    d. Analysis and Design
    e. Implementation
    f. Testing

Course Outcomes: The students will be able to:

CO1: Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.

CO2: Design programs using appropriate OOP techniques.

CO3: Develop variety of Java program for the real world applications.

Conduction of Practical Examination:

1. All laboratory experiments from part A are to be included for practical Examination.
2. Mini project has to be evaluated for 60 Marks.
3. Report should be prepared in a standard format prescribed for project work.
4. Students are allowed to pick one experiment from the lot.

Marks Distribution:

a) Part A: Procedure + Conduction + Viva: **06+28+06 =40 Marks**

b) Part B: Demonstration + Report + Viva voce **30+20+10 = 60 Marks**

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

Diploma Mathematics- II (0:0:0) NIL
COMMON TO ALL BRANCHES
(Effective from the academic year 2021-22)

Course Code	21DIP41A	CIE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	-
Total Number of Contact Hours	3	Exam Hours	3

Course Objectives:
This course will enable students to:

1. To provide an insight into linear & higher order ODE's and elementary probability theory.
2. To familiarize the important tools of Laplace transformations required to analyze the engineering problems.

Module – I

Introduction: Understanding the importance of Vector Differentiation, Differential equations, Laplace Transforms and Probability in the field of Science, Engineering, Business and Research.
Differential equations–I: Introduction-solutions of first order and first-degree differential equations: exact, Equations reducible to exact, linear differential equations and Bernoulli's equation.

(6 hours)

Module – II

Differential equations–II: Linear differential equations of second and higher order equations with constant coefficients. Homogeneous/non-homogeneous equations. Inverse differential operators. [Particular Integral restricted to $R(x)= e^{ax}$, sin ax, cos ax, polynomial for $f(D)y = R(x)$].

(6 hours)

Module – III

Probability: Introduction to Probability, Sample space and events. Axioms of probability. Addition & multiplication theorems. Conditional probability, Bayes' theorem, problems.

(6 hours)

Module – IV

Laplace Transforms: Definition and Laplace transforms of elementary functions, Laplace Transforms of e^{at} f(t), t^nf(t), n is a positive integer & (f(t))/t (without proof), Periodic function (statement only) and Unit-step function – problems.

(6 hours)

Module – V

Inverse Laplace Transforms: Inverse Laplace Transform- Definition and problems, Convolution theorem (No Proof), Evaluation of Inverse Laplace Transform using Convolution theorem. Solution of linear differential equations using Laplace transforms technique.
Recap/Summary of the course.

(6 hours)

Course outcomes: The students will be able to:

CO1: Solve first and higher order ordinary differential equations.
CO2: Use Laplace transform and inverse Laplace transform in solving differential equation.
CO3: Apply elementary probability theory for related problems.

Question paper pattern:

CIE will be conducted for 100 marks.

- Three Unit Tests each of **20 Marks** (Duration 01 hour).
- Two assignments each of 10 Marks.
- Course Seminar suitably planned to attain the COs and POs for 20 Marks (duration 01 hours).
- The sum of three tests, two assignments, and a seminar will be out of 100 marks. The student shall secure a minimum of 40% of marks of the course to qualify and become eligible for the award of a degree

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2015.
2. E. Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2015.
3. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill, 2010.

References:

1. N. P. Bali, Manish Goyal, "A Text Book of Engineering Mathematics", Laxmi Publishers, 2014.
2. C. Pandurangappa, Advanced Mathematics II (Lateral entry bridge course text book)", 3rd Edition. Sanguine Publishers, 2015.
3. S. Pal, S. C. Bhunia, Engineering Mathematics, 3rd Edition, Oxford University Press, 2011.
4. H. K. Dass, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Private Ltd, 2014.