BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(Autonomous Institute affiliated to VTU)

Scheme of Teaching and Examination: Effective from AY 2021 – 22Choice Based Credit System (CBCS)

UG PROGRAM: MECHANICAL ENGINEERING (ME) — **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
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	ME	0	0	0	4	2	3	100	-	100
5	PC	21ME35	Mechanics of Materials and Material Science	ME	3	2	0	0	4	3	50	50	100
6	PC	21ME36	Manufacturing Technology	ME	2	2	0	0	3	3	50	50	100
7	PC	21ME37	Computer Aided Machine Drawing	ME	0	2	2	0	2	3	50	50	100
8	PC	21MEL38A	Materials Testing Laboratory	ME	0	0	2	0	1	3	50	50	100
9	PC	21MEL38B	Foundry Technology and Forging Laboratory	ME	0	0	2	0	1	3	50	50	100
10	PC	21MEL38C	Manufacturing Technology Laboratory	ME	0	0	2	0	1	3	50	50	100
				TOTAL	**10**	**7**	**9**	**4**	**20**		**550**	**450**	**1000**

Course Prescribed to Lateral Entry Diploma holders admitted to III Semester B. E.												
11	NCMC	21DIP31A	Diploma Mathematics-I	MAT	3	0	0	0	-	100	-	100

- The Lateral entry students have to undergo Internship-I during the intervening vacation of III and IV semesters.
- The Assessment Pattern for 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 shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shallbe mandatory for the award of degree.
- Successful completion of the course Diploma Mathematics-I shall be indicated as satisfactory in the grade card. Non completion of the same shall be indicated as unsatisfactory.

B.E. MECHANICAL ENGINEERING
Choice Based Credit System (CBCS)
SEMESTER – III

Fourier Series, Numerical Methods, Statistics and Probability - III (3:1:1) 4

(Common to ECE, ETE, EEE, MECH & CIVIL Branches)
(Effective from the academic year 2021-22)

Course Code	21MTA31	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 will enable students to:

1. Apply the concepts of Fourier series, Fourier transforms, Difference equations and Z-transforms in the field of engineering.
2. Apply the concept of Numerical Techniques, and probability distribution to analyze problems arising in Science and Engineering field.
3. Apply the knowledge of interpolation/extrapolation and Numerical Integration technique whenever analytical methods fail or very complicated to offer solutions.

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 $y = ae^{bx}$.
Calculus of variation: Variation of a function and a functional, Extremal of a functional, Euler's equation, Standard variational problems.
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 2π and arbitrary period. Half range Fourier Series, Practical harmonic analysis over the period 2π.
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

Fourier Transforms: Infinite Fourier transforms, Fourier Sine and Cosine transforms. Inverse Fourier transforms - problems.

Z-transforms: Difference equations, basic definition, Z-transform-definition, Standard Z-transforms (only formula), Damping rule, Shifting rule (without proof) and problems, Inverse Z-transforms – problems, Solution of Difference equations using Z transforms.

Self-Learning Component: Proofs of Z-transformation of standard functions.

Lab Session 4:

1. Obtain the Fourier Transform of a function.
2. Obtain the solution of difference equation using Z Transforms. (10 Hours)

Module – V

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

Self-Learning Component: Uniform distribution.

Lab Session 5:

1. Compute Pdf/Pmf for given data.
2. Compute and plot the probability density function for Normal Distribution, Binomial Distribution, Exponential Distribution, Poisson Distribution.

Recap/Summary of the Course. (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 and Fourier transforms and Z-transforms to illustrate discrete/continuous function arising in wave and heat propagation, signals and systems.

CO4: Develop probability distribution of discrete, continuous random variables and joint probability distribution 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.

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", 6th Edition, Tata McGraw-Hill, 2010.

References:

1. N.P. Bali, Manish Goyal, "A Text Book of Engineering Mathematics", Laxmi Publishers, 2014.
2. H.K. Dass, Er. Rajnish Verma, "Higher Engineering Mathematics", 3rd Edition, S. Chand publishers, 2014.
3. P. Kandasamy, K. Thilagavathi, K. Gunavathi, "Engineering Mathematics", Vol. III, 2001.
4. S.S. Sastry, "Introductory Methods of Numerical Analysis", 4th Edition, Prentice Hall of India, 2010.

Department of Humanities and Social Sciences
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	**01**

ಸಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪತ್ಯದ 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

Assessment Details (both CIE and SEE): Kannada, Constitution of India and Professional Ethics and Universal Human Values

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum mark which is 20 marks. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together

Continuous Internal Evaluation:

Three Tests each of **20 Marks.** (duration 01 hour)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Two alternate assessment tools (AATs) from the list shall be planned to attain the COs and POs for **20 Marks**

6. At the end of the 13th week of the semester

The sum of three tests, two assignments and AATs will be out of 100 marks and will be scaled down to 50 marks.

CIE methods/question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject.

- The question paper will have 50 questions. Each question is set for 01 mark.
- SEE Pattern will be in MCQ Model (Multiple Choice Questions) for 50 marks. The duration of the examination is 01 Hour.

Textbook:

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

ಡಾ.ಹಿ.ಚಿ ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ,

ಪ್ರಸಾರಾಂಗ ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ

Department of Humanities and Social Sciences
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	**01**

ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು Course Learning Objectives:

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

Module-1

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-2

ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು
Possessive forms of nouns, dubitive question and Relative nouns
ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು Qualitative, Quantitative and Color Adjectives, Numerals
ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು – ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ (ಅ, ಅದು, ಅವು, ಅಲ್ಲಿ) Predictive Forms, Locative Case **3 Hours**

Module-3

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-4

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-5

"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.

Assessment Details (both CIE and SEE): Kannada, Constitution of India and Professional Ethics and Universal Human Values

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum mark which is 20 marks. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together

Continuous Internal Evaluation:

Three Tests each of **20 Marks.** (duration 01 hour)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Two alternate assessment tools (AATs) from the list shall be planned to attain the COs and POs for **20 Marks**

6. At the end of the 13th week of the semester

The sum of three tests, two assignments and AATs will be out of 100 marks and will be scaled down to 50 marks.

CIE methods/question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject.

- The question paper will have 50 questions. Each question is set for 01 mark.
- SEE Pattern will be in MCQ Model (Multiple Choice Questions) for 50 marks. The duration of the examination is 01 Hour.

Textbook:

ಬಳಕೆ ಕನ್ನಡ

ಲೇಖಕರು: ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ

ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ

B.E. MECHANICAL ENGINEERING
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	01

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 – I

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 – II

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 – III

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 – IV

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 – V

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. MECHANICAL ENGINEERING
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	-

Course Objectives:

This course will enable students to:

1. Provide the experiential learning opportunity for the students.
2. Expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence create competent professionals
3. Learn to apply technical knowledge in real industrial situations.
4. Gain experience in writing reports in technical works/projects

Module – I: Sheet Metal Practice

Introduction to development of lateral surfaces, Tools used in sheet metal working.

Development of prism using parallel line development method, Preparation of model (PRISM) using GI sheet.

Development of pyramid using radial line development method, Preparation of model (PYRAMID) using GI sheet, Development of truncated pyramid, Preparation of model (TRUNCATED PYRAMID) using GI sheet, Preparation of model (FUNNEL) using GI sheet, Final Assessment

Module – II: 3D Modeling Practice using Solidworks

Introduction: Review of graphic interface of the CAD software, Review of basic sketching, editing and navigational commands, Sheet setup and sizing, Title block, Unit Systems, Grid and Snap.

Geometrical Editing of Solid Parts: Standard Holes: Straight and tapered hole, holes with counter bore and counter sink. Fillets and Chamfer of various dimensions.

Multiplying Features/Solids: Patterns: linear, circular, curve driven and fill patters. Mirror feature. Other Special Features: Shell, Swept, Lofted, Rib

Orthographic projections: Conversion of Pictorial views into Orthographic projections of machine parts.

Create 3D sheet metal models for given dimension and generate 2D manufacturing drawings for the following:

a. Panel Board
b. Battery Cabinet
c. CPU Cabinet

Submission of Coursework, Final Assessment

Module – III: Material Testing
Introduction to materials and materials testing. Non-Destructive Testing: Conduction of Magnetic Particle Inspection (MPI) and Dye Penetrant Testing (DPT), Destructive Testing methods: Mechanical property evaluation using Universal Testing machine a. Bending Test: Wood and Brick b. Tensile Test: Mild steel c. Compression Test: Cast Iron Impact strength determination for the metallic specimens, Fatigue testing of ferrous metals, Hardness testing on the metals using Rockwell Testing machine before and after heat treatment process.
Course Outcomes: Students will be able to 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.

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)	Absence for presentation. OR Presented after	Information is lacking/ unclear and communicated in such a way that the audience	Information is not presented in a clear manner and many details are	Information is presented in such a way that the audience can

(CO5)	the due date. **0-1 marks**	cannot understand the purpose of the evidence of work and internship experiences. **2-4 Marks**	missing related to the evidence work and internship experiences. **5-7 Marks**	understand the purpose of the evidence of work and internship experiences. **8-10 Marks**
Practical Knowledge (10 Marks) **(CO3)**	Not gained any practical knowledge. OR Able to define basic concepts. **0-1 Marks**	Partial practical Knowledge gained. Less hands-on experience. **2-4 Marks**	Average practical knowledge gained. Only few models are exhibited. **5-7 Marks**	Complete practical knowledge gained. **8-10 Marks**
Societal and environmental relevance (10 Marks) **(CO2)**	No relevance to society or environment (At-least one relevance). **0-1 Marks**	Partial relevance to society or environment. **2-4 Marks**	Average relevance to society or environment. **5-7 Marks**	Directly Relevant to society or environment. **8-10 Marks**
Viva (10 Marks) **(CO4)**	Does not know any information. OR Fair leadership quality/ teamwork/ cooperation. **0-1 Marks**	Provides irrelevant information for all questions. Good leadership quality/ teamwork/ cooperation. **2-4 Marks**	Provides incomplete information for all questions. Better leadership quality/ teamwork/ cooperation. **5-7 Marks**	Provides complete information for all questions. Outstanding leadership quality/ teamwork/ cooperation. **8-10 Marks**
Report (40 Marks) **(CO6)**	Does not submit the report. **0 Marks**	Report submitted does not fulfill the prescribed format/ submission after one weeks of the deadline. **1-24 Marks**	Report submitted partially fulfills the prescribed format/ submission after one weeks of the deadline. **25-32 Marks**	Report submitted fulfills the prescribed format / submission in par with the deadline. **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. MECHANICAL ENGINEERING
Choice Based Credit System (CBCS)
SEMESTER -III

Mechanics of Materials and Material Science (3:1:0) 4
(Effective from the academic year 2021-22)

Course Code	21ME35	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:2:0	SEE Marks	50
Total Number of Lecture Hours	52	Exam Hours	3

Course Objectives:

This course will enable students to:

1. Describe crystal structure, mechanical behavior of different materials.
2. Illustrate iron carbon diagram and heat treatment processes
3. Summarise properties and applications of ferrous and composite materials.
4. Summarize heat treatment process and properties & applications of composite materials for different applications.
5. Describe stresses, strains and deformations in bars, beams and shafts.
6. Analyse the structural members subjected to axial, bending and torsional loads.

Module – I

Preamble: Introduction, significance and scope of materials and mechanics of materials in industries.

Simple Stresses and Strain: Introduction to Mechanics of Materials, Stress and strain due to axial force, elastic limit, Hooke's law, stress strain diagram for ductile and brittle materials, stepped bars, uniformly varying sections, stresses in composite bar due to axial force and temperature, Lateral strain - Poisson's ratio, volumetric strain, shear stress, shear strain, relationship between elastic constants. Simple numericals on stress and strains.

Crystal Structure: Introduction to Engineering materials, Crystalline materials, non-crystalline materials**,** Crystal Structure: Atomic packing factors, coordination number for FCC, BBC and HCP.

Crystal imperfection: Classification, Vacancies, Interstialities, substitutional impurities, grain boundaries, tilt and twin boundaries, edge and screw dislocation.

Diffusion: Steady- state diffusion, Non-study state diffusion, factors that influences diffusion. **Creep: Creep deformation,** Creep Curve, different stages of creep.

(12 Hours)

Self Study Component: Vacancy diffusion, interstitial diffusion and strain hardening processes.

Module – II

Phase Diagram: Solid solution**,** Substitutional solid solution, interstitial solid solution, Construction of Binary phase diagram, binary phase diagram, Eutectic system, Eutectoid system.

Iron Carbon Diagram: Description of equilibrium phases, invariant reactions: eutectic, eutectoid and peritectic. Time Temperature Transformation (TTT) diagram and Continuous Cooling Curves for steels.

Metal alloys

Ferrous materials: Classification, properties and applications of steels, Properties and applications of cast irons: grey cast iron, malleable cast iron and spheroidal Graphite iron.

Non-ferrous materials: Classification, properties and applications of Aluminium alloys, magnesium alloys, copper alloys.

(10 Hours)

Self-Study Component: Titanium alloys, Silicate ceramics, fullerene and carbon nanotubes

Module – III

Heat treatment processes: Classification and objectives. Annealing, normalizing, tempering, Austempering, Martempering, and hardening. Case hardening: Carburizing, nitriding.

Composite Materials:

Polymer Matrix Composites (PMC): Matrix and reinforcement materials, Production process: Bag moulding, pultrusion and resin transfer moulding, Hydro & thermo forming.

Metal Matrix Composites (MMC): Matrix and reinforcement materials, Production process: Diffusion bonding, Powder metallurgy techniques, spray co-deposition, liquid metal infiltration.

Ceramic Matrix Composites (CMC): Matrix and reinforcement materials, Production process: vapour infiltration process, slurry infiltration process, reaction bonding and direct oxidation process.

(8 Hours)

Self-Study Component: Carbon-carbon composites, Hybrid composites, laminar composites and sandwich panels.

Module – IV

Compound Stresses: Introduction to three-dimensional state of stress, stresses on inclined planes, principal stresses and maximum shear stress, principal angles, shear stress on principal planes, Mohr's circle for plane stress conditions, numerical on compound stresses.

Torsion of Circular Shafts: Introduction, pure torsion, assumptions, derivation of torsional equations, polar modulus, torsional rigidity / stiffness of shafts, power transmitted by solid and hollow circular shafts, numerical on torsion of circular shafts.

(10 Hours)

Self-Study Component: Torsion of stepped and composite shafts.

Module – V

Shear Force and Bending Moment in beams: Type of beams, loads and reactions, relationship between loads, shear forces and bending moments. Shear force and bending moments of cantilever beams, pin support and roller supported beams subjected to concentrated loads, Uniformly Distributed Load (UDL), Uniformly Varying Loads (UVL) and couple. Numericals on Shear Force Diagram (SFD) and Bending Moment Diagram (BMD).

Bending and Shear Stresses in Beams*:* Introduction, theory of simple bending, assumptions in simple bending, relationship between bending stresses, radius of curvature and bending moment, moment carrying capacity of a section, shearing stresses in beams, shear stress across rectangular, circular. Numerical problems.

Recap / Summary of the Course.

(12 Hours)

Self-Study Component: Bending stresses in I and T sections.

Course Outcomes:

The students will be able to:
CO1: Describe crystal structure, mechanical behavior of different materials.
CO2: Illustrate iron carbon diagram and heat treatment processes.
CO3: Summarize properties and applications of ferrous and composite materials.
CO4: Solve for stresses, strains and deformations in bars, beams and shafts.
CO5: Analyze the structural members subjected to axial, bending and torsional loads.

Assessment Methods:

I. Continuous Internal Evaluation (CIE): 50 Marks

- **Three Internal Assessments** conducted for 50 Marks each and reduced to 25 Marks. Average of three Internal Assessments will be considered for 25 Marks.
- **Alternative Assessment** will be conducted for 25 Marks using appropriate tools.

II. Semester End Examination (SEE): 50 Marks

- SEE is conducted for 100 Marks and reduced to 50 Marks.

Question Paper Pattern

Part- A: Comprises 20 objective type questions carrying 1 Marks each with a total 20 Marks.

Part-B: Comprises 10 descriptive type questions carrying 16 Marks each. Each Module will have two questions with an internal choice to answer any one full question. There will be a maximum of three sub section for each question.

TEXTBOOKS:

1. William. D. Callister, "Material Science and Engineering an Introduction", 10th Edition, Wiley Publications, 2018.
2. J M Gere, B J Goodno, "Mechanics of Materials", 8th Edition, Cengage Publications, 2013.

REFERENCES:

1. Raghavan. V, "Materials Science and Engineering: A First Course", 6th Edition, Prentice Hall India, 2015.
2. Shackleford, M. K. Muralidhara, "Introduction to Materials Science for Engineers", 8th Edition, Pearson Publication, 2017.
3. R. Subramanian, "Strength of Materials", 3rd Edition, Oxford Publications, 2016.
4. Punmia B C, Ashok Kumar Jain and Arun Kumar Jain, "Mechanics of Materials", 5th Edition, Laxmi Publications, 2016.
5. S S Bhavikatti, "Strength of Materials", 4th Edition, Vikas Publishing House Pvt. Ltd., 2013.
6. S. Ramamrutham, R. Narayanan, "Strength of Materials", 20th Edition, Dhanpat Rai Publicating Company, 2020.

B.E. MECHANICAL ENGINEERING
Choice Based Credit System (CBCS)
SEMESTER - III

Manufacturing Technology (2:1:0) 3
(Effective from the Academic Year: 2021 -22)

Course Code	21ME36	CIE Marks	50
Teaching Hours/Week (L:T:P)	2:2:0	SEE Marks	50
Total Number of Lecture Hours	52	Exam Hours	3

Course Objectives:

This course will enable students to:

1. Provide knowledge on basic principles of metal casting, machine tools, powder metallurgy techniques and welding processes.
2. Provide knowledge on basic metal forming processes and its applications.
3. Impart knowledge on the selection of manufacturing processes.

Module - I

Preamble:
Manufacturing industry is the backbone of any economy. Innovation in manufacturing for new products and services. Creating value for society by designing innovative human- and social-centric solutions.

Fundamentals of Manufacturing: Basic principle and classification.
Sand casting: Introduction, steps involved in making a casting, advantages and disadvantages. Important moulding process: Sweep mould, CO_2 mould, shell mould and investment mould. Gating and riser system: Types of gates, runner, riser and types of risers.

Melting furnaces: Classification, working principle of cupola furnace and electric resistance furnace.

Special casting processes: Introduction, principle of centrifugal casting, squeeze casting, stir casting and thixocasting. New casting method of bionic non-smooth surface on the complex casts.

Mechanism of solidification: Concept of nucleation and growth, progressive and directional solidification, dendrite growth, degasification in liquid metals and degasification methods.
Casting defects: Causes, features and remedies.

(10 Hours)

Self Study Component: Use of cores and challenges for Indian foundry industry.

Module - II

Joining processes: Introduction and classification. Principle of shielded metal arc welding (SMAW), Submerged arc welding (SAW), Gas metal arc welding (GMAW), Gas tungsten arc welding (GTAW). Concept of electrodes, filler rod and fluxes. Metallurgy of welds: Formation of different zone during welding, shrinkage in welds and residual stresses. Weldability and welding defects, causes and remedy.

Solid state welding: Friction stir welding and ultrasonic welding.

Special welding processes: Laser beam welding, electron beam welding, plastic welding, glass and ceramic welding.

Inspection methods: Methods used for inspection of casting and welding. Visual, magnetic particle and ultrasonic methods.

(10 Hours)

Self Study Component: Welding nomenclature, underwater welding and use of CAD/CAM software for weldment.

Module - III

Machine tools and operations: Classification of machine tools, concept of generatrix and directrix, generating motions of different machine tools. Operations performed on lathe, drilling machine and shaping machine. Peripheral milling, face milling, up milling and down milling, milling machine operations. Indexing and indexing methods: Simple and universal dividing head; Direct indexing, simple indexing and compound indexing, numericals. Machining parameters: Cutting speed, feed, depth of cut and material removal rate (MRR) and machining time calculation, numericals on turning and facing operations.

Grinding and finishing processes: Introduction, classification of grinding machines, and grinding wheel parameters. Surface grinding, cylindrical grinding and centerless grinding machines. Honing, lapping, super finishing, polishing and buffing.

Cutting fluids: Functions, properties and types of fluids.

Cutting tools: Desirable properties of tool materials, classification, types of cutting tool materials. Geometry of single point cutting tool, cutting tool nomenclature in American Standards Association (ASA) system.

(12 Hours)

Self Study Component: Use of capstan and turret lathe, advanced/CNC machine tools.

Module - IV

Mechanics of metal cutting: Orthogonal and oblique cutting, mechanics of chip formation, types of chips. Determination of shear angle, forces in orthogonal cutting, cutting velocity relationships, coefficient of friction, analysis of forces using Merchants circle diagram, shear strain, power consumption, numericals.

Tool wear and tool life: Tool wear mechanism, types of tool wear, tool life criteria, effect of cutting parameters on tool life, machinability, variables affecting machinability, numericals.

Powder metallurgy (PM): Production of metallic powders, processing methods, cold isostatic pressing and hot isostatic pressing, applications, advantages and limitations.

(10 Hours)

Self Study Component: Application of chip breakers.

Module - V

Metal forming processes: Classification of metal forming processes. Hot working & cold working of metals.

Rolling: Principle of rolling process, angle of bite, types of rolling mills, variables of rolling process, rolling defects.

Drawing and extrusion: Drawing of wires, rods & pipes, variables of drawing process. Difference between drawing & extrusion. Various types of extrusion processes.

Forging: Principle, Open die and closed die forging, forging methods and defects in forging.

Sheet metal operations: Blanking, piercing, punching, drawing, draw ratio, drawing force, variables in drawing, trimming, and shearing. Bending, types of bending dies, bending force, embossing and coining, numericals.

Types of dies: Progressive die, compound die and combination die.

Recap / Summary if the course.

(10 Hours)

Self Study Component: Best-known metal forming processes and its applications, use of CAD/CAM software.

Course Outcomes:

The students will be able to:
CO1: Describe the different manufacturing processes.
CO2: Apply the manufacturing processes to produce engineering products.
CO3: Analyse the manufacturing processes and its applications.

Assessment Methods:

Continuous Internal Evaluation (CIE): 50 Marks

- **Three Internal Assessments** conducted for 50 Marks each and reduced to 25 Marks. Average of three Internal Assessments will be considered for 25 Marks.
- **Alternative Assessment** will be conducted for 25 Marks using appropriate tools.

II. Semester End Examination (SEE): 50 Marks

- SEE is conducted for 100 Marks and reduced to 50 Marks.

Question Paper Pattern

Part - A: Comprises 20 objective type questions carrying 1 Marks each with a total 20 Marks.

Part - B: Comprises 10 descriptive type questions carrying 16 Marks each. Each Module will have two questions with an internal choice to answer any one full question. There will be a maximum of three sub section for each question.

TEXTBOOKS:

1. P.N. Rao, "Manufacturing Technology: Volume 1 and Volume 2 (4e), McGraw Hill Education, 2019.
2. Geoffrey Boothroyd and Winston A. Knight., "Fundamental of Machining and Machine Tools", 3rd Edition, CRC Taylor & Francis, Fourth Indian reprint 2013.
3. Amitabha Ghosh and Asok Kumar Mallik, "Manufacturing Science", Second Edition, East-West press Pvt Ltd, Reprint 2019.

REFERENCES:

1. Heine R W, Loper C R and Rosenthal P C., “Principles of Metal Casting”, 2nd Edition, Tata McGraw Hill Publishing Co. Ltd, 2000.
2. Kalpakjian, S. Steaven R Schmid, Vijay Sekhar, “Manufacturing Engineering and Technology”, 7th Edition, Pearson Publications, 2013.
3. Hajra Choudhary.S.K and Hajra Choudhary.A.K, “Elements of workshop Technology: Volume-1 & 2”, 15th Edition, Media Promoters and Publisher Pvt. Ltd, 2008.
4. B.L. Juneja, G.S. Sekhon and Nitin Seth., “Fundamentals of metal cutting and Machine Tools”, 2nd Edition, New Age International Publishers, 2003.

B. E. MECHANICAL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - III

Computer Aided Machine Drawing (0:1:1) 2

(Effective from the academic year 2021-22)

Course Code	21ME37	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:2:2	SEE Marks	50
Total Number of hours	52	Exam Hours	3

Course Objectives:

This course will enable students to:

1. Familiarize with Indian and International Standards on engineering drawing practices in terms of 2D and 3D modelling.
2. Equip with knowledge and skill to generate various thread forms, fasteners, keys, joints and couplings.
3. Read and interpret manufacturing drawings of machine components leading to preparation of assembly drawings manually and using CAD Applications.
4. Acquire the knowledge of Geometric Dimensioning and Tolerance (GD&T) and indicate them on machine drawings.

PART A

Introduction: Review of graphic interface of the CAD software, Review of basic sketching, editing and navigational commands, Sheet setup and sizing, Title block, Unit Systems, Grid and Snap.

Geometrical Editing of Solid Parts: Standard Holes: Straight and tapered hole, holes with counter bore and counter sink. Fillets and Chamfer of various dimensions.

Multiplying Features/Solids: Patterns: linear, circular, curve driven and fill patters. Mirror feature.

Other Special Features: Shell, Swept, Lofted, Rib

(4 Hours)

Orthographic and sectional views of machine parts: Reading of orthographic views, missing lines and missing views, conversion of pictorial views in orthographic views, sectioning in machine parts and hatching.

(8 Hours)

Thread Forms and Fasteners: Thread terminology, sectional views of threads. ISO Metric threads, BSW, Square, Acme threads, Seller's thread and American Standard thread. Hexagonal and Square headed bolt and nut with washer.

(6 Hours)

Total: (18 Hours)

PART B

GD&T: Introduction, Fundamental tolerances, Deviations, dimensional limits, machining symbols, types of fits, geometrical tolerances as per the standards. (2 Hours)

Assembly drawings:

Knuckle joint for two rods, Protected type flanged coupling (Only for CIE)

Screw jack (bottle type), Plummer block (pedestal bearing), Machine vice, Square tool post, Lever safety valve (For CIE and SEE)

(32 Hours)
Total: (34 Hours)

Course Outcomes:

The student will be able to:

CO1: Develop orthographic projections of pictorial views in manual drawing and generate 3D modelling for various machine parts.
CO2: Construct the drawings of threads and fasteners using different standards.
CO3: Model and assemble the machine parts using 3D modelling software by applying appropriate limits and tolerances.
CO4: Develop 3D model and manufacturing drawing for simple mechanisms /machines/systems/products for the given application by working in group and communicate effectively with appropriate media.

Assessment Methods:

I. Continuous Internal Evaluation (CIE): 50 Marks

- Sketchbook drawing and Printouts of CAD for the exercises given will carry 15 Marks.
- Two Internal Assessments will be conducted for 50 Marks each and reduced to 20 Marks. Average of the two Internal Assessments will be considered for 20 Marks.
- Alternative Assessment will be conducted for 15 Marks using appropriate tools.

II. Semester End Examination (SEE): 50 Marks

- SEE is conducted for 100 Marks and reduced to 50 Marks.

Question Paper Pattern

Part A

1. Two questions from Orthographic Projections. Student has to answer any one out of two. Maximum Marks is 20.
2. Mandatory Question on Thread Forms and Fasteners. Maximum Marks is 20.

Part B

Two questions on Assembly drawing for various machine parts. Student has to answer any one full question. Maximum Marks 60.

TEXT BOOKS:

1. K R Gopala Krishna, "Machine Drawing", Subhash Publications, 2005.
2. N D Bhatt, "Engineering Drawing", Charotar Publishing House, 2011

REFERENCES:

1. K L Narayan, "Machine Drawing", New Age International Publishers, 2006.
2. P S Gill, " Engineering Drawing", S K Kataria and Sons, 2013

B.E. MECHANICAL ENGINEERING
Choice Based Credit System (CBCS)
SEMESTER - III

Materials Testing Laboratory (0:0:1) 1
(Effective from the Academic year 2021-22)

Course Code	21MEL38A	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. Identify microstructure and wear properties of metallic materials.
2. Demonstrate heat treatments of ferrous materials for different samples.
3. Examine the defects in the materials by non-destructive testing using DPT, UT and MPT.
4. Test the important mechanical properties and behaviour of ferrous and non-ferrous materials.

PART-A

1. Metallographic examination of ferrous and non-ferrous materials to study the microstructures.
2. Study the effect of heat treatment on the hardness of the specimen using Rockwell Hardness Testing machine.
3. Determination of Brinell and Vickers's Hardness of ferrous and non-ferrous materials.
4. Determination of Microhardness of the given specimen using Vickers microhardness tester.
5. Determination of the impact strength of the metals using impact testing machine (Izod and Charpy Tests).
6. Determination of impact strength of polymer materials using computerized impact testing machine.
7. Non-destructive testing: Magnetic Particle Test (MPT), Dye Penetration Testing (DPT) and Ultrasonic Flaw Detection (UT) to study the defects in the metallic materials (demonstration only)

PART-B

1. Determination of tensile and shear strength of metals using Universal Testing Machine.
2. Perform the compression tests on metals using Universal Testing Machine.
3. Determination of torsional strength of a given specimen using Torsional Testing Machine.
4. Perform bending test on metallic/non- metallic materials using Universal Testing Machine.
5. Study the wear characteristics of ferrous and non-ferrous materials.
6. Determination of fatigue strength of the steel using fatigue testing machine.

Course outcomes:

The students will be able to:

CO1: Identify microstructure and wear properties of metallic materials.
CO2: Demonstrate heat treatments and hardness of metallic materials.
CO3: Examine the defects in the materials by non-destructive testing.
CO4: Test the important mechanical properties of different materials.

Assessment methods:

I. Continuous Internal Evaluation (CIE): 50 Marks

The marks for the record write-up and internal assessment will be in the ratio of 60:40. Record will be continuously evaluated for each experiment with regard to conduction, write-up and viva-voce: 30Marks.

Internal Test will be conducted for 100 Marks and reduced to 20 Marks.

II. Semester End Examination (SEE): 50 Marks

SEE is conducted for 100 Marks and reduced to 50 Marks.

Question paper pattern:

One question from Part-A	: 30 Marks
One question from Part-B	: 50 Marks
Viva – Voce	: 20 Marks
TOTAL	**: 100 Marks**

B.E. MECHANICAL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - III

Foundry Technology and Forging Laboratory (0:0:1) 1

(Effective from the Academic Year: 2021-22)

Course Code	21MEL38B	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. Understand sand mould preparation.
2. Use various forging tools to make models.
3. Examine the properties of sand.

PART - A

Sand Testing:

1. Determine the Compression strength of core sand specimen using Universal Sand Testing Machine.
2. Determine the Shear strength of core sand specimen using Universal Sand Testing Machine.
3. Determine the Tensile strength of core sand specimen using Universal Sand Testing Machine.
4. Determine the permeability of moulding sand specimen.
5. Find the Grain Fineness Number (GFN) of Base Sand using Sieve analysis.
6. Determine the percentage of Clay content of the moulding sand.

PART - B

Foundry:

1. Preparation of sand mould using Single piece pattern.
2. Preparation of sand mould using Split pattern.
3. Preparation of sand mould without pattern.
4. Sand casting process using Casting Simulation Software. (Demonstration only)
5. Preparation of Aluminium alloy casting (Demonstration only).

Forging:

6. Preparation of round to square forging model.
7. Preparation of square to L-shape forging model.
8. Preparation of L-shape to Hook forging model.

Course outcomes:

The students will be able to:

CO1: Apply engineering knowledge in preparation of moulding sand for conducting tensile, shear and compression tests using universal sand testing machine.

CO2: Analyse the importance of permeability, clay content and grain fineness number of base sands and forging methods.

CO3: Develop end product by casting and forging processes.

Assessment methods:

I. Continuous Internal Evaluation (CIE): 50 Marks

- The marks for the record write-up and internal assessment will be in the ratio of 60:40. Record will be continuously evaluated for each experiment with regard to conduction, write-up and viva-voce: 30Marks.
- Internal Test will be conducted for 100 Marks and reduced to 20 Marks.

II. Semester End Examination (SEE): 50 Marks

- SEE is conducted for 100 Marks and reduced to 50 Marks.

Question paper pattern:

One Model from Part-A : 30 Marks
One Model from Part-B : 50 Marks
Viva – Voce : 20 Marks
TOTAL : 100 Marks

B.E. MECHANICAL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - III

Manufacturing Technology Laboratory (0:0:1) 1

(Effective from the Academic Year: 2021 - 22)

Course Code	21MEL38C	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. Use hand tools to perform machining and welding operations.
2. Perform machining operations on different machine tools.
3. Calculate the machining time for a given operation.

PART-A

Lathe operations:

1. Perform step turning and taper turning operations.
2. Perform grooving, knurling and thread cutting operations.
3. Perform drilling and boring operations.
4. Perform internal thread cutting operations.
5. Perform eccentric turning operations.
6. Demonstration on the working of CNC Machine Tool for turning operations.

PART-B

Shaping and milling operations:

1. Cutting of V-groove, dovetail and rectangular groove using a shaper.
2. Cutting of gear teeth using milling machine.
3. Profile sharpening of single point cutting tool using bench grinder (demonstration only).

PART-C

Welding operations:

1. Preparation of welding joints (L-joint, T-Joint, Butt joint, and Lap joint) using Arc welding.
2. Preparation of welding joint using Gas, TIG / MIG welding.

Course outcomes:

The students will be able to:

CO1: Prepare welding joints using appropriate welding methods.

CO2: Choose cutting parameters and cutting tools for various machining operations.

CO3: Estimate cutting time and perform machining operations.

Assessment methods:

I. Continuous Internal Evaluation (CIE): 50 Marks

- The marks for the record write-up and internal assessment will be in the ratio of 60:40. Record will be continuously evaluated for each experiment with regard to conduction, write-up and viva-voce: 30Marks.
- Internal Test will be conducted for 100 Marks and reduced to 20 Marks.

II. Semester End Examination (SEE): 50 Marks

- SEE is conducted for 100 Marks and reduced to 50 Marks.

Question paper pattern:

One Model from Part-A	: 50 Marks
One Model from Part-B or Part-C	: 30 Marks
Viva – Voce	: 20 Marks
Total	**:100 Marks**

B.E. MECHANICAL ENGINEERING
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.