



GLOBAL ACADEMY OF TECHNOLOGY

(Autonomous) Approved by AICTE, New Delhi, Affiliated to VTU, Ideal
Homes Township, Rajarajeshwari Nagar, Bengaluru - 560098

Bachelor of Engineering (B.E)

Scheme & Syllabus I & II Semester: 2026-27 (CSE stream)



BE Programs: CS, IS, AI&DS, EC, CS-AI&ML, EE, ME, CE, AE, AI&ML
PG Programs: M. Tech (CSE), M. Tech (Structural Engg.), MBA
Ph.D. Programs: VTU Affiliated Research Centers in Engineering



GLOBAL ACADEMY OF TECHNOLOGY

Autonomous Institution Affiliated to Visveswaraya Technological University
Approved by UGC, AICTE and Govt of Karnataka



About GAT

Established in 2001, Global Academy of Technology (GAT) is one of the leading autonomous engineering institutions in Bengaluru, Karnataka, affiliated to Visveswaraya Technological University and approved by the All India Council for Technical Education. The institution is accredited by NAAC with 'A' Grade reflecting its commitment to quality education and continuous academic improvement. Situated in a serene and eco-friendly campus at Rajarajeshwari Nagar, Bengaluru, GAT provides a vibrant learning environment supported by modern infrastructure, advanced laboratories, digital classrooms, research facilities, innovation centers, and an extensive library with access to national and international resources.

GAT is dedicated to nurturing technically competent, socially responsible, and ethically grounded professionals through a balanced blend of academic rigor, practical exposure, research orientation, and value-based education. The institution offers undergraduate, postgraduate, and research programs in various disciplines of engineering, management, and applied sciences, designed to meet the evolving needs of industry and society. The curriculum emphasizes outcome-based education, interdisciplinary learning, experiential learning practices, project-based activities, internships, and industry collaboration to enhance employability and innovation skills among students.

The institution actively promotes research and development activities through funded projects, publications, patents, conferences, workshops, and collaborations with industries and academic organizations. Faculty members are highly qualified, experienced, and dedicated to mentoring students in academics, research, innovation, and professional growth. GAT also encourages participation in co-curricular and extracurricular activities through various student clubs, professional societies, cultural forums, sports activities, and community engagement initiatives, thereby fostering leadership qualities, teamwork, communication skills, and holistic personality development.

With a strong focus on academic excellence, discipline, inclusiveness, sustainability, and continuous improvement, Global Academy of Technology strives to create a transformative educational experience that empowers students to become competent engineers, innovative researchers, entrepreneurs, and responsible global citizens capable of addressing contemporary technological and societal challenges.



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VISION OF THE INSTITUTE

Become a premier institution imparting quality education in engineering and management to meet the changing needs of society.

MISSION OF THE INSTITUTE

- **M1:** Create environment conducive for continuous learning through quality teaching and learning processes supported by modern infrastructure
- **M2:** Promote Research and Innovation through collaboration with industries.
- **M3:** Inculcate ethical values and environmental consciousness through holistic education programs.



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Rules & Regulations

- The academic programs shall be governed by the regulations of Visvesvaraya Technological University and the rules framed by the institution from time to time.
- Students admitted to the First Year B.E. program shall abide by all academic, administrative, and disciplinary regulations of the institution.
- Student Induction Program (SIP) will be conducted by the institute for newly admitted students as per the norms and guidelines prescribed by the All India Council for Technical Education (AICTE).
- Attendance in all theory, tutorial, practical, workshop, seminar, and activity classes is compulsory. Students shall satisfy the minimum attendance requirement prescribed by the Institution /University to become eligible to appear for examinations.
- Continuous Internal Assessment (CIA) and Semester End Examination (SEE) shall be conducted as per the norms and regulations prescribed by the Institution/University.
- Students shall maintain proper discipline and decorum within the campus and shall conduct themselves in a manner befitting the reputation of the institution.
- Ragging in any form is strictly prohibited inside and outside the campus. Any student found involved in ragging shall be liable for disciplinary action as per the provisions of the Anti-Ragging Act and University regulations.
- Students shall carry their identity cards while on campus and produce the same whenever demanded by authorized personnel.
- Use of mobile phones and other electronic gadgets during class hours, laboratories, library sessions, and examinations is prohibited unless specifically permitted for academic purposes.
- Students shall be punctual and regular in attending classes, laboratory sessions, mentoring activities, and institutional programs.
- Damage to institutional property, laboratory equipment, library resources, furniture, or infrastructure shall be viewed seriously, and the cost of such damage shall be recovered from the concerned student(s).
- Malpractice or misconduct during examinations shall attract disciplinary action as per University and institutional norms.
- Students shall follow the dress code and code of conduct prescribed by the institution from time to time.
- Submission of assignments, laboratory records, project work, and other academic requirements shall be completed within the stipulated time.
- Students are expected to make effective use of library facilities, digital learning resources, laboratories, innovation centers, sports, and other academic support systems provided by the institution.
- Students shall regularly check notices and communications displayed on notice boards, official website, ERP portal, or communicated through departments.
- The decision of the Principal and the competent authorities of the institution in all academic and disciplinary matters shall be final and binding on all students.

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Bachelor of Engineering Scheme of Teaching and Examinations (2026) Outcome-Based Education (OBE)and Choice-Based Credit System (CBCS) (Effective from the academic year 2026-27) Common to all Engineering Programmes													
I Semester (CSE stream)					(Physics Cycle)								
Sl . No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory	Tutorial	Practical	SAAE	Duration in hours	CIE Marks	SEE Marks	Total Mark	
					L	T	P	S					
1	ASC	BMATS26101	Calculus and Linear Algebra	Maths Dept	3	2	0		03	50	50	100	04
2	ASC(IC)	BPHYS26102	Quantum Physics and Applications	PHY Dept	3	0	2		03	50	50	100	04
3	ESC	BCEDS26103	Computer Aided Engineering Drawing for CSE stream	ME Dept	2	0	2		03	50	50	100	03
4	ESC	BESC26104x	Engineering Science Course-I	Respective Engg Dept	3	0	0		03	50	50	100	03
5	PSC	BEIT26105	Programming in C	Respective Engg dept	3	0	0		03	50	50	100	03
6	AEC (NCMC)	BSKS26106	Soft Skills	Humanities Dept	1	0	0		-	100	---	100	PP
7	PSC	BPOPL26107	C Programming Lab	Respective Engg Dept	0	0	2		02	50	50	100	01
8	AEC/SDC	BIDTL26108	Innovation and Design Thinking Lab (Project-based learning)	Respective Dept	0	0	2		02	50	50	100	01
9	HSMC	BKSK26109/ BKBK26109	Samskrutika Kannada/ Balake Kannada	Humanities Dept	1	0	0		01	50	50	100	01
	TOTAL				16	02	08		20	500	400	900	20
10	AICTE Activity Points (students have to earn 100 activity points between 01 to 08 semester)				Compulsory requirement for the award of a degree								
ASC-Applied Science Course, IC – Integrated Course (Practical Course Integrated with Theory Course), PSC-Programme Specific Course, ESC- Engineering Science Courses, ETC- Emerging Technology Course, AEC- Ability Enhancement Course, NCMC: Non Credit Mandatory Course, PP: (Pass/Pass) is assigned to a noncredit course. “PP” represents pass in course provided students have successfully completed the CIE requirements. Otherwise, “NP-not pass shall be awarded. “PP” is essential for the award of the degree. PLC(IC)- Programming Language Course (Integrated Course), AEC/SDC- Ability Enhancement Course/Skill Development course, TD/PSB- Teaching Department / Paper Setting Board, HSMC- Humanity, Social Science and management Course, S- (SAAE) Students’ Academic Activity Engagement Hours, CIE –Continuous Internal Evaluation, SEE-Semester End Examination,													

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Credit Definition: 1- hour Lecture (L) per week= 1Credit 2-hoursTutorial(T) per week= 1Credit 2- hours Practical / Drawing (P) per week= 1Credit	04-Credit courses are designed for 50 hours of Teaching-Learning Session 04-Credit (IC) is designed for 40 hours' theory and 10-12 hours of practical sessions 03-Credit courses are designed for 40 hours of Teaching-Learning Session 02- Credit courses are designed for 25 hours of Teaching-Learning Session 01-Credit courses are to be designed for 12 hours of Teaching-Learning sessions
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Applied Mathematics-I Courses					Applied Physics Courses				
Code	Title	L	T	P	Code	Title	L	T	P
BMATC26101	Differential Calculus and Linear Algebra (CV Stream)	3	2	0	BPHYC26102	Physics for Sustainable Structural Systems (CV stream)	3	0	2
BMATM26101	Differential Calculus and Linear Algebra (ME Stream)	3	2	0	BPHYM26102	Physics of Materials (ME stream)	3	0	2
BMATE26101	Differential Calculus and Linear Algebra (EEE Stream)	3	2	0	BPHEC26102	Quantum Physics and Electronics Sensors (ECE stream)	3	0	2
BMATS26101	Calculus and Linear Algebra (CSE Stream)	3	2	0	BPHEE26102	Physics of Electrical Engineering Materials (EEE stream-only for EEE students)	3	0	2
					BPHYS26102	Quantum Physics and Applications (CSE stream)	3	0	2
Computer-Aided Engineering Drawing Courses					Engineering Science Courses-I(ESC-I)				
BCEDC26103	Computer Aided Engineering Drawing (CV Stream)	2	0	2	BESC26104A	Introduction to Engineering Mechanics	3	0	0
BCEDM26103	Computer Aided Engineering Drawing (ME Stream)	2	0	2	BESC26104B	Introduction to Electrical Engineering	3	0	0
BCEDEC26103	Computer Aided Engineering Drawing (ECE stream)	2	0	2	BESC26104C	Introduction to Electronics & Communication Engineering	3	0	0
BCEDE26103	Computer Aided Engineering Drawing for EEE stream (only for EEE students)	2	0	2	BESC26104D	Introduction to Mechanical Engineering	3	0	0
BCEDS26103	Computer Aided Engineering Drawing (CSE stream)				BESC26104E	Essentials of Information Technology	3	0	0
Programme Specific Courses (PSC)					Programme-Specific Course Labs (PSCL)				
BCIV26105	Engineering Mechanics	3	0	0	BMEML26107	Mechanics and Materials Lab	0	0	2
BBEE26105	Basics of Electrical Engineering	3	0	0	BBEEL26107	Basic Electrical Lab	0	0	2
BECE26105	Fundamentals of Electronics & Communication Engineering	3	0	0	BECEL26107	Fundamentals of Electronics & Communication Engineering Lab	0	0	2
BEME26105	Elements of Mechanical Engineering	3	0	0	BEMEL26107	Elements of Mechanical Engineering Lab	0	0	2
BEIT26105	Programming in C	3	0	0	BPOPL26107	C Programming Lab	0	0	2
BEBT26105	Elements of Biotechnology and Biomimetics	3	0	0	BECTL26107	Elements of Biotechnology Lab	0	0	2
BSSA26105	Principles of Soil Science and Agronomy	3	0	0	BSSAL26107	Soil Science and Agronomy Field Lab	0	0	2
BEAE26105	Elements of Aeronautical Engineering	3	0	0	BEAEL26107	Elements of Aeronautical Engineering Lab	0	0	2
BECH26105	Elements of Chemical Engineering	3	0	0	BECEL26107	Elements of Chemical Engineering Lab	0	0	2
Integrated courses (IC), combining theory with practical components. (i) Theory sessions shall be conducted for 3 hours per week, while the practical sessions shall be conducted for 2 hours per week. (ii) Theory components shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). (iii) The practical component shall be assessed only through CIE.									
The Mathematics/Physics courses shall be taught by a single faculty member per session, with no sharing of the course (subject) modules. The tutorial sessions for the mathematics course shall be conducted in the laboratory environment using Maxima/Mathematica/ Python/Scilab/MATLAB software to enhance computational understanding and application skills (one hour for problem solving and one hour laboratory session).									

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All students admitted to the engineering program have to complete **Applied Mathematics-I and Applied Mathematics-II** in I and II semesters by selecting the courses prescribed for their stream, viz. CV, ME, EEE or CSE, under the heading Mathematics –I and Mathematics-II.

Those who have completed the physics course under the heading Applied Physics in I semester have to select the prescribed stream wise chemistry course under the heading Applied chemistry during II semester.

Programme Specific Courses (PSC): Programme Specific Courses (PSC) are a set of core courses tailored to a specific branch or discipline of engineering in which a student is enrolled (e.g., Mechanical Engineering, Computer Science, Civil Engineering, etc.). These courses are intended to provide students with in-depth knowledge and specialized skills essential for professional competence in the chosen field. Students must select and complete the course from this cycle that **corresponds to their admitted program stream.**

Similarly, students are also required to choose and pass laboratory courses

that are specific to their stream from the **Programme Specific Courses Laboratory (PSCL) cycle.**

Engineering Sciences Courses-I(ESC-I): These courses are designed to broaden the technical knowledge of students beyond their core area of study. These courses enable students to gain a foundational understanding of engineering principles from other stream courses. Students are required to select and complete two courses that are not belong to their admitted program /stream. For example, a student admitted to the any programme of the Civil Engineering /Civil Engineering stream should not select Introduction to Engineering Mechanics but any other two. One course shall be selected under ESC-I and another course under ESC-II. The two courses must be different from the other.

Computer-Aided Engineering Drawing: The courses under this category are stream-specific. Students must select and complete the course that corresponds to their admitted engineering stream.

The **Student Induction Programme (SIP)**, initiated by the All India Council for Technical Education (AICTE), is designed to help newly admitted students in technical institutions transition smoothly into the higher education environment. It aims to familiarize students with the institutional culture, foster connections with peers and faculty, and provide a foundation for holistic learning. Activities under SIP may include Physical Activities, Creative Arts, Universal Human Values, Literary Events, Proficiency Modules. Lectures shall be by Eminent Personalities, Local Area Visits, Department/Branch Familiarization, and Innovation-related sessions.

The first year of the Engineering programmes is composed of I semester, II semester and Summer Semester. SIP activities shall be scheduled in the afternoon sessions during the first week of class commencement of I and II semesters only.

The specific programmes to be conducted will be notified separately by the University via the academic calendar or through a separate notification.

AICTE Activity Points Requirement for BE/B.Tech. Programmes

As per AICTE guidelines (refer Chapter 6 – *AICTE Activity Point Program, Model Internship Guidelines*), in addition to academic requirements, students must earn a specified number of **Activity Points** to be earned is to be eligible for the award of their degree.

- **Regular students** admitted to a 4-year degree program must earn **100 Activity Points**.
- **Lateral entry students** (joining from the second year) must earn **75 Activity Points**.
- **Students transferred** from other universities directly into the fifth semester must earn **50 Activity Points** from the date of entry into VTU.

These Activity Points are **non-credit** and will not be considered for **the SGPA/CGPA** or be used for **vertical progression**. However, they are mandatory for the **award of the degree**, and the points earned will be reflected on the **eighth semester Grade Card**.

The hours spent for earning the activity points shall not be counted for regular attendance requirements. Students can accumulate these points at any time during their program, including on weekends, holidays, and vacations starting from the year of admission, provided they meet the minimum hours of engagement prescribed for each activity.

If a student fails to earn the required Activity Points, the eighth-semester Grade Card will be withheld until the requirement is fulfilled. Consequently, the degree will be awarded only after the Grade Card has been released.

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Sl No	Stream	UG Programmes under the stream with code
1	Civil Engineering Stream (CV)	(1) Civil engineering (CV), (2) Mining Engineering (MI)
2	Mechanical Engineering Stream (ME)	(1)Aeronautical Engineering (AE), (2)Aerospace Engineering (AS),(3) Agricultural Engineering (AG),(4)Automation and Robotics (AR), (5)Automobile Engineering (AU), (6)Chemical Engineering (CH), (7) Industrial & Production Engineering (IP), (8)Industrial Engineering & Management (IM), (9) Manufacturing Science and Engineering (MS), (10) Marine Engineering (MR), (11) Mechanical & Smart Manufacturing (MM), (12) Mechanical Engineering (ME), (13)Mechatronics (MT), (14) Petrochem Engineering (PC), (15)Robotics & Automation (RA),(16) Robotics and Artificial Intelligence (RI),(17)Silk Technology (ST), (18) Textile Technology (TX),(19)Energy Engineering (ER),(20) Smart Agritech (SA).
3	Electrical and Electronics Engineering Stream (EEE)	(1)Electronics & Communication Engineering (EC), (2)Biomedical Engineering (BM), (3)Electrical & Electronics Engineering (EE), (4) Electronics & Instrumentation Engineering (EI),(5) Electronics & Telecommunication Engineering (ET),(6) Industrial IoT (IO), (7) Medical Electronics Engineering (ML),(8) Electronics Engineering (VLSI Design and Technology) (VL),(9) Electronics & Communication(Advanced Communication Technology) (EA),(10) Electronics & Computer Engineering (UE).
4	Computer Science and Engineering Stream (CSE)	(1) Computer Science and Engineering (CS), (2) Computer Engineering (CE), (3)Artificial Intelligence and Data Science (AD), (4) Artificial Intelligence and Machine Learning (AI),(5) Biotechnology (BT),(6)Computer & Communication Engineering (CM), (7) Computer Science and Business System (CB),(8) Computer Science and Design (CG),(9) Computer Science and Engineering (IoT) (CO), (10)CSE(Artificial Intelligence and Machine Learning) (CI),(11) CSE(Artificial Intelligence) (CA),(12) CSE(Cyber Security) (CY), (13)CSE(Data Science) (CD),(14) CSE(IoT and Cyber Security including Block Chain Technology) (IC), (15) Data Science (DS), (16) Information Science & Engineering (IS),(17) Computer Science (CR).

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II Semester (For the students who have studied Physics cycle in I semester)													
Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory	Tutorial	Practical	SAAE	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC	BMATS26201	Numerical Methods	Maths Dept	3	2	0		03	50	50	100	04
2	ASC(IC)	BCHES26202	Applied Chemistry for Smart Systems	CHE Dept	3	0	2		03	50	50	100	04
3	ETC	BAIA26203	Introduction to AI and Applications	Any Dept	3	0	0		03	50	50	100	03
4	ESC	BESC26204x	Engineering Science Course-II	Respective Engg Dept	3	0	0		03	50	50	100	03
5	PLC(IC)	BPLC26205B	Python Programming	CSE & allied Dept	3	0	2		03	50	50	100	04
6	AEC	BENG26206	Communication Skills	Humanities Dept	1	0	0		02	50	50	100	01
7	AEC (NCMC)	BICO26207	Indian Constitution & Engineering Ethics	Humanities Dept	1	0	0		01	100	0	100	PP
8	AEC/SDC	BPRJ26208	Interdisciplinary Project Based Learning	Respective Dept (Multiple Dept)	0	0	0	2	02	50	50	100	01
TOTAL					17	02	05	02	20	450	350	800	20
ASC- Applied Science Course, IC – Integrated Course (Practical Course Integrated with Theory Course), ESC- Engineering Science Courses, PLC(IC)- Programming Language Course (Integrated Course), AEC- Ability Enhancement Course, NCMC: Non Credit Mandatory Course, TD/PSB- Teaching Department / Paper Setting Board, HSMC- Humanity, Social Science and management Course, S- (SAAE)- Students' Academic Activity Engagement Hours, AEC/SDC- Ability Enhancement Course/Skill Development course, CIE –Continuous Internal Evaluation, SEE- Semester End Examination, PP : (Pass/Pass) is assigned to a noncredit course. “PP” represents pass in course provided students have successfully completed the CIE requirements. Otherwise, “NP-not pass shall be awarded. “PP” is essential for the award of the degree													

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Integrated courses (IC), combining theory with practical components.

The theory sessions shall be conducted for 3 hours per week, while the practical sessions shall be conducted for 2 hours per week.

- The theory component will be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).
- The practical component will be assessed only through CIE.

Communication Skills: This course shall be conducted in a laboratory environment

Applied Mathematics-II Courses					Applied Chemistry Courses				
Code	Title	L	T	P	Code	Title	L	T	P
BMATC26201	Differential Calculus and Numerical Methods (CV Stream)	3	2	0	BCHEC26202	Applied Chemistry for Sustainable Structure & Material Design (CV stream)	3	0	2
BMATM26201	Multivariable Calculus and Numerical Methods (ME Stream)	3	2	0	BCHEM26202	Applied Chemistry for Advanced Metal Protection and Sustainable Energy Systems (ME stream)	3	0	2
BMATE26201	Calculus, Laplace Transform And Numerical Techniques (EEE stream)	3	2	0	BCHEE26202	Applied Chemistry for Emerging Electronics and Futuristic Devices (EEE Stream)	3	0	2
BMATS26201	Numerical Methods (CSE Stream)	3	2	0	BCHES26202	Applied Chemistry for Smart Systems (CSE stream)	3	0	2
Engineering Sciences Courses II(ESC-II)					Programming Language Courses (PLC)				
BESC26204A	Introduction to Engineering Mechanics	3	0	0	BPLC26205E	Introduction to C Programming (for non-IT programmes)	3	0	2
BESC26204B	Introduction to Electrical Engineering	3	0	0	BPLC26205B	Python Programming (For CSE and allied programmes)	3	0	2
BESC26204C	Introduction to Electronics & Communication Engineering	3	0	0					
BESC26204D	Introduction to Mechanical Engineering	3	0	0					
BESC26204E	Essentials of Information Technology	3	0	0					
The Mathematics/Chemistry courses shall be taught by a single faculty member per session, with no sharing of the course (subject) modules. The tutorial sessions for the mathematics course shall be conducted in the laboratory environment using Maxima/Mathematica/ Python/Scilab/MATLAB software to enhance computational understanding and application skills. Students admitted to a specific engineering stream are required to select and successfully complete Applied Mathematics-II and Applied Chemistry courses that are aligned to their program stream. Engineering Sciences Courses-II(ESC-II): These courses are designed to broaden the technical knowledge of students beyond their core area of study. These courses enable students to gain a foundational understanding of engineering principles from other disciplines. Students are required to select and complete a course under ESC-II that does not belong to their admitted program stream. Students should select a course other than that was selected under ESC-I and other than course not belonging to their branch/ stream.									

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For the course ***Interdisciplinary Project (BPRJ209)***, it is mandatory to form a team comprising students from multiple engineering disciplines. For example, a project team may include students from Mechanical Engineering, Electronics and Communication Engineering (ECE), and Computer Science and Engineering (CSE), working collaboratively to design and implement the project.



DEPARTMENT OF MATHEMATICS

Course	Calculus and Linear Algebra		
Course Code	BMATS26101		
Course Category	ASC		
Hours/Week (L: T: P)	3:2:0	No. of Credits	4
Self-Study hours/semester	65		
CIE Marks	50	SEE Marks	50

1. COURSE DESCRIPTION:

This course introduces advanced concepts in multivariable calculus, vector calculus, and linear algebra with emphasis on engineering applications. It enables students to analyse functions of several variables using partial derivatives, Jacobians, and optimization techniques. The course also develops the ability to analyse vector fields and coordinate systems, including curvilinear coordinates. In addition, it provides a strong foundation in linear algebra through systems of equations, eigenvalues, vector spaces, and linear transformations. Overall, the course builds analytical and problem-solving skills essential for engineering applications and higher-level studies.

2. PREREQUISITES:

A basic understanding of differential and integral calculus. Familiarity with algebra and coordinate geometry. Knowledge of fundamental differentiation techniques. Basic problem-solving and analytical skill.

3. COURSE OBJECTIVES: By the end of this course, students will be able to:

- Apply multivariable calculus concepts such as partial derivatives, Jacobians, and optimization techniques.
- Analyse vector fields and coordinate systems using vector calculus concepts.
- Solve systems of linear equations and apply eigenvalues and eigenvectors in engineering applications.
- Understand vector spaces and their properties, including basis and dimension.
- Apply concepts of linear transformations and rank-nullity theorem in mathematical and engineering contexts.

4. WKs covered through this course – WK1, WK2, and WK4

5. COURSE OUTCOMES: *By the end of the course students will be able to,*

Course Outcome	Description	Mapped POs/PSOs	Blooms Taxonomy Level
C101.1	Apply the fundamental concepts of multivariable calculus and linear algebra to formulate and solve mathematical problems.	PO1	L3
C101.2	Apply the principles of multivariable calculus, vector calculus, and coordinate systems to solve engineering problems.	PO1, PO2	L3
C101.3	Apply the concepts of matrices, vector spaces, and linear transformations to solve engineering problems involving multiple variables.	PO1, PO2	L3
C101.4	Analyse computational and engineering problems using concepts of calculus and linear algebra to obtain appropriate mathematical solutions.	PO5, PO8	L4

6.CO-PO Articulation Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C101.1	1	-	-	-	-	-	-	-	-	-	-
C101.2	2	1	-	-	-	-	-	-	-	-	-
C101.3	3	2	-	-	-	-	-	-	-	-	-
C101.4	-	-	-	-	1	-	-	1	-	-	-

7.MODULAR TOPICS

Module 1	Hours
Calculus Partial differentiation, differentiation of composite functions, Jacobian, Maclaurin's series expansion for two variables, Maxima and minima for the function of two variables.	10
Module 2	Hours
Vector Calculus Scalar and vector fields, Gradient, directional derivatives, divergence and curl - physical interpretation, solenoidal vector fields, irrotational vector fields and scalar potential. Introduction to polar coordinates and polar curves. Curvilinear coordinates: Scale factors, base vectors, Cylindrical polar coordinates, Spherical polar coordinates, transformation between Cartesian and curvilinear systems, orthogonality.	10

Module 3	Hours
System of Linear Equations, Eigenvalues and Eigenvectors Elementary row transformation of a matrix, Echelon form, rank of a matrix. Consistency and solution of system of linear equations: Gauss elimination method, Gauss Jordan method, Eigenvalues and Eigenvectors.	10
Module 4	Hours
Vector Space Vector spaces, subspace: definition and examples. Linear Combinations, linear span, linearly independent and dependent sets, basis and dimension, column space of a matrix, inner products and orthogonality.	10
Module 5	Hours
Linear Transformation Definition and examples, algebra of linear transformations, matrix of a linear transformation. Singular, non-singular linear transformations and invertible linear transformations. Rank and nullity of linear transformations, Rank-Nullity theorem.	10

8.TEXT BOOK

- B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2021.
- E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2018.
- Seymour Lipschutz and Marc Lipson, Linear Algebra, Schaum's outlines series, 4th Ed., 2008.

9.REFERENCES

- B.V. Ramana, Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017
- Gilbert Strang, Linear Algebra and its Applications, Cengage Publications, 4th Ed., 2022.
- N. P Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022.
- James Stewart, Calculus, Cengage Publications, 7th Ed., 2019.
- David Poole, Linear Algebra, a modern introduction, Cengage publishers, 4th Ed., 2014.
- David C Lay, Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018.
- Gareth Williams, Linear Algebra with applications, Jones Bartlett Publishers Inc., 6th Ed., 2017.

10. EVALUATION METHODOLOGY

- Continuous Internal Evaluation (CIE) = 50 marks

b) Semester End Examination (SEE) = 50 marks

Total = 100 marks

Assessment	Actual Weightage in Marks	Final weightage in Marks
CIE1	50	Avg. of 2 CIEs out of 30
CIE2	50	
AAT1	20	Avg. of 2 AATs out of 20
AAT2	20	
SEE	100	50
TOTAL		100
Grading consideration		50% CIE + 50% SEE

DEPARTMENT OF MATHEMATICS

Course	Numerical Methods		
Course Code	BMATS26201		
Course Category	ASC		
Hours/Week (L: T: P)	3:2:0	No. of Credits	4
Self-Study hours/semester	65		
CIE Marks	50	SEE Marks	50

1. Course Description:

This course introduces fundamental concepts of numerical methods with emphasis on solving engineering problems using computational techniques. It enables students to analyze different types of errors, solve algebraic and transcendental equations, and handle systems of linear equations using iterative and decomposition methods. The course also develops skills in interpolation, numerical integration, and numerical solutions of differential equations. In addition, it integrates analytical methods of differential equations with numerical approaches for practical problem solving. Overall, the course equips students with essential computational and analytical tools required for engineering applications and scientific computing.

2. Prerequisites:

- A basic understanding of differential and integral calculus
- Familiarity with algebra and coordinate geometry
- Knowledge of fundamental differentiation and integration techniques
- Basic problem-solving and analytical skills

3. Course Objectives:

By the end of this course, students will be able to:

- Analyze errors in numerical computations and apply root-finding methods to solve equations.
- Solve systems of linear equations using numerical and matrix-based methods and compute eigenvalues.
- Apply interpolation techniques to approximate functions and data.
- Solve differential equations using analytical methods.
- Apply numerical techniques for integration and solving ordinary differential equations

4. **Wks covered through this course – WK1, WK2, and WK4**

5. **Course Outcomes:** *By the end of the course students will be able to,*

Course Outcome	Description	Mapped POs/PSOs	Blooms Taxonomy Level
C201.1	Apply the fundamental principles of numerical techniques for solving algebraic equations, systems of linear equations, interpolation, and differential equations to obtain numerical solutions to mathematical problems.	PO1	L3
C201.2	Apply numerical techniques for error analysis, solving nonlinear equations, systems of linear equations, and eigenvalue problems to obtain approximate solutions for engineering and scientific problems.	PO1, PO2	L3
C201.3	Apply interpolation, numerical integration, and numerical methods for differential equations to solve mathematical models arising in computational and engineering applications.	PO1, PO2	L3
C201.4	Analyze computational problems using appropriate numerical methods to obtain accurate and efficient approximate solutions.	PO5, PO8	L4

6. **CO-PO Articulation Matrix**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C201.1	1	-	-	-	-	-	-	-	-	-	-
C201.2	2	1	-	-	-	-	-	-	-	-	-
C201.3	3	2	-	-	-	-	-	-	-	-	-
C201.4	-	-	-	-	1	-	-	1	-	-	-

7. **Modular Topics**

Module 1	Hours
Introduction to Numerical Methods Errors and their computation: Round off error, Truncation error, Absolute error, Relative error and Percentage error. Solution of algebraic and transcendental equations: Bisection, Regula-Falsi, Newton-Raphson methods.	10

Module 2	Hours
Numerical solutions for system of linear equations Norms: Vector norms and Matrix norms- L_1 , L_2 and L_∞ , Ill conditioned linear system, condition number. Solution of system of linear equations: Gauss Seidel method and LU-decomposition method. Eigenvalues and Eigen vectors: Rayleigh power method.	10
Module 3	Hours
Interpolation Finite differences, interpolation using Newton Gregory forward and Newton Gregory backward difference formulae, Newton's divided difference, Lagrange interpolation formulae.	10
Module 4	Hours
Differential Equations of First and Higher Order Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations with integrating factors $\frac{1}{N} \left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} \right)$ and $\frac{1}{M} \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y} \right)$, Homogeneous and non-homogeneous differential equations of higher order with constant coefficients. Inverse differential operators (e^{ax} , $\sin(ax+b)$, $\cos(ax+b)$ and x^n).	10
Module 5	Hours
Numerical Integration and Numerical Solution of Differential Equations Numerical integration: Trapezoidal, Simpson's $1/3^{rd}$, Simpson's $3/8^{th}$ rule. Numerical solution of ordinary differential equations of first order and first degree - Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor-corrector method.	10

8. Text Book:

- M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 8thEd., 2022.
- David C Lay, Linear Algebra and its Applications, Pearson Publishers, 5th Ed., 2023.
- B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44thEd., 2021.

9. References:

- B.V. Ramana, Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017
- N. P Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022.
- S. S. Sastry, Introductory Methods of Numerical Analysis, PHI Learning Private Limited, 5th Ed. 2012.
- Steven V. Chapra and Raymond P. Canale, Applied Numerical Methods with Matlab for Engineers and Scientists, McGraw-Hill, 3rd Ed., 2011

5. Richard L. Burden, Douglas J. Faires, A. M. Burden, Numerical Analysis, 10th Edition.,2010, Cengage Publishers.

10. Evaluation Methodology

a) Continuous Internal Evaluation (CIE) = 50 marks

b) Semester End Examination (SEE) = 50 marks

Total = 100 marks

Assessment	Actual Weightage in Marks	Final weightage in Marks
CIE1	50	Avg. of 2 CIEs out of 30
CIE2	50	
AAT1	20	Avg. of 2 AATs out of 20
AAT2	20	
SEE	100	50
TOTAL		100
Grading consideration		50% CIE + 50% SEE

DEPARTMENT OF PHYSICS

Course	QUANTUM PHYSICS AND APPLICATIONS		
Course Code	BPHYS26102/202		
Course Category	ASC (IC)		
Hours/Week (L:T:P)	3:0:2	No. Of Credits	04
Self-Study hours/Semester	65		
CIE Marks	50	SEE Marks	50

1. Course Description:

This course introduces students to the fundamental principles of quantum mechanics and their role in superconductivity and quantum computing. It provides a strong foundation in the electrical properties of metals and semiconductors. The course bridges core physics concepts with practical applications in semiconductors. Through a balanced mix of theory and laboratory experiments, students gain analytical and experimental skills essential for engineering applications.

2. Prerequisites:

The course presumes prior exposure to higher secondary-level Physics and Mathematics, enabling students to understand fundamental physical concepts, apply mathematical techniques for problem-solving, and carry out basic experimental measurements. This includes familiarity with modern physics, classical physics semiconductors, and elementary calculus. Knowledge of basic laboratory practices and graphical data representation is advantageous. Such foundational preparation supports the achievement of course outcomes related to analytical thinking, application of scientific principles, and experimental proficiency.

3. Course Objectives:

Learning the basic concepts in Physics in turn is essential in understanding and solving engineering related challenges.

Make the students gain practical knowledge which correlates with theoretical studies. Achieve perfection in experimental skills and ability to develop and fabricate novel technical equipment.

4. Wks covered through this course – WK1

5. Course Outcomes: By the end of the course students will be able to

Course Outcome	Description	Mapped POs/PSOs	Blooms Taxonomy Level
C102.1/ C202.1	Interpret the concepts of quantum mechanics & employ in electrical properties of metals and semiconductors.	PO1, PO2	L1, L2, L3
C102.2/ C202.2	Outline the fundamental phenomena, properties and applications of superconductivity.	PO1	L1, L2, L3
C102.3/ C202.3	Apply the concepts of photonics with their applications.	PO1, PO2	L1, L2, L3
C102.4/ C202.4	Summarize the fundamentals of quantum computing and predict simple circuit outcomes.	PO1	L1, L2, L3

1. CO-PO Articulation Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C102.1/C202.1	3	2									
C102.2/C202.2	2										
C102.3/C202.3	2	1									
C102.4/C202.4	2										

7. Module Topics

Module 1	Hours
Quantum Mechanics: de Broglie Hypothesis, Heisenberg's Uncertainty Principle and its application (Broadening of spectral lines), Wave Function, Time independent Schrödinger wave equation (Derivation), Physical significance, properties of a wave function and Born Interpretation, Eigen functions and Eigen values, Particle inside one dimensional infinite potential well, Waveforms and Probabilities, Particle inside a finite potential well and quantum tunnelling, Numerical Problems.	8
Module 2	Hours
Electrical Properties of Metals and Semiconductors: Failures of classical free electron theory, Matheissen's rule, Assumptions of Quantum Free Electron Theory, Density of States(Qualitative), Fermi Dirac statistics, Fermi Energy, Variation of Fermi Factor with Temperature and Energy, Expression for carrier concentration in a conductor, Mention of expression for electrical conductivity, Success of quantum free electron theory	8

of metals, Derivation of electron concentration in an intrinsic semiconductor, Fermi level for intrinsic and extrinsic semiconductor (Qualitative), Hall effect, Numerical Problems.	
Module 3	Hours
Superconductivity: Zero resistance state, Persistent current, Meissner effect, Critical temperature, Critical current (Silbbee Effect) – Derivation of expression of critical current for a cylindrical wire using ampere's law, Critical field, BCS Theory, Type-I and Type-II superconductors, Formation of Vortices, Explanation for upper critical field, Cooper pair tunneling (Andreev reflection), Josephson junction, DC and AC SQUID (Qualitative), Numerical Problems.	8
Module 4	Hours
Photonics: Interaction of radiation with matter – Einstein's A and B coefficients and derivation of expression for energy density, Prerequisites for lasing actions, Semiconductor diode LASER, Use of attenuators for single photon sources, Optical modulators – Pockel's effect, Kerr effect, Photodetectors – Single Photon Avalanche Diode, Optical fiber, Derivation of Numerical aperture, V-number(qualitative), Number of modes, optical fiber losses, Mach-Zehnder interferometer, Numerical problems.	8
Module 5	Hours
Quantum Computing: Moore's law - limitation of VLSI, Classical vs Quantum Computation, bit, Qubit and its properties, Bloch Sphere, Dirac notation, Single qubit, extension to n qubits, Harmonic oscillator (qualitative) – Need for anharmonicity, Operators and Operations (matrix form), Quantum Gates – Pauli Gates, Phase gate (S, T), Hadamard Gate, Two qubit gates – CNOT gate, SWAP gate, Controlled-Z gate, Numerical Problems.	8

Lab Component			
Exercise	Experiment	Course Outcomes	RBT Level
1	Determination of wavelength of LASER using Diffraction Grating.	CO3	L3
2	Determination of acceptance angle and numerical aperture of the given Optical Fiber.	CO3	L3
3	Study the Characteristics of a Photodiode and to determine the power responsivity & detectivity.	CO1	L3

4	Determination of Planck's Constant using LEDs	CO1	L3
5	Determination of Fermi Energy of Copper.	CO1	L3
6	Determination of Energy gap of the given Semiconductor.	CO1	L3
7	Black-Box Experiment (Identification of basic Electronic Components)	CO1	L3
8	Resonance in LCR circuit and determination of coefficient of self-induction.	CO1	L3
9	Study the I-V Characteristics of a Bipolar Junction Transistor and hence determine α and β .	CO1	L3
10	Predicting the outputs of various combinations of single and two-qubit gates using QISKIT	CO4	L3

8. Textbook:

- Engineering Physics, Satyendra Sharma and Jyotsna Sharma, Pearson, 2018.
- Engineering Physics, S L Kakani, Shubra Kakani, 3rd Edition, CBS Publishers and Distributors Pvt. Ltd., 2020.
- Solid State Physics, S. O. Pillai, New Age International, 2021.
- Quantum Computing, Parag K Lala, McGraw Hill, 2020.

9. References:

- Beiser, A. (2002). Concepts of Modern Physics (6th ed.). McGraw-Hill Education.
- Griffiths, D. J. (2018). Introduction to Quantum Mechanics (2nd or 3rd ed.). Pearson.
- Tinkham, M. (2004). Introduction to Superconductivity (2nd ed.). Dover Publications.
- Mishra, P. K. (2009). Superconductivity – Basics and Applications. Ane Books.
- Gaur R L, Gupta S I (2001). Engineering Physics for B.E. and B.Sc. students, Dhanpat Rai Publications.
- B B Laud (2011). LASERS and Non-Linear Optics, New Age International.
- Nielsen, M. A., & Chuang, I. L. (2016). Quantum Computation and Quantum Information, Cambridge University Press.
- Vishal Sahani (2007). Quantum Computing, McGraw Hill Education Edition.

Web resources:

- NPTEL – Quantum Mechanics I (IIT Madras):
<https://nptel.ac.in/courses/115106066>
- Solid State Physics – NPTEL (IIT Madras)

<https://nptel.ac.in/courses/115106127>

3. Introduction to Photonics – NPTEL (IIT Madras, Prof. Balaji Srinivasan)
Lecture 03 to Lecture 12 cover: Direct video link (start Lecture 03):

<https://nptel.ac.in/courses/108106135>

4. A brief course on superconductivity: <https://nptel.ac.in/courses/115103108>
5. Semiconductor Optoelectronics – NPTEL (IIT Delhi, Prof. M. R. Shenoy):
<https://nptel.ac.in/courses/108108174>

6. Lecture 04 – Quantum Computing Basics:
<https://www.youtube.com/watch?v=-ftE1SzpD8>
7. Lecture 08 – Quantum Gates and Circuits Part 1:
https://www.youtube.com/watch?v=nGPr1QM_XrY

10. Evaluation Methodology:

- a) Continuous Internal Evaluation (CIE) = 50 Marks
- b) Semester End Examination (SEE) = 50 Marks
- c) Total = 100 Marks

Evaluation Structure

Assessment	Actual Weightage in Marks	Final weightage in Marks
CIE1	50	Avg. of 2 CIEs out of 25
CIE2	50	
AAT	10	10
LAB	30	15
SEE	100	50
TOTAL		100
Grading consideration		50% CIE + 50% SEE

DEPARTMENT OF CHEMISTRY

Course	Applied Chemistry for Smart Systems		
Course Code	BCHES26102/202		
Course Category	ASC (IC)		
Hours/Week (L: T: P)	3:0:2	No. of Credits	04
Self-Study hours/semester	65		
CIE Marks	50	SEE Marks	50

1. Course Description:

This course introduces the fundamental concepts of applied chemistry for smart systems with a focus on advanced materials, energy storage devices, sensors, polymers, corrosion science, and sustainable technologies. It covers memory and display materials, quantum materials, electrochemical sensors, green energy systems, and e-waste management, highlighting their applications in modern engineering and electronic systems. The course also develops practical laboratory skills in quantitative chemical analysis and promotes sustainable engineering practices for addressing current technological and environmental challenges.

2. Prerequisites:

Students are expected to have a basic understanding of fundamental chemistry concepts, including atomic structure, chemical bonding, electrochemistry, and chemical reactions. Basic knowledge of physics related to materials, electricity, and energy systems, along with familiarity with laboratory practices and safety procedures, will help students better understand the concepts of smart materials, energy devices, sensors, corrosion, and sustainable technologies covered in this course.

3. Course Objectives:

To introduce students to advanced materials and energy devices used in emerging electronic technologies.

To develop understanding of fundamentals of memory and display devices, polymers electrochemical sensors, and Corrosion control.

To provide knowledge about sustainable practices including e-waste management.

4. Wks covered through this course: WK1, WK2, WK3, WK4

5. Course Outcomes: By the end of the course students will be able to,

Course Outcome	Description	Mapped POs/PSOs	Blooms Taxonomy Level
C102.1/C202.1	Describe the principles of memory device materials, display materials, and energy systems.	PO1, PO2	L1, L2
C102.2/ C202.2	Interpret the role of sensor materials, quantum dot materials, and corrosion phenomena in technological applications.	PO1, PO2	L1, L2

C102.3/ C202.3	Demonstrate the use of sustainable energy devices, green and biomaterials, e-waste management techniques, and polymer materials for sustainable engineering solutions.	PO1,PO2, PO6	L1, L2, L3
C102.4/C202.4	Apply quantitative chemical analysis techniques using experimental and analytical skills.	PO1, PO2	L1, L2, L3

6. CO-PO Articulation Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C102.1/C202.1	3	1									
C102.2/C202.2	2	2									
C102.3/C202.3	2	1				2					
C102.4/C202.4	2	3									

7. Modular Topics

Module-1 Functional Materials for Memory and Display Systems	Hours
Memory Devices: Introduction, organic semiconductors; types of organic semiconductors used in memory devices, p-type semiconductor-pentacene and n-type semiconductor- perfluoropentacene. Advantages of pentacene semiconductor chip. Resistive RAM (ReRAM) Materials: Introduction, synthesis of TiO₂-RAM nanomaterial by sol-gel method, properties and applications. Display Systems: Introduction, liquid crystals (LCs)-classification, properties and its applications. Construction, working principle and applications of Light Emitting Diodes (LEDs), Organic Light Emitting Diodes (OLEDs), Active-Matrix Organic Light Emitting Diodes (AMOLEDs) and Quantum Light Emitting Diodes (QLEDs).	08
Module-2 Quantum Materials and Polymers	Hours
Quantum Dots: Introduction, size dependent properties-quantum confinement effect, surface-to-volume ratio & band gap. Synthesis of Cd-Se Quantum dots by wet chemical method and its applications. Construction, working principle and applications of quantum dot sensitized solar cells (QDSSCs). Polymer: Introduction, Synthesis and properties of nylon- 6,6 and its advantages in 3D printing applications. Synthesis and properties of chlorinated polyvinyl chloride (CPVC), and polymethyl methacrylate (PMMA) and their uses in device applications. Conducting polymers- Introduction, synthesis of polyaniline, conduction mechanism and its engineering applications.	08
Module-3 Sustainable Energy Systems	Hours
Energy Systems: Introduction, basic overview of Nernst equation, construction and working of concentration cell and numerical problems. Batteries-classification of batteries, construction, working and applications of Li-Ion battery. Next-Generation Energy Devices: Introduction, construction and working of sodium	08

ion battery for EV applications. Construction and working of ultra-small asymmetric super capacitor and its applications in IoT/wearable devices. Sustainable Energy Devices: Introduction, fuel cells. Construction, working principle, applications and limitations of solid-oxide fuel cell (SOFCs) and solar photovoltaic cell (PV cell). Production of green hydrogen by electrolysis of water.	
Module-4 Sensors and Corrosion Science	Hours
Sensors: Introduction, terminologies-Transducer, Actuators and Sensors. Conductometric sensor-principle, construction and its application in the estimation of acid mixture. Colorimetric sensor-principle, instrumentation and its application in the estimation of copper in PCB. Electrochemical gas sensors- principle, construction and its application in the detection of NO_x and SO_x in air sample. Biosensor-principle, construction and working for the detection of glucose in biofluids. Corrosion: Introduction, electrochemical theory of corrosion, types of corrosion-differential metal and differential aeration corrosion-waterline and pitting corrosion. Corrosion control- galvanization and anodization. Vapour corrosion inhibitors for protecting computer circuit boards.	08
Module-5 Green Materials and E-Waste Management	Hours
Green Chemistry: Introduction, properties and applications of green solvents for server heat management. Synthesis and properties of glycerol trioleate ester and its uses in IT infrastructure applications. Green synthesis of ZnO nanoparticles and its uses in magnetic Radio Frequency Identification (RFID) and Internet of Nano Things (IONT) system applications. Biomaterials: Introduction, synthesis and properties of polylactic Acid (PLA) and its uses in touch screen applications. Synthesis and properties of Alginate Hydrogel and its uses in Brain-Computer Interfaces (BCIs) applications. E-waste: Introduction, sources, composition of e-waste, effects of e-waste on environment and human health, Artificial intelligence in e-waste management, extraction of gold from e- waste by bioleaching method.	08

Lab Component			
Exercise	Experiment	Course Outcomes	RBT Level
1	Estimation of total hardness of water by EDTA method.	CO4	L3
2	Determination of chemical oxygen demand (COD) of industrial effluent sample.	CO4	L3
3	Estimation of iron in TMT bar by diphenyl amine indicator method.	CO4	L3
4	Determination of total alkalinity of given water sample.	CO4	L3
5	Determination of acid value of solder flux using KOH.	CO4	L3
6	Estimation of acid mixture by conductometric sensor (Conductometry)	CO4	L3

7	Estimation of iron in rust sample by Potentiometric sensor (Potentiometry)	CO4	L3
8	Determination of pKa of vinegar using pH sensor (Glass electrode)	CO4	L3
9	Estimation of copper present in e-waste by optical sensor (Colorimetry).	CO4	L3
10	Interpretation of PKa values of a cooling fluid using origin software.	CO4	L3
11	Smartphone-Based colorimetric estimation of total phenolic content in coffee products.	CO4	L3

8. Textbook:

- Engineering Chemistry, Suba Ramesh, Vairam, Ananda Murthy, 2011, Wiley India, ISBN: 9788126519880.
 - A Textbook of Engineering Chemistry, R.V. Gadag and Nityananda S h e t t y , I. K. International Publishing house. 2nd Edition, 2016.
- Engineering Chemistry: Jain & Jain, Publisher: Dhanpat Rai Publishing Company, ISBN: 978-9353161118.

9. References:

- Electrochemical Energy System: Dr. K. K. Rajeshwar (IIT Madras), Publisher: IIT Madras Open Courseware (Free PDF & videos), ISBN: N/A (Open Educational Resource).
- Advances in Corrosion Science and Technology, M.G. Fontana, R.W. Seattle, Springer publications, 2012, ISBN: 9781461590620
- Engineering Chemistry: Jain & Jain, Publisher: Dhanpat Rai Publishing Company, ISBN: 978-9353161181. Smart Materials: Harvey, James A. Handbook of materials selection, 2002, John Wiley & Sons Canada, Limited, ISBN: 9780471359241.
- Energy Storage and Conversion Devices; Supercapacitors, batteries and hydroelectric Cells Editor: Anurag Gaur, 2021, CRC Press, ISBN: 9781000470512.

Web links and Video Lectures (e-Resources):

- <https://youtu.be/1TGTvQbMIlc>
- <https://www.youtube.com/watch?v=IzWONUYIQ5E&t=56s>
- <https://youtu.be/3j0jLuOs0v4>
- <https://youtu.be/CeZxn8CyM6Q>
- <https://youtu.be/om0gppRTKoU>
- https://youtu.be/_ubwkG7uCFA
- <https://youtu.be/0EokkhdpPgE?si=L6Znx5yXYjI9EVlw>
- <https://youtu.be/hT2yCPnNEol>
- <https://www.youtube.com/watch?v=EE35ICGthR8>
- <https://www.youtube.com/live/CMylb58vd4Q>
- <https://www.youtube.com/watch?v=YsZcSnqV9lg>
- <https://youtu.be/xrsK9FUdvRE?si=prlzf7fRocxyyJr>
- <https://youtu.be/OEDapr-9lNE?si=CydVhq3d5ffzdXUC>
- <https://youtu.be/QNKPaZkWC9Q?si=PyI4sQUL75340I9i>

15. <https://youtu.be/0Citdpy92EE>
16. <https://youtu.be/zaNdJ9I21YA>
17. <https://youtu.be/YAW7nMf8j0A>
18. <https://www.youtube.com/watch?v=FXGNQqdRBzc>
19. <https://www.youtube.com/watch?v=KvmqgAYO0MI>
20. <https://www.youtube.com/watch?v=SvlrAFDHOLc>
21. <https://youtu.be/kUCVBhSka2Q>

10. Evaluation Methodology

a) Continuous Internal Evaluation (CIE) = 50 marks

b) Semester End Examination (SEE) = 50 marks

Total = 100 marks

Evaluation structure

Assessment	Actual Weightage in Marks	Final weightage in Marks
CIE1	50	Avg. of 2 CIEs out of 25
CIE2	50	
AAT	10	10
LAB	30	15
SEE	100	50
TOTAL		100
Grading consideration		50% CIE + 50% SEE

DEPARTMENT OF MECHANICAL ENGINEERING

Course	Computer Aided Engineering Drawing for CSE Stream		
Course Code	BCEDS26103/203		
Course Category	Engineering Science Course (ESC)		
Hours/Week (L: T: P:S)	2:0:2:0	No. of Credits	03
Self-Study hours/semester	34		
CIE Marks	50	SEE Marks	50

1. Course Description:

Computer Aided Engineering Drawing is designed for I/II Semester Engineering students of all branches. The course covers the fundamental concepts and principles of engineering drawing with emphasis on the use of drafting and CAD software tools. Engineering drawing serves as a graphical medium for expressing technical details without language barriers and is therefore regarded as the universal language of engineers. Engineering drawings play a vital role in communicating technical information among engineers through standardized conventions, rules, and practices. The course aims to develop students' visualization skills and drafting abilities required to create and interpret engineering drawings for the design and manufacturing of components in various fields of engineering.

2. Prerequisites: -NA-

3. Course Objectives:

- Explain BIS conventions and standards used in engineering drawing.
- Construct orthographic projections of engineering components in different positions.
- Create isometric projections of simple and combined solids
- Utilize CAD software tools to generate engineering drawings and basic 3D models.

4. Wks covered through this course: WK2, WK3, WK4, WK6

5. Course Outcomes: By the end of the course students will be able to,

Course Outcome	Description	Mapped POs/PSOs	Blooms Taxonomy Level
C103.1/C203.1	Illustrate the orthographic projections of points, lines, and planes using standard engineering drawing conventions.	PO1, PO8, PO9,	L3
C103.2/C203.2	Sketch the orthographic projections of solids inclined to both horizontal and vertical planes.	PO1, PO8, PO9,	L3
C103.3/C203.3	Sketch the isometric projections of combinations of solids and develop the lateral surfaces of prisms and pyramids.	PO1, PO8, PO9,	L3
C103.4/C203.4	Execute 2D engineering drawings of lines, planes, and solids using CAD drafting software.	PO5, PO8, PO9	L3

6. CO-PO Articulation Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C103.1/ C203.1	3	—	—	—	—	—	—	1	1	—	—
C103.2/ C203.2	3	—	—	—	—	—	—	1	1	—	—
C103.3/ C203.3	3	—	—	—	—	—	—	1	1	—	—
C103.4/ C203.4	—	—	—	—	3	—	—	1	1	—	—

7. Modular Topics

Module 1	Hours
Module 1: Introduction to Engineering Drawing & Orthographic Part A: Projections of points and lines - Significance of engineering drawing, BIS conventions, freehand sketching, and scales. Introduction to CAD software, coordinate systems, and reference planes (HP, VP, RPP, and LPP) in 2D and 3D environments. Selection of drawing sheet size and scales. Basic CAD commands and creation of geometric entities such as lines, coordinate points, axes, polylines, rectangles, polygons, splines, circles, ellipses, text, move, copy, offset, mirror, rotate, trim, extend, break, chamfer, fillet, and curves. Orthographic projections of points in first and third quadrants. Orthographic projections of straight lines using first-angle projection method: lines inclined to both reference planes, true and apparent lengths, true and apparent inclinations. Part B: Orthographic Projection of plane surfaces (first quadrant only)- Introduction, Projections of regular plane surfaces such as triangle, square, rectangle, pentagon, hexagon, and circle inclined to both HP and VP using change of position method. <i>Application on projections of Lines & Planes (For CIE only)</i>	18
Module 2	Hours
Module 2: Orthographic Projection of Solids Part A: Projection of Prisms Introduction, types of solids, projections of right regular prisms resting on HP only: square prism, Cube(hexahedron), Pentagonal prism, and Hexagonal prism in different positions inclined to both HP and VP. Part B: Projection of Pyramids and Other Solids Projections of right regular pyramids resting on HP only: Square pyramid, Pentagonal pyramid, Hexagonal pyramid, Cone, and Tetrahedron in different positions inclined to both HP and VP. <i>Projections of Frustum of cone and pyramids (For practice only, not for CIE and SEE).</i>	18
Module 3	Hours
Module 3: Part A: Isometric Projection (using isometric scale only) Introduction, Isometric scale, Isometric projection of combinations of solids (Maximum of two solids) like cube, regular prisms, cylinders, pyramids, cone, tetrahedron, frustum of pyramids, cone & sphere.	16

<i>Conversion of simple isometric projections into orthographic views. (For practice only, not for CIE and SEE).</i> Part B: Development of Lateral Surfaces of Solids Development of lateral surfaces of right regular prisms, cylinders, pyramids and cones resting with base on HP only. Development of lateral surfaces of their frustums and truncations. Problems on applications of the development of lateral surfaces like funnels and trays.	
Module 4	Hours
Module 4: Computer Network Drawing (For CIE Only): Introduction to CAD tools and network drawing concepts. Practice on 2D drafting of basic wired and wireless network layouts and simple network topologies. Introduction to 3D visualization and modelling of basic computing and networking components such as Raspberry Pi, Arduino boards, routers, switches, and IoT devices. Concept of converting simple 3D models into STL format for 3D printing applications. Introduction to industrial drawing concepts, annotations, and standard drawing practices.	04

8. Text Book:

- Engineering Graphics, K. R. Gopalakrishna & Sudhir Gopalakrishna, Subhas Publishers, Bengaluru, 40th Edition, 2018-19. (All Modules)
- Engineering Drawing, N. D. Bhatt, Charotar Publishing House Pvt. Ltd., Gujarat, 53rd Edition, 2014, (Modules 1, 2 & 3)
- Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production, Luzadder Warren J. & Duff John M. Pearson Education India, 2015, (All Modules)
- Engineering Graphics, P. L. Varghese, McGraw Hill Education (India) Pvt. Ltd., New Delhi 2013, (Modules 1, 2 & 3)
- Engineering Drawing, N. S. Parthasarathy & Vela Murali, Oxford University Press 2015, (Modules 1, 2 & 3)
- Engineering Drawing & Graphics Using AutoCAD, T. Jeyapoovan, Vikas Publishing House, Latest Edition, (Module 4)
- Engineering Graphics with AutoCAD D. M. Kulkarni, A. P. Rastogi & A. K. Sarkar PHI Learning Pvt. Ltd. Revised Edition, (Module 4)

9. References:

NPTEL – Engineering Graphics

Platform: NPTEL / SWAYAM

Resource Link: <https://nptel.ac.in/courses/112102304>

Modules Covered: Modules 1, 2, 3

NPTEL – Engineering Graphics and Design

Instructor: Prof. K. V. N. Kavuri, IIT Guwahati

Platform: NPTEL / SWAYAM

Resource Link: https://nptel.ac.in/courses/112103019?utm_source=chatgpt.com

SWAYAM – Engineering Drawing and Graphics

Platform: SWAYAM

Resource Link: https://onlinecourses.swayam2.ac.in/e-learning/preview/aic22_ts42

Virtual Labs – Computer-Aided Design and Drafting

Organization: IITs/NITs under Virtual Labs

Initiative Platform: Virtual Labs

Resource Link: <https://eg-nitk.vlabs.ac.in/exp/engineering-drawing/theory.html>

Coursera: <https://www.coursera.org/courses?query=3d%20modeling&utm>

10. Evaluation Methodology

Scheme of Examination: (Theory courses)

Semester End Examination (SEE): The SEE Question paper is to be set for 100 marks, and the marks scored will be proportionately reduced to 50. Students are required to answer any three full questions, choosing at least one full question from each module.

Continuous Internal Evaluation (CIE): Two internal tests, each for **20 marks**, shall be conducted during the semester. The average of the two test scores shall be considered for awarding **20 marks** under CIE. In addition, **Activity Assessment Tasks (AATs)** shall carry **10 marks**, and the **Sketch Book evaluation** shall carry **20 marks**.

Some possible AATs:

Term Work: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning, Assignments, Seminars, model making, poster presentations, group discussions, quizzes, technical article reviews, design exercises, software simulations, hands-on lab activities, participation in technical competitions.

Self-Learning & Experiential Learning: Massive Open Online Courses (MOOCs), Virtual Labs, Simulation-Based Learning, E-Books and Digital Libraries, Online Certification Courses, Technical Article Reviews and Self-Directed Reading, Educational Video Resources, Online Discussion Forums, Model Making / Prototyping, Industrial Visits, Technical Competitions and Hackathons, Reverse Engineering Tasks, Software Tutorials and Practice, Online Quizzes & Practice Tests, Technical Blogs or e-Portfolios

Continuous Internal Evaluation (CIE):

Component		Marks	Total Marks
CIE	CIE Test-1	20	(Average of 2 CIE + AATs & Sketch Book) 50
	CIE Test-2	20	
	AATs	10	
	Sketch Book	20	
SEE	Semester End Examination	50	50
Grand Total			100

SEE Assessment: Maximum of **THREE QUESTIONS** will be set for **SEE** as per the pattern given below:

Scheme of Evaluation:

Modules	Marks Allocated
Module 1: Answer any ONE question out of TWO Questions from Projection of Points, Lines OR Projection of Planes	30
Module 2: Answer any ONE question out of TWO Questions from Projection of solids.	40
Module 3: Answer any ONE question out of TWO Questions from Isometric Projections & Development of Lateral Surfaces of Solids.	30
Total Marks	100

Question No.	Solutions and sketching in the sketch book	Computer Printout	Total Marks
1	15	15	30
2	20	20	40
3	15	15	30
Total Marks	50	50	100

Note: Students are required to submit the computer printouts along with the hand-drawn sketches at the end of the examination for evaluation.

a) Continuous Internal Evaluation (CIE) = 50 marks

b) Semester End Examination (SEE) = 50 marks

Total = 100 marks

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Course	Introduction to AI and Applications		
Course Code	BAIA26103/203		
Course Category	ETC		
Hours/Week (L: T: P)	3:0:0	No. of Credits	03
Self-Study hours/semester	45		
CIE Marks	50	SEE Marks	50

1. Course Description:

This course introduces the fundamental concepts of Artificial Intelligence, including intelligent agents and search algorithms for problem-solving. It covers data preprocessing and feature engineering paradigms. The course also explores expert systems and equips learners to apply and analyze AI techniques in real-world scenarios.

2. Prerequisites:

Understanding of basic mathematics including:

- Linear algebra (vectors, matrices)
- Probability and statistics
- Basic calculus

Concepts such as logic, sets, relations, and graphs.

Understanding of problem-solving techniques and computational thinking.

3. Course Objectives:

- To interpret various concepts like agents, and environment in applications to AI.
- To understand and compare the various search strategies used by the agents.
- To relate and contrast different learning paradigms and understand the data.
- To understand the applications of AI in the development of Expert Systems.

4. Wks covered through this course: WK2, WK3 AND WK4

5. Course Outcomes: By the end of the course students will be able to,

Course Outcome	Description	Mapped POs/PSOs	Blooms Taxonomy Level
C103.1/ 203.1	Elucidate the reasons behind AI for being an important field of study, and understand the types of agents, environments, and their relationships	PO1,PO2,PO3, PO5,PO11	L2

C103.2/ C203.2	Describe the Informed search algorithms that make up the fundamental building blocks of AI.	PO1,PO2,PO3, PO5,PO11	L3
C103.3/ C203.3	Understand the importance of preprocessing, types of data, and data transformation.	PO1,PO2,PO3, PO5,PO11	L3
C103.4/ C203.4	Understand different forms of learning and the importance of the structure of the data used by the agent.	PO1,PO2,PO3, PO5,PO11	L3
C103.5/ C203.5	Explore the application of AI ideas in the development of expert systems.	PO1,PO2,PO3, PO5,PO11	L3

6. CO-PO Articulation Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C103.1/C203.1	3	3	3	-	2	-	-	-	-	-	2
C103.2/C203.2	3	3	3	-	2	-	-	-	-	-	2
C103.3/C203.3	3	3	3	-	2	-	-	-	-	-	2
C103.4/C203.4	3	3	3	-	2	-	-	-	-	-	2
C103.5/C203.5	3	3	3	-	2	-	-	-	-	-	2

7. Modular Topics

Module 1	Hours
Introduction to AI What is AI? History of AI, Agents and Environments, Structure of Agents, Types of Agents: Simple reflex agents, Model-based reflex agents, Goal-based agents, Utility-based agents, Learning agents. Textbook 1: Chapters 1 and 2	8
Module 2	Hours
Informed Search Algorithms Search strategies, Best First Search, A*, AO*, Hill Climbing, Generate & Test, Alpha-Beta pruning, Min-max search. Textbook 1: Chapter 3	8
Module 3	Hours
Data preprocessing	8

Types of Data: Structured and Unstructured Data, Quantitative and Qualitative Data, Four Levels of Data (Nominal, Ordinal, Interval, Ratio Level). Data Transformation: Handling imbalanced data, Sampling theory, Techniques of sampling, and Quantile transformers. Textbook 3: Chapter 3	
Module 4	Hours
Feature Engineering and Learning Feature Engineering: Processes and Techniques, Forms of Learning: Introduction to Supervised, Unsupervised, Semi-Supervised and Reinforcement Learning. Textbook 3: Chapter 7	8
Module 5	Hours
Expert Systems What an expert system is; types of expert system, Characteristics of expert system, basic components of an expert system, Expert System Architecture, Rule-based Expert systems: components of rule-based expert system, Structure of rule-based system, Conflict resolution, Uncertainty Management. Textbook 2: Chapter 20	7

8. Text Book:

- Artificial Intelligence – A Modern Approach, by Stuart J. Russell and Peter Norvig, 3rd Edition Pearson 2015.
- Artificial Intelligence, by E. Rich and Knight, 3rd Edition, McGraw Hill International, 2016.
- Data preprocessing in Data Mining, by Salvador García, Julián Luengo Francisco Herrera, Springer.

9. References:

- Artificial Intelligence: Foundations of Computational Agents, by David L. Poole and Alan K. Mackworth, Cambridge University Press, 2017.
- Machine Learning: A Probabilistic Perspective, by Kevin P. Murphy, MIT Press, 2012.
- Expert Systems: Principles and Programming, by Joseph C. Giarratano and Gary D. Riley, 4th Edition, Cengage Learning, 2005.

10. Evaluation Methodology

a) Continuous Internal Evaluation (CIE) = 50 marks

b) Semester End Examination (SEE) = 50 marks

Total = 100 marks

Evaluation structure

Component		Marks	Total Marks
CIE	CIE Test-1	30	(Average of 2 CIE + AATs & Sketch Book) 50
	CIE Test-2	30	
	AATs	20	
SEE	Semester End Examination	50	50
Grand Total			100

DEPARTMENT OF MECHANICAL ENGINEERING

Course	Introduction to Engineering Mechanics		
Course Code	BESC26104A/204A		
Course Category	ESC		
Hours/Week (L: T: P)	3:0:0	No. of Credits	03
Self-Study hours/semester	50		
CIE Marks	50	SEE Marks	50

1. Course Description: The course is designed for I/II semester engineering students of all branches. It covers fundamental concepts and principles of Engineering Mechanics, and the application of these basic principles to solve static equilibrium problems related to Mechanical, Civil, Automobile, Aeronautical, Mechatronics, Robotics, and other allied Engineering branches where analysis for forces and displacement of particles or rigid bodies is involved. It also introduces real-life problems involving forces and computer applications to solve Engineering Mechanics problems.

2. Prerequisites: Basic Mathematics, Physics (Forces and Equilibrium)

3. Course Objectives:

- Apply principles of equilibrium to particles and rigid bodies.
- Determine centroid and moment of inertia of engineering sections.
- Apply frictional systems and truss members.

4. Wks covered through this course –WK1, WK2, WK3 and WK4

5. Course Outcomes: *By the end of the course students will be able to,*

Course Outcome	Description	Mapped POs/PSOs	Blooms Taxonomy Level
C104A.1/ C204A.1	Apply principles of forces, moments and equilibrium to solve engineering mechanics problems.	PO1, PO2	L3

C104A.2/ C204A.2	Determine the centroid and moment of inertia of plane and built-up sections and evaluate their significance in engineering applications.	PO1	L3
C104A.3/ C204A.3	Apply frictional forces, simple machines, linear motion and projectile motion to determine the response of mechanical systems under different operating conditions.	PO1, PO2	L3
C104A.4/ C204A.4	Apply D'Alembert's principle, dynamic equilibrium and the motion of connected bodies, including pulley systems, to solve practical engineering mechanics problems.	PO1, PO2	L3

6. CO-PO Articulation Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C104A.1/C204A.1	3	3	-	-	-	-	-	-	-	-	-
C104A.2/C204A.2	3	-	-	-	-	-	-	-	-	-	-
C104A.3/C204A.3	3	3	-	-	-	-	-	-	-	-	-
C104A.4/C204A.4	3	3	-	-	-	-	-	-	-	-	-

7. Modular Topics

Module 1	Hours
Introduction to Engineering Mechanics: Basic idealization and principles in Engineering Mechanics. Newton's laws of motion, units and dimensions, scalar, and vectors. Force and Systems of Forces, Moment of a force and couple. Lami's theorem: Equations of equilibrium for coplanar concurrent force systems. (Simple numerical, No derivation of Lami's theorem)	8
Module 2	Hours
Equilibrium of Forces: Free body diagrams, Vector representation of forces, Varignon's theorem, Resolution and composition of forces – Coplanar concurrent and non-concurrent force system. Beams: Support reactions for statically determinate beams at different loading conditions.	8
Module 3	Hours

Centroid: Importance of centroid and centre of gravity, methods of determining the centroid, locating the centroid of plane laminae from first principles, centroid of built-up sections. Numerical examples	8
Module 4	Hours
Moment of Inertia: Importance of Moment of Inertia, method of determining the second moment of area (moment of inertia) of plane sections from first principles. Friction: Introduction, Frictional force, Types of Friction-Static friction and Dynamic friction, Limiting friction, Laws of friction – Laws of Static friction and Laws of Dynamic friction, Angle of friction, Angle of Repose, Ladder friction. Problems on Static friction –Inclined plane and ladder friction.	8
Module 5	Hours
Trusses: Types of trusses, Assumptions in analysis, Analysis of determinate trusses by method of joints. Simple Machines: Introduction to Simple Machines (levers, pulleys). Mechanical advantage, Law of Machines and efficiency.	8

8. Textbook:

- Kumar, K. L., Kumar, V. Engineering Mechanics, Tata McGraw Hill, 4th edition, 2017
- Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 2015, Laxmi Publications.
- Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB

9. References

- S. Rajasekharan, G. Sankarsubramanian, “Engineering Mechanics- Statics and Dynamics” - Vikas Publishing House, 2011
- F. P. Beer and E. R. Johnston et.al., Vector Mechanics for Engineers - Statics and Dynamics, McGraw-Hill; 12th edition, 2019
- R. C. Hibbler, Engineering Mechanics: Statics and Dynamics, Pearson Education; 14th edition, 2017
- S. Timoshenko, D.H. Young, J.V. Rao, Sukumar Patil, Engineering Mechanics (In SI Units), McGraw Hill Education; 5th edition, 2017.

Online references

- Engineering Mechanics: <https://nptel.ac.in/courses/112106286>
- NPTEL – Engineering Mechanics (Statics):
https://onlinecourses.nptel.ac.in/noc24_me02/preview
- Virtual Labs – Engineering Mechanics: <https://www.vlab.co.in/broad-area-civil-engineering>

10. Evaluation Methodology

a) Continuous Internal Evaluation (CIE) = 50 marks

b) Semester End Examination (SEE) = 50 marks

Total = 100 marks

Assessment	Actual Weightage in Marks	Final weightage in Marks
CIE 1	50	Avg of 2 CIEs out of 30
CIE 2	50	
AAT	20	20
SEE	100	50
Total		100

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Course	Introduction to Electrical Engineering		
Course Code	BESC26104B/204B		
Course Category	ESC		
Hours/Week (L: T: P)	3:0:0	No. of Credits	3
Self-Study hours/semester	48		
CIE Marks	50	SEE Marks	50

1. Course Description: This course provides first-year engineering students with an introduction to the basic concepts of electrical engineering. It includes the study of DC and AC circuits, fundamental circuit analysis methods, and important electrical parameters such as voltage, current, power, and energy. The course also introduces three-phase systems, transformers, and induction motors that are commonly used in electrical and industrial systems. In addition, students gain awareness of modern topics such as renewable energy sources and electric vehicles. The aim of the course is to build a strong conceptual foundation that supports further learning in different engineering fields.

2. Prerequisites: Basic knowledge of Physics and Mathematics.

3. Course Objectives:

- Apply basic electrical laws to analyze DC circuits.
- Analyze single-phase AC circuits using phasor relationships and power concepts.
- Explain the principles of three-phase circuits and synchronous generators.
- Describe the construction and operating principles of single-phase transformers and three-phase induction motors.
- Explain the importance of renewable energy systems, electric vehicles, and the necessity of earthing.

4. Wks covered through this course – WK2 & WK3

5. Course Outcomes: *By the end of the course students will be able to,*

Course Outcome	Description	Mapped POs/PSOs	Blooms Taxonomy Level
<i>C104B.1/ C204B.1</i>	Apply the fundamental electrical laws and network analysis techniques to solve DC and single-phase AC circuits.	PO1	L3
<i>C104B.2/ C204B.2</i>	Explain the principle of three-phase AC systems and the construction of synchronous generator, single-phase transformer, and three-phase Induction motor.	PO1	L2

C104B.3/ C204B.3	Apply the operating principles of transformers and Induction motors to solve numerical problems.	PO1	L3
C104B.4/ C204B.4	Explain the general structure of electrical power systems using a single-line diagram, green energy generation systems, electric vehicles and earthing.	PO1	L2

6. CO-PO Articulation Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C104B.1/C204B.1	3	-	-	-	-	-	-	-	-	-	-
C104B.2/C204B.2	2	-	-	-	-	-	-	-	-	-	-
C104B.3/C204B.3	2	-	-	-	-	-	-	-	-	-	-
C104B.4/C204B.4	2	-	-	-	-	-	-	-	-	-	-

7. Modular Topics

Module 1	Hours
DC Circuits Basics concepts, Ohm's law, Kirchhoff's laws, analysis of series, parallel and series parallel circuits excited by independent voltage sources only. Power and energy in resistor. Analysis of Two loop circuits by Loop or mesh current method. (Two loop circuits only)	09
Module 2	Hours
Single Phase AC Circuits Basics Terminology: Generation of sinusoidal voltage, frequency of generated voltage, average value, root mean square value, form and peak factors. Analysis of Circuits: Voltage and current relationship, with phasor diagrams, in R, L, C, R-L, R-C and R-L-C series circuits. Concept of apparent, real, and reactive powers. Significance of power factor.	09
Module 3	Hours
Three Phase AC Circuits and Synchronous Generator Three Phase AC Circuits: Advantages of three phase systems, Generation of three phase voltages, meaning of phase sequence, Relationship between line and phase quantities for balanced star and delta connections for balanced loads. Synchronous Generator: Principle of operation and construction of Synchronous Generator, types and EMF equation (Excluding the derivation and Calculation of winding factors).	08

Module 4	Hours
Single-phase Transformer and Three Phase Induction Motor Single-phase Transformer: Principle of operation and construction, types, EMF equation, losses and efficiency calculations (Condition for maximum efficiency excluded). Three phase Induction Motor: Principle of operation and construction, types, concept of rotating magnetic field, slip and significance of slip, Advantages and applications. (Numerical problems on slip calculations only)	08
Module 5	Hours
Green Energy Sources and Electric vehicles Green Energy Sources: General structure of electrical power systems using single line diagram approach, Solar and Wind energy generation systems. Introduction to Electric vehicles: Overview and block diagram approach to electric vehicles. Earthing: Necessity of Earthing and Types of Earthing.	08

8. Text Book:

Basic Electrical Engineering – D. C. Kulshreshtha, Tata McGraw-Hill, 2nd Edition
(Recommended for all units).

9. References:

1. Basic Electrical Engineering – V. K. Mehta and Rohit Mehta, S. Chand, 2nd Edition (Recommended for all units).
2. Fundamentals of Electrical and Electronics Engineering – Samarjit Ghosh, PHI Learning, 2nd Edition (Recommended for all units).
3. Hughes Electrical and Electronic Technology – John Hiley, Keith Brown, and Ian McKenzie Smith, Pearson Education, 12th Edition (Recommended for all units).
4. Basic Electrical and Electronics Engineering – S. K. Bhattacharya, Pearson Education, 2nd Edition (Recommended for all units).
5. Electrical Technology – Volume 1 – B. L. Theraja and A. K. Theraja, S. Chand, Latest Edition (Recommended for all units).
6. Electrical Engineering Fundamentals – Vincent Del Toro, Pearson, 2nd Edition (Recommended for all units).
7. Non-Conventional Energy Resources – Sobh Nath Singh, Pearson Education, 2nd Edition (Recommended for all units).

10. Evaluation Methodology:

Semester end Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduce to 50.

The SEE Question Paper format is:

- Part A (20 Marks): 10 questions of two marks each (all compulsory)
- Part B (80 Marks): There will be two full questions (with a maximum of three

sub questions) from each module carrying 16 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Two internal tests will be conducted, each for 50 marks. The average score of these tests will be scaled down to 30 marks and considered for the CIE. In addition, the CIE will include an AAT component of 20 marks.

Evaluation structure

	Component	Marks	Total Marks
CIE	CIE Test-1	30	Avg. CIE +AAT = 50
	CIE Test-2	30	
	AAT	20	
SEE	Semester End Examination	100	50
Grand Total			100

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course	Introduction to Electronics and Communication Engineering		
Course Code	BESC26104C		
Course Category	ESC		
Hours/Week (L: T: P)	3:0:0	No. of Credits	3
Self-Study hours/semester	48		
CIE Marks	50	SEE Marks	50

1. Course Description:

The course Introduction to Electronics and Communication is offered to second-semester non ECE students. This course provides a comprehensive foundation in electronics and communication, covering both analog electronics, digital electronics communication systems and Embedded Systems. It introduces semiconductor devices such as diodes, BJTs, and operational amplifiers, along with their characteristics, biasing methods, and practical applications. Students learn the principles of rectifiers, filter circuits essential for power supply and waveform generation. The course also covers number systems, Boolean algebra, logic gates, and combinational logic circuits for digital system design. Fundamentals of feedback, amplification, and frequency response are emphasized to build circuit analysis skills.

2. Prerequisites: Basic Physics and Mathematics

3. Course Objectives:

- Operation of Semiconductor diode and its applications.
- Biasing circuits for transistor (BJT) as an amplifier.
- Op -amps and its applications.
- Number systems, Combinational circuits.
- Basics of Communication system and Embedded system.

4. Wks covered through this course –WK1, WK2, WK5, WK6

5. Course Outcomes: *By the end of the course students will be able to,*

Course Outcome	Description	Mapped POs/PSOs	Blooms Taxonomy Level	No. of Hours	Marks
C104C.1/ C204C.1	Explain the operating principles and applications of semiconductor devices used in basic electronic systems.	PO1, PO2, PO9, PO11	L2	16	160
C104C.2/ C204C.2	Apply concepts of electronics to study amplifiers, feedback circuits and Op-Amps.	PO1, PO2, PO9, PO11	L2	10	100

C104C.3/ C204C.3	Use Boolean algebra to simplify combinational logic circuits.	PO1, PO2, PO9, PO11	L2	08	80
C104C.4/ C204C.4	Illustrate the concept of Communication system, Embedded System and their applications	PO1, PO2, PO9, PO11	L2	08	80

2. CO-PO Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C104C.1/ C204C.1	3	3							3		3
C104C.2/ C204C.2	3	2							1		1
C104C.3/C204C.3	3	2							1		1
C104C.4/C204C.4	3	2							1		1

3. Modular Topics

Module 1	Hours
Semiconductor Diode and Applications: Introduction, Forward and Reverse Bias: V-I Characteristics of PN Junction diode, Diode applications, working of Half wave rectifier, Advantages and Disadvantages, Center tapped Full Wave Rectifier-Operation, Advantages and Disadvantages, Full Wave Bridge Rectifier-Operation, Advantages and Disadvantages, Filters, Capacitor filter. Text1 (No Derivation, No Numerical, Given all formulas). Text 1	08
Module 2	Hours
BJT Biasing: Introduction, DC operating point and Load Line, Simpler Way of Drawing a D. C. Load Line, Methods of Transistor Biasing – Fixed Bias, Voltage Divider Bias. Text 1 Single Stage BJT amplifier: Introduction, Classification of amplifiers and Transistor as an Amplifier, RC Coupled Amplifier. Text 1 Feedback amplifiers: Introduction, Principles of Feedback, Advantages and Disadvantages of positive and negative feedback. Text 1	08
Module 3	Hours
Op-Amps and its Applications: Introduction, modes of operation, OpAmp parameters - Gain, Input resistance, Output resistance, CMRR, Slew rate, Bandwidth, Input offset voltage, Input bias Current and Input offset Current. Applications- Inverting amplifier, Non-Inverting Amplifier, Voltage Follower, Summer, Differential/Difference amplifier. Text 1	08

Module 4	Hours
Binary Systems: Binary numbers, Number base conversion, octal & Hexa Decimal Numbers and conversions, Numerical, 1's & 2's Complements. Text 2 Boolean algebra and Logic Circuits: Basic definitions, Axiomatic definition of Boolean algebra, Basic theorems and properties of Boolean algebra, Boolean functions, Digital logic gates, Realization of Boolean expressions. Text 2 Adders- Half adder, Full adder. Text 2	08
Module 5	Hours
Communication Systems: Introduction, Block diagram of a communication system (transmitter, channel, receiver); Radio frequency Spectrum, Modulation, Need for modulation, Methods of Modulation. Text 1 Embedded Systems: Definition, Embedded systems vs General Computing Systems, Classification of Embedded Systems, Major Application Areas of Embedded Systems, Elements of an Embedded System. Text 3	08

4. Text Book:

- Dr. R.S. Sedha, "Electronic Circuits", S Chand & Company Pvt Ltd, 3rd Revised Edition, Reprint 2020.
- Morris Mano, "Digital Logic and Computer Design", Prentice Hall India Publication, Eighth Impression, 2018.
- K V Shibu, 'Introduction to Embedded Systems', 2nd Edition, McGraw Hill Education (India), Private Limited, 2016.

5. References:

- Robert L. Boylestad, "Electronic Devices and Circuit Theory", Prentice Hall of India Pvt Ltd., 11th edition, 2015, 2020 reprint.
- David A Bell, "Electronic Devices and Circuits", Oxford University Press, Fifth Edn.

6. Evaluation Methodology

- Continuous Internal Evaluation (CIE) = 50 marks
- Semester End Examination (SEE) = 50 marks
Total = 100 marks

Evaluation structure

	Component	Marks	Total Marks
CIE	CIE Test-1	30	Avg. CIE +AAT = 50
	CIE Test-2	30	
	AAT	20	
SEE	Semester End Examination	100	50
Grand Total			100

DEPARTMENT OF MECHANICAL ENGINEERING

Course	Introduction to Mechanical Engineering		
Course Code	BESC26104D / 204D		
Course Category	ESC		
Hours/Week (L: T: P)	3:0:0	No. of Credits	03
Self-Study hours/semester	48		
CIE Marks	50	SEE Marks	50

1. Course Description:

This course provides an overview of fundamental concepts and emerging technologies in Mechanical Engineering, including energy systems, vehicles, manufacturing processes, engineering materials, and automation technologies. It introduces students to the applications of mechanical engineering principles in solving real-world engineering problems and familiarizes them with modern advancements such as electric vehicles, drones, CNC machining, 3D printing, mechatronics, and smart materials. The course aims to develop basic technical knowledge, interdisciplinary awareness, and an understanding of the role of mechanical engineers in modern industries.

2. Prerequisites: -NA-

3. Course Objectives:

The objectives of the course Introduction to Mechanical Engineering are to:

- Introduce the fundamental concepts, principles, and applications of Mechanical Engineering in various industrial and societal domains.
- Familiarize students with energy conversion systems, automobile systems, engines, refrigeration systems, and emerging mobility technologies such as electric and hybrid vehicles.
- Provide basic knowledge of engineering materials, composite materials, smart materials, and their engineering applications.
- Develop an understanding of manufacturing processes, machine tools, CNC technology, and additive manufacturing techniques.
- Introduce modern concepts such as automation, mechatronics, sensors, drones, and integrated intelligent systems used in contemporary engineering practice.
- Create awareness about the role of mechanical engineers in solving real-world engineering problems and motivate students toward innovation, interdisciplinary learning, and career opportunities in Mechanical Engineering.

4. WKs covered through this course: WK3, WK4, WK8

5. Course Outcomes: By the end of the course students will be able to,

Course Outcome	Description	Mapped POs/PSOs	Blooms Taxonomy Level
C104D.1/ C204D.1	Demonstrate the working principles of energy conversion systems, vehicle systems, IC engines, electric and hybrid vehicles, and power transmission systems.	PO1, PO2	L3
C104D.2/ C204D.2	Select suitable engineering, composite, and smart materials for engineering applications based on their properties and characteristics.	PO1, PO2	L3
C104D.3/ C204D.3	Apply the principles of manufacturing to welding, machining, CNC, and additive manufacturing processes for engineering applications.	PO1, PO2, PO3, PO5, PO9	L3
C104D.4/ C204D.4	Apply the principles of automation, mechatronics, sensors, and integrated intelligent systems to modern mechanical engineering applications	PO1, PO2, PO3, PO5, PO9	L3

6. CO-PO Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C104D.1/ C204D.1	3	2									
C104D.2/ C204D.2	3	2									
C104D.3/ C204D.3	3	2	1	-	1	-	-	-	1	-	-
C104D.4/ C204D.4	3	2	1	-	1	-	-	-	1	-	-

7. Modular Topics

Module 1	Hours
Introduction: Streams in mechanical engineering and their relevance/significance, role of mechanical engineers in solving the real case problems (with examples) Energy conversion: Introduction and basic working principles of the Pelton Turbine and Centrifugal pump.	09

Vehicle systems: Identification of parts of vehicle systems such as steering system, brake system, gear system, working principle of Power steering (Layout of Automobile).	
Module 2	Hours
Engines: Introduction, petrol engine, diesel engines, Working of four Stroke engines, applications. Insight into Future Mobility: Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles. Advantages and disadvantages of EVs and Hybrid vehicles. Power Transmission systems: Classification of gears, simple & compound gear trains, concepts of automatic and CVT transmission.	08
Module 3	Hours
Engineering materials: Introduction, Classification, Ferrous and Non-Ferrous metals: Types, Properties and their applications. Composite materials: Introduction, Constituents of a composite, Classification, Types of Matrix and Reinforcement materials, Advantages, Disadvantages and Applications of composite materials. Smart materials: Introduction, Types - Piezoelectric materials, MR fluids, Shape memory alloys and Advantages, Disadvantages and Applications.	09
Module 4	Hours
Manufacturing overview, classification of manufacturing processes, process selection criterion. Principles of Welding, soldering, brazing. Introduction to machine tools – lathe, drilling and milling machine. Lathe operations: Turning, facing, knurling, Drilling machine operations: Drilling, reaming, tapping. Milling machine operations: End milling, face milling. Introduction to CNC, components, advantages and applications. Basic principles of 3D printing.	08
Module 5	Hours
Advances in Mechanical Engineering: Automation technology: Definition of automation, types of automation, basic elements of automation. Mechatronics systems: Definition of mechatronics, elements of mechatronics systems, examples. Elementary sensors: Working principle and applications of Potentiometer, capacitive sensor and optical encoders. Integrated system: Need for integration of technologies, ADAS (Advanced Driver Assistance System).	08

8. Text Book:

- Elements of Mechanical Engineering, K R Gopala Krishna, Subhash Publications, 2018, (Modules 1-4).
- An Introduction to Mechanical Engineering, Jonathan Wickert and Kemper Lewis, Third Edition, 2012, (Modules 1-4)
- Elements of Mechanical Engineering R K Rajput Laxmi Publications Pvt Ltd 2018, (Modules 1-4)
- Basic Mechanical Engineering, Pravin Kumar, Pearson learning, 2013, (Modules 1-4)

- v. Internal Combustion Engines, Ganeshan. V, Tata McGraw Hill, 2012, (Module 2)
- vi. Thermal Engineering, Rajput R.K, Laxmi Publications (Pvt) Ltd. 2007, (Module 1-2)
- vii. Automation, production systems, and computer integrated manufacturing, Groover M. P. Prentice Hall, 2008, (Module 5)
- viii. Industrial Robotics technology, programming and applications. Mikell P. Groover and Mitchel Weiss and Roger N. Nagel Nicholas G. Odrey, Tata McGraw Hill Edition, 2008, (Module 4)
- ix. Manufacturing Engineering and Technology Serope Kalpakjian and Steven R Schmid Pearson Education, 2000, (Module 3)
- x. Introduction to Internet of Things: A Practical Approach Dr SRN Reddy, Rachit Thukral and Manasi Mishra, ETI Labs, Module 5

9. References:

1. <https://nptel.ac.in/courses/112104526>
2. <https://nptel.ac.in/courses/112104616>
3. <https://nptel.ac.in/courses/112104769>
4. <https://theconstructor.org/practical-guide/pelton-turbine-parts-working-design-aspects/2894/>
5. <https://www.mechstudies.com/centrifugal-pump/>
6. <https://cfdflowengineering.com/working-principle-and-components-of-drone/>
7. <https://youtu.be/i1ojp09VXHY>
8. <https://www.theengineerspost.com/automatic-transmission>

10. Evaluation Methodology

Scheme of Examination: (Theory courses)

Semester End Examination (SEE): The SEE Question paper is to be set for 100 marks, and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of three sub-questions) from each module, carrying 20 marks each. Students are required to answer any five full questions, choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

a) Continuous Internal Evaluation (CIE) = 50 marks

b) Semester End Examination (SEE) = 50 marks

Total = 100 marks

Evaluation structure

	Component	Marks	Total Marks
CIE	CIE Test-1	50	Avg. of CIE will be reduced to 30. 30 + 20 = 50
	CIE Test-2	50	
	QUIZ/AAT	20	
SEE	Semester End Examination	100	50
Grand Total			100

DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course	Essentials of Information Technology		
Course Code	BESC26104E / 204E		
Course Category	ESC		
Hours/Week (L: T: P)	3:0:0	No. of Credits	03
Self-Study hours/semester	48		
CIE Marks	50	SEE Marks	50

1. Course Description:

This course introduces essential information technology concepts for computing students. Students explore data storage and representation using binary number systems, computer architecture, and machine language fundamentals. Operating systems including their history, architecture, and process management are examined. Networking, internet protocols, the World Wide Web, and cybersecurity principles including the information security model and cyber hygiene are studied. Software engineering methodologies, the software lifecycle, and modular design are introduced. Database fundamentals and the relational model are covered. Website development using HTML and CSS, computer graphics overview, and ethical issues in information technology including ownership rules and online content complete the course.

2. Prerequisites: Basics of Computer Usage; No prior programming experience required

3. Course Objectives: The course will enable students to

1. Understand how data is stored and processed in binary form inside a computer system.
2. Explore IT infrastructure including operating systems, networking, and internet technologies.
3. Recognize cybersecurity threats and apply ethical principles in the use of information technology.
4. Apply basic software engineering and database concepts for application development.
5. Design and develop simple web pages and understand computer graphics fundamentals.

4. Wks covered through this course – WK1, WK3, WK5, WK7, WK8

5. Course Outcomes: By the end of the course students will be able to,

Course Outcome	Description	Mapped POs/PSOs	Blooms Taxonomy Level
C104E.1/ C204E.1	Understand foundational concepts of data representation, algorithmic logic, cybersecurity, software engineering, and web development.	PO1, PO2	L2

C104E.2/ C204E.2	Explain how binary storage, system processes, network safeguards, databases, and graphics support information processing.	PO1, PO2	L2
C104E.3/ C204E.3	Understand the role of information encoding, computational procedures, cyber-ethics, development lifecycle, and interface design in responsible IT us.	PO1, PO2	L2
C104E.4/ C204E.4	Apply data handling, algorithm design, secure development, structured querying, and web construction to build IT solutions..	PO1, PO2	L3

6. CO-PO Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C104E.1/ C204E.1	3	2									
C104E.2/ C204E.2	3	2									
C104E.3/ C204E.3	3	2									
C104E.4/ C204E.4	3	2									

7. Modular Topics

Module 1	
Data Storage: Bits and Their Storage, Main Memory, Mass Storage, Representing Information as Bit Patterns, The Binary System, Storing Integers, Storing Fractions. Data Manipulation: Computer Architecture, Machine Language, Program Execution, Arithmetic/Logic Instructions, Communicating with Other Devices. Textbook 1: Chapter 1 (1.1–1.7), Chapter 2 (2.1–2.5)	08 Hours L2
Module 2	
Operating Systems: The History of Operating Systems, Operating System Architecture, Coordinating the Machine's Activities, Handling Competition Among Processes, Security. Algorithms: The Concept of an Algorithm, Algorithm Representation, Algorithm Discovery. Textbook 1: Chapter 3, Chapter 5 (5.1–5.3)	08 Hours L2

Module 3	
Networking and the Internet: Network Fundamentals, The Internet, The World Wide Web, Internet Protocols, Security. Cybersecurity: Overview – What is Cyber security?, Brief History of Cybersecurity Events, The Basic Information Security Model, Cyber Hygiene, Teams in Cybersecurity. Ethical Issues in Information Technology: Overview, Ownership Rules, Ethics and Online Content. Textbook 1: Chapter 4; Textbook 2: Chapter 16, Chapter 17	08 Hours L3
Module 4	
Software Engineering: The Software Engineering Discipline, The Software Life Cycle, Software Engineering Methodologies, Modularity, Tools of the Trade. Database Systems: Database Fundamentals, The Relational Model. Textbook 1: Chapter 7 (7.1–7.5), Chapter 9 (9.1–9.2)	08 Hours L3
Module 5	
Introduction to HTML and Website Development: What is HTML?, Cascading Style Sheets (CSS), Website Design and Storyboarding, Structure of a Website. Computer Graphics: The Scope of Computer Graphics, Overview of 3D Graphics, Modeling, Rendering. Textbook 2: Chapter 12; Textbook 1: Chapter 10 (10.1–10.4)	08 Hours L3

Self-Study (for Learning Activity, Not for SEE):

File Management, Word Processors, Introduction to Spreadsheets, Introduction to Presentation Applications.

Refer Textbook 2: Chapter 6, Chapter 8, Chapter 9, Chapter 10.

8. Text Books:

- J. Glenn Brookshear and Dennis Brylow, "Computer Science: An Overview", 12th Edition, Pearson Education Limited, 2017.
- Roy, Shambhavi; Daniel, Clinton; and Agrawal, Manish, "Fundamentals of Information Technology", Digital Commons at The University of South Florida, 2023.
https://digitalcommons.usf.edu/dit_tb_eng/19

9. References:

- V. Rajaraman, "Introduction to Information Technology", Third Edition, PHI Learning, 2018.
- Pelin Aksoy, "Information Technology in Theory", First Edition, Cengage.

Web Links and Video Lectures (e-Resources):

- Information Technology: https://onlinecourses.swayam2.ac.in/cec20_cs05/preview
- Computer Organization and Architecture: <https://nptel.ac.in/courses/106103068>
- Introduction to Internet: <https://nptel.ac.in/courses/106105084>

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

1. Flipped Classroom
2. Problem-Based Learning (PBL)
3. Case-Based Teaching
4. Simulation and Virtual Labs
5. ICT-Enabled Teaching

10. Evaluation Methodology

a) Continuous Internal Evaluation (CIE) = 50 marks

b) Semester End Examination (SEE) = 50 marks

Total = 100 marks

Evaluation structure

	Component	Marks	Total Marks
CIE	CIE Test-1	40	50
	CIE Test-2	40	
	QUIZ/AAT	10	
SEE	Semester End Examination	100	50
Grand Total			100

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Course	Programming in C		
Course Code	BEIT26105 / 205		
Course Category	PSC		
Hours/Week (L: T: P)	3:0:0	No. of Credits	3
Self-Study hours/semester	42		
CIE Marks	50	SEE Marks	50

1. Course Description:

This course introduces undergraduate students to the fundamentals of structured programming using the C language one of the most foundational and widely used programming languages in computing. It covers core concepts including data types, operators, control structures, arrays, strings, and pointers, progressively building the student's ability to write efficient and well-structured programs. Students further develop competency in modular programming through user-defined functions, recursion, and dynamic memory management, along with the ability to model real-world entities using structures, unions, and enumerations.

The course emphasizes not just syntactic correctness but the development of a strong problem-solving mindset enabling students to analyze problems and select appropriate language constructs for effective solutions.

2. Prerequisites:

Students should have basic knowledge of computers and logical thinking.

3. Course Objectives:

The course will enable students:

- To explain the basic concepts, structure, and language constructs of the C programming language.
- To apply control structures and I/O functions to develop simple C programs.
- To use arrays, strings, and pointers for efficient data handling and memory access.
- To design modular programs using functions, recursion, and dynamic memory allocation.
- To build user-defined data types using structures, unions, and enumerations to model real-world problems.

4. Wks covered through this course –WK2, WK3, WK6, WK8

5. Course Outcomes: By the end of the course students will be able to,

Course Outcome	Description	Mapped POs/PSOs	Blooms Taxonomy Level
CO105.1/ CO205.1	Apply fundamental programming concepts of C to develop programs for basic computational applications.	PO1	L3
CO105.2/ CO205.2	Implement logical problem-solving approaches to solve given computational problems using C.	PO2, PO5	L3
CO105.3/ CO205.3	Experiment with arrays, strings, and functions to perform data operations and develop modular C programs.	PO5	L3
CO105.4/ CO205.4	Develop C programs and applications to meet given computational requirements.	PO3, PO5	L3

6. CO-PO Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO105.1/ CO205.1	3										
CO105.2/ CO205.2		3			2						
CO105.3/ CO205.3					3						
CO105.4/ CO205.4			2		2						
CO105.1/ CO205.1	3										

7. Modular Topics

Module 1	Hours
Introduction to Computing: Computer languages, Creating and Running Programs, System Development. Overview of C: A Brief History of C, C Is a Middle-Level Language, C Is a Structured Language, C Is a Programmer's Language, Compilers Vs. Interpreters, The Form of a C Program, The Library and Linking, Separate Compilation, Compiling a C Program, C's Memory Map. Expressions: The Basic Data Types, Modifying the Basic Types, Identifier Names, Variables, The Four C Scopes, Type Qualifiers, Storage Class	8

Specifiers, Variable Initializations, Constants, Operators, Expressions. Textbook 1: Chapter 1, 2 Textbook 2: Chapter 1: 1.3, 1.4, 1.5	
Module 2	Hours
Console I/O: Reading and Writing Characters, Reading and Writing Strings, Formatted Console I/O, printf(), scanf(). Statements: True and False in C, Selection Statements, Iteration Statements, Jump Statements, Expression Statements, Block Statements. Textbook 1: Chapter 8, 3	8
Module 3	Hours
Arrays and Strings: Single-Dimension Arrays, Generating a Pointer to an Array, Passing Single-Dimension Arrays to Functions, Strings, Two-Dimensional Arrays, Multidimensional Arrays, Array Initialization, Variable - Length Arrays. Pointers: What Are Pointers?, Pointer Variables, The Pointer Operators, Pointer Expressions, Pointers and Arrays, Multiple Indirection, Initializing Pointers. Textbook 1: Chapter 4, 5	8
Module 4	Hours
Functions: The General Form of a Function, Understanding the Scope of a Function, Function Arguments, argc and argv—Arguments to main(), The return Statement, What Does main() Return?, Recursion, Function Prototypes, Declaring Variable Length Parameter Declarations, The inline Keyword. Pointers (Contd...): Pointers to Functions, C's Dynamic Allocation Functions. Textbook 1: Chapter 5, 6	8
Module 5	Hours
Structures, Unions, Enumerations, and typedef: Structures, Arrays of Structures, Passing Structure to Functions, Structure Pointers, Arrays and Structures within Structures, Unions, Bit-Fields, Enumerations, Using sizeof to Ensure Portability, typedef. Textbook 1: Chapter 7	8

8. Text Book:

- C: The Complete Reference, Herbert Schildt, McGraw Hill, 4th Edition
- A Structured Programming Approach in C, Hassan Afyouni, Behrouz A. Forouzan., Cengage, 4th Edition

9. References:

- The 'C' Programming Language, Brian W. Kernighan and Dennis M. Ritchie, Prentice Hall of India, 2nd Edition
- Programming in C, Reema Thareja, Oxford University Press, 3rd Edition, 2023

10. Evaluation Methodology

a) Continuous Internal Evaluation (CIE) = 50 marks

b) Semester End Examination (SEE) = 50 marks

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be ten full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions, choosing at least one full question from each module.

Total = 100 marks

Grading consideration: 50% CIE + 50% SEE

Evaluation structure

Assessment	Actual Weightage in Marks	Final weightage in Marks
CIE 1	50	Avg. of 2 CIEs out of 30
CIE 2	50	
AAT	20	20
Total		50

DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course	Python Programming		
Course Code	BPLC26105B/205B		
Course Category	PLC(IC)		
Hours/Week (L: T: P)	3:0:2	No. of Credits	04
Self-Study hours/semester	50		
CIE Marks	50	SEE Marks	50

1. Course Description:

This course introduces fundamental concepts of Python programming, enabling students to develop practical problem-solving skills at the application level. It covers basic syntax, data types, variables, and flow control structures, followed by functions and modular programming. Learners explore data structures such as lists and dictionaries, along with string manipulation techniques. The course also includes regular expressions for pattern matching and file handling for data storage and retrieval. Emphasis is placed on writing, debugging, and executing programs to solve real-world problems, preparing students to build simple applications using Python's core features and standard libraries

2. Prerequisites: *C – Programming (but not Mandatory)*

3. Course Objectives: *Broad statements*

1. Learn the syntax and semantics of Python Programming Language.
2. Write Python functions to facilitate code reuse and optimization.
3. Illustrate the process of structuring the data using lists, strings and dictionaries.
4. Demonstrate the use of built-in functions related regular expression, strings and to navigate the
5. Appraise the need for working with various file system.

4. Wks covered through this course – WK2, WK 3, WK 4, WK 6, WK 8

5. Course Outcomes: *By the end of the course students will be able to,*

Course Outcome	Description	Mapped POs/PSOs	Blooms Taxonomy Level
C105B.1/ C205B.1	Apply appropriate Python programming constructs to solve numerical, textual, and computational problems	PO1, PO2	L3

C105B.2/ C205B.2	Design Python-based solutions for specified requirements using suitable programming constructs and problem-solving techniques.	PO1, PO2, PO3	L3
C105B.3/ C205B.3	Conduct practical experiments to solve real-time problems using Python.	PO1, PO3, PO5	L3
C105B.4/ C205B.4	Analyze test cases, program execution, and errors to verify and improve Python programs against given requirements.	PO2, PO4, PO5	L3

6. CO-PO Articulation Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C105B.1/C205B.1	3	2	-	-	-	-	-	-	-	-	-
C105 B.2/C205B.2	2	2	2	-	-	-	-	-	-	-	-
C105B.3/C205B.3	2	-	3	-	2	-	-	-	-	-	-
C105 B.4/C205 B.4	-	3	-	3	2	-	-	-	-	-	-

7. Modular Topics

CONTENTS	No. of Hours
Module 1 Introduction and Flow Control Introduction, Python Basics: Entering Expressions into the InteractiveShell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program. Flow control: Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys.exit(). Text Book 01: Chapters - 1, 2	08 Hours

Module 2 Functions and List Functions: def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling, A Short Program: Guess the Number Lists: The List Data Type, Working with Lists, Augmented Assignment Operators, Methods, List-like Types: Strings and Tuples, References Text Book 01: Chapters - 3, 4	08 Hours
Module 3 Dictionaries and String Dictionaries and Structuring Data: The Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things, Nested Dictionaries and Lists Manipulating Strings - Working with Strings, Useful String Methods Project: Password Locker Text Book 01: Chapters - 5, 6	08 Hours
Module 4 Regular Expressions Pattern Matching with Regular Expressions: Finding Patterns of Text without Regular Expressions, Finding Patterns of Text with Regular Expressions, More Pattern Matching with Regular Expressions, Greedy and Nongreedy Matching, The findall() Method, Character Classes, Making Your Own Character Classes, The Caret and Dollar Sign Characters, The Wildcard Character, Review of Regex Symbols, Case-Insensitive Matching, Substituting Strings with the sub() Method, Managing Complex Regexes, Combining re.IGNORECASE, re.DOTALL, and re.VERBOSE. Text Book 01: Chapters - 7	08 Hours

Module 5 Files Handling Organizing Files: The shutil Module, Walking a Directory Tree, Compressing Files with the zipfile Module. Reading and Writing Files: Files and File Paths, The os. path Module, The File Reading/Writing Process, Saving Variables with the shelve Module, Saving Variables with the pprint. pformat() Function. Text Book 01: Chapters -8, 9	08 Hours
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Lab Component			
Exercise	Experiment	Course Outcomes	RBT Level
1.	Introduction lab session – Sample Programs	CO1	L3
2.	Programs on data types, string concatenation and replication	CO1	L3
3.	Program on operators and Flow Control Statements	CO1	L3
4.	Programs on loops	CO1	L3
5.	Programs on Functions	CO2	L3
6.	Programs on List	CO2	L3
7.	Programs on Dictionaries	CO3	L3
8.	Programs on String manipulation	CO3	L3
9.	Programs on Pattern Matching with Regular Expressions	CO4	L3
10.	Programs on Pattern Matching with Regular Expressions	CO4	L3
11.	Programs on File Handling	CO5	L3

8. Text Books:

1. Al Sweigart, “Automate the Boring Stuff with Python”, William Pollock, 2015, ISBN: 978-1593275990.

9. Reference Books:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015, ISBN: 978-9352134755.
2. Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd. ISBN-13: 978-8126556014.
3. Wesley J Chun, “Core Python Applications Programming”, 3rd Edition, Pearson Education India, 2015. ISBN-13: 978-9332555365.

4. Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, “Data Structures and Algorithms in Python”, 1st Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126562176.
5. ReemaThareja, “Python Programming using problem solving approach”, Oxford University press, 2017. ISBN-13: 978-0199480173
6. Charles R. Severance, “Python for Everybody: Exploring Data Using Python-3”, 1st Edition, Shroff Publishers, 2017. ISBN: 978-9352136278.

10. Evaluation Methodology

a) Continuous Internal Evaluation (CIE) = 50 marks

b) Semester End Examination (SEE) = 50 marks

Total = 100 marks

Evaluation Structure

Assessment	Actual Weightage in Marks	Final weightage in Marks
CIE 1	50	Avg. of 2 CIEs out of 30
CIE 2	50	
AAT	20	20
Total		50

DEPARTMENT OF SCIENCE & HUMANITIES

Course	Communication Skills		
Course Code	BENG26106/206		
Course Category:	AEC		
Hours/Week(L:T:P)	1:0:0	Number of Credits	1
Self-Study hours/Semester	15		
CIE Marks	50	SEE Marks	50

1. Course Description

This course aims to develop essential verbal, non-verbal, and written communication skills required for academic, professional, and digital contexts. It focuses on enhancing interpersonal skills, presentation abilities, and workplace communication, while integrating employability skills such as email writing, group discussions, and interviews. Through interactive and experiential learning approaches, the course prepares learners to communicate effectively with clarity, confidence, and professionalism.

2. Pre-requisites:

Students should possess a basic understanding of the English language, including reading, writing, and simple sentence formation. They are expected to demonstrate a willingness to participate in interactive activities such as discussions, presentations, and role plays, along with openness to feedback and continuous improvement. Basic listening skills and the ability to follow instructions are essential. No prior formal training in communication skills is required, making the course suitable for beginner to intermediate learners.

3. Course Objectives

- To develop **effective verbal and non-verbal communication skills** for clarity and professional interaction
- To enhance **interpersonal and presentation skills** for group discussions, debates, and workplace communication
- To build competence in **formal and informal writing**, including emails, reports, and creative content
- To enable learners to communicate effectively in **digital platforms**, following netiquette and ethical practices
- To prepare students for **career readiness**, including resume writing, job applications, and interview performance

4. Wks covered through this course – WK8, WK9

5. Course Outcomes: By the end of the course students will be able to

Course Outcome	Description	Mapped POs/PSOs	Cognitive Level
C106.1/ C206.1	Build essential verbal, non-verbal, and phonetic communication skills and apply interpersonal skills for clarity, confidence, and effective professional interaction.	PO 9	L3

C106.2/ C206.2	Apply formal writing, email etiquette, creative content development, and digital communication practices with appropriate netiquette and academic integrity.	PO 9	L3
C106.3/ C206.3	Develop employability -oriented communication skills through professional writing, résumé preparation, job applications, presentations, and interviews.	PO 9	L3
C106.4/ C206.4	Demonstrate effective communication, collaboration, and professional interaction skills in group discussions, presentations, workplace situations, and digital environments.	PO 9	L3

6. CO-PO articulation matrix

CO/PO	PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C106.1/C206.1									1		
C106.2/206.2									1		
C106.3/C206.3									1		
C106.4/C206.4									1		

7. Modular Topics

Module 1	Hours
Glimpses of Essential English for Engineers (General Over view), Communication Skills: Process, Verbal and Non-Verbal, Proxemics, Chronemics and Barriers. Writing: Word Classification–Parts of Speech, Sentence structures. Speaking & Listening: Listening to English Pronunciation–English Phonemes–Intelligible Accent – Speech Organs- Syllable Structures, Stress, Intonation, and Practice.	03
Module 2	Hours
Speaking: Role Play Exercises Based on Workplace Contexts, Introducing Oneself - PEP Talks- Personal Empowerment, Participating in Group Discussion and Debates, Giving Technical Presentation. Reading: Reading the Interview of an Achiever (Skimming and Scanning) (Case Studies). Writing: Writing a Short Biography of an Achiever Based on given reflections. Grammar: Sentence patterns. Vocabulary Development: Idioms and Phrases.	03
Module 3	Hours

Writing: Form a l Letter writing (Enquiry, Order, and Complaint). Tenses–Reported Speech-Voice - Email Etiquettes, Structure, Writing and Responding to Emails. Paragraph Writing (Descriptive, Argumentative, Expository, Short Story, and Narrative), Blog Writing. Reading: Proof Reading (Spelling, Punctuation, Grammar). Error Identification Exercises. Speaking: Questions & Requests (non-Wh questions and Question tags).	03
Module 4	Hours
Writing: Framing of search terms / keywords in search engines/ Commands for search on open AIs - Tools to support synchronous communication such as webinar platforms, and asynchronous communication such as forums and social media - Online communication - Types – pros and cons of online communication. Acceptable online roles and behaviors – Netiquettes - Etiquettes of social media. Problems and opportunities in handling digital resources -Tools to check grammar. Writing: Citing information accurately from source material - Plagiarism – Infringement, Importance of academic integrity.	03
Module 5	Hours
Writing: Framing of search terms / keywords in search engines/ Commands for search on open AIs - Tools to support synchronous communication such as webinar platforms, and asynchronous communication such as forums and social media - Online communication - Types – pros and cons of online communication. Acceptable online roles and behaviors – Netiquettes - Etiquettes of social media. Problems and opportunities in handling digital resources -Tools to check grammar. Writing: Citing information accurately from source material - Plagiarism – Infringement, Importance of academic integrity.	03

8. LIST OF RECOMMENDED AND REFERENCE TEXTBOOKS

1. Kumar,A.R.(2008).*English for engineers and ethnologists* .Orient Black Swan.
2. Raman,M.,&Sharma,S.(2015).*Technicalcommunication:Principlesandpractice* (3rd ed.). Oxford University Press.
3. Floyd, K.,& Cardon,P.W.(2019).*Business and professional communication* (3rd ed.). Principles of Scientific and Technical Writing, 1e, By Pratap K. J. Mohapatra, Sanjib Moulick, © 2025 | Published: December 23, 2024
4. EffectiveTechnicalCommunication,3e,ByAshrafM.Rizvi,Priyadarshi Patnaik, © 2024 | Published: September 12, 2024
5. Yadav,D.P.(2022).*AcourseinEnglishpronunciation*.NotionPublications.

9. List Of Online Resources [Nptel/ Swayam/Moocs/Web Resource

- Oxford Advance Learners Dictionary
- Cambridge English Skills Real is listening and Speaking by Miles Craven
- Communicative English for Professionals by Nitin Bhatnagar and Mamta Bhatnagar

10. Evaluation Methodology

- a) Continuous Internal Assessment (CIA) 1 and 2 = 50 marks each reduced to 30 marks

- b) AAT 1 & 2 (Alternative Assessment Tool) = 10 marks each = 20 Marks
 c) Semester End Examination (SEE) = 50 marks
 Total = 100 marks

Evaluation Structure

	Component	Marks	Total Marks
CIE	CIE Test-1	50	Avg. CIE +AAT = 50
	CIE Test-2	50	
	AAT	10+10	
SEE	Semester End Examination	50	50
Grand Total			100

DEPARTMENT OF SCIENCE AND HUMANITIES

Course	Soft Skills		
Course Code	BSKS26106/206		
Course Category:	AEC (NCCMC)		
Hours/Week (L:T:P)	1:0:0	Number of Credits	PP
Self-Study hours/Semester	-		
CIE Marks	100	SEE Marks	-

1. Course Description

This course is designed to develop essential soft skills required for personal and professional success. It focuses on enhancing self-awareness, communication, stress management, goal setting, and problem-solving abilities, while also nurturing empathy, teamwork, critical thinking, and conflict resolution skills. Through experiential and activity-based learning, the course prepares learners to adapt, collaborate, and perform effectively in real-world and workplace environments.

2. Prerequisites:

Students should possess basic communication abilities and a willingness to engage in interactive learning activities such as discussions, role plays, and presentations. They are expected to be open to self-reflection, enabling them to identify and improve their strengths and weaknesses. A positive attitude towards personal growth, stress management, and teamwork is essential. No prior formal training in soft skills is required.

3. Course Objectives

- Apply social skills for clear communication, persuasion, self-awareness, and active listening.
- Use emotional skills to build confidence, manage stress, and adapt to change.
- Set ambitious goals, practice empathy, and apply creativity for problem-solving.
- Demonstrate discipline, time management, and structured problem-solving.
- Work in teams, negotiate, resolve conflicts and think critically.

4. Wks covered through this course – WK8, WK9



Approved by AICTE



After completing the course, Students would be able to:

Course Outcome	Description	Mapped POs/PSO	Blooms Taxonomy Level
<i>C106.1/C206.1</i>	Apply principles of effective communication, persuasion, self-awareness, active listening, and emotional intelligence to interact effectively in professional and social contexts.	PO9	L1
<i>C106.2/C206.2</i>	Develop goal-setting abilities, empathy, creativity, adaptability, and resilience to enhance personal growth, interpersonal effectiveness, and problem-solving.	PO9	L1
<i>C106.3/C206.3</i>	Apply problem-solving techniques, discipline, time management, and academic integrity practices to manage structured academic and professional tasks effectively.	PO9	L1
<i>C106.4/C206.4</i>	Apply collaboration, teamwork, negotiation, conflict resolution, and critical thinking skills to address workplace and real-life situations effectively.	PO9	L1

6. CO-PO articulation matrix

[illegible]

7. Modular Topics

Module 1	Hours
Communication: Principles of clear and effective exchange of ideas in professional and social contexts. Persuasion: Techniques to influence and convince through logical, emotional and ethical appeals. Self-Awareness: Identifying personal strengths, weaknesses, opportunities and challenges (SWOC analysis). Active Listening: Paraphrasing, questioning techniques and demonstrating attentiveness.	03
Module 2	
Emotional Intelligence (EI): Recognizing and managing emotions, empathy, relationship management, and conflict resolution. Stress Management: Identifying stress triggers, relaxation techniques, work-life balance strategies, and mindfulness practices. Time Management: Prioritization (Eisenhower Matrix), setting SMART goals, avoiding procrastination, and effective scheduling. Adaptability & Resilience: Handling change, bouncing back from setbacks and developing a growth mindset.	03
Module 3	
Ambition & Goal Setting: Defining personal and professional aspirations, creating SMART goals, and aligning actions with long-term vision. Sympathy & Empathy: Understanding emotional perspectives, differentiating between the two, and applying them in workplace and social interactions. Creativity & Innovation: Generating original ideas, problem-solving, and applying creative thinking techniques (mind-mapping, SCAMPER).	03
Module 4	
Problem Solving: Identifying root causes, analyzing options, and implementing solutions using methods like 5 Whys and Fishbone Diagram. Discipline: Building consistency, accountability, and professional habits. Time Management: Prioritizing tasks (Eisenhower Matrix), scheduling, avoiding procrastination. Writing: Citing information accurately from source material - Plagiarism Infringement, Importance of academic integrity.	03
Module 5	
Collaboration & Team work: Working effectively in diverse teams, fostering trust and achieving shared goals. Negotiation & Conflict Resolution: Strategies to solve differences and reach win-win outcomes. Critical Thinking: The ability to analyze, evaluate, and synthesize information to make well-reasoned decisions.	03

8. Text Books:

- I. Principles of Scientific and Technical Writing, 1, By Pratap K.J. Mohapatra, Sanjib Moulick, © 2025 | Published: December 23, 2024
- II. Soft Skills, 1, By Soma Mahesh Kumar © 2024 | Published: June 8, 2023
- III. Effective Technical Communication, 3, By Ashraf M. Rizvi, Priyadarshi Patnaik, © 2024 | Published: September 12, 2024
- IV. Yadav D.P (2022). A course in English pronunciation. Notion Publications.

9. References:

1. Oxford Advance Learners Dictionary
2. Cambridge English Skills Real Listening and Speaking by Miles Craven
3. Communicative English for Professionals by Nitin Bhatnagar and Mamta Bhatnagar

10. Evaluation Methodology

- a) Continuous Internal Evaluation (CIE) = 50 marks
- b) Semester End Examination (SEE)
= 50 marks Total = 100 marks

Course	C Programming Lab		
Course Code	BPOPL26107		
Course Category	PSC		
Hours/Week (L: T: P)	0:0:2	No. of Credits	1
Self-Study hours/semester	-		
CIE Marks	50	SEE Marks	50

1. Course Description:

The C Programming Lab is designed to provide students with hands-on experience in implementing concepts learned in the C Programming theory course. The laboratory emphasizes problem-solving skills, logical thinking, and structured programming techniques using the C language. The lab covers fundamental concepts such as data types, operators, control structures, arrays, strings, functions, pointers, structures, unions, file handling, and dynamic memory allocation. Students will gain experience in writing modular programs, handling input/output operations, and debugging errors using standard development tools.

2. Prerequisites:

Students should have basic knowledge of computers and logical thinking.

3. Course Objectives:

The course will enable students to:

- Develop structured C programs to solve real-world problems.
- Apply control structures and modular programming techniques.
- Use arrays, pointers, structures, and file handling effectively.
- Debug and optimize programs for better performance.
- Follow good programming practices and coding standards.

4. Wks covered through this course –WK2, WK3, WK6, WK8

5. Course Outcomes:

By the end of the course students will be able to,

<i>Course Outcome</i>	<i>Description</i>	<i>Mapped POs/PSOs</i>	<i>Blooms Taxonomy Level</i>
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<i>C107.1/C207.1</i>	Apply C language derived data types to solve simple real-world problems.	PO1	L3
<i>C107.2/C207.2</i>	Implement C programs to solve simple computational problems.	PO2	L3
<i>C107.3/C207.3</i>	Develop C programming experiments and document their implementation, observations, results, and inferences.	PO5, PO8, PO9	L3

6. CO-PO Articulation Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
<i>C107.1/C207.1</i>	3										
<i>C107.2/C207.2</i>		3									
<i>C107.3/C207.3</i>					3			3	3		

7. Modular Topics

Exercise	PART – A CONVENTIONAL EXPERIMENTS	Course Outcomes	RBT Level
1	A robot needs to find how far it must travel between two points on a 2D plane. Develop a C program to calculate the straight-line distance between the given coordinates.	CO1, CO3	L3
2	Develop a C program that takes a student's marks as input and displays their grade based on the following criteria: 90 and above: Grade A 75 to 89: Grade B 60 to 74: Grade C 50 to 59: Grade D Below 50: Grade F Choose a suitable control structure to implement this logic efficiently.	CO1, CO3	L3

3	Develop a C program that takes a unique identification input like PAN Number, AADHAR_Number, APAAR_Id, Driving License, Passport and checks it against a set of stored KYC records. Based on the input, display whether the individual is verified or not. Use an appropriate control structure to handle multiple possible ID matches. Assume all Unique identification are of integer type.	CO1, CO3	L3
4	A math app needs to determine the type of roots for a quadratic equation based on user input. Develop a C program to calculate and display the roots based on the given coefficients.	CO1, CO3	L3
5	A sensor in a robotic arm needs to calculate the angle of rotation in real-time, but the hardware doesn't support built-in trigonometric functions. Develop a C program to approximate the value of $\sin(x)$ using a series expansion method for improved performance.	CO2, CO3	L3
6	Develop a C program that accepts a course description string and a keyword from the user. Search whether the keyword exists within the course description using appropriate string functions. If found, display: "Keyword '<keyword>' found in the course description." Otherwise, display: "Keyword '<keyword>' not found in the course description."	CO2, CO3	L3
7	Develop a C program that takes marks for three subjects as input. Use a function to check if the student has passed (minimum 40 marks in each subject). Display the average and whether the student passed or failed.	CO2, CO3	L3
8	In an ATM system, two account balances need to be swapped temporarily for validation. Develop a C program that accepts two balances and uses a function with pointers to swap them. Display the balances before and after swapping.	CO2, CO3	L3
PART – B TYPICAL OPEN-ENDED EXPERIMENTS			

1	A college library has a digital bookshelf system where each book is assigned a unique Book ID. The bookshelf is organized in ascending order of Book IDs. Develop a C Program to quickly find whether a book with a specific Book ID is available in the shelf.	CO2, CO3	L3
2	A sports teacher has recorded the scores of students in a 100-meter race. To prepare the result sheet, the teacher wants the scores arranged in descending order (from highest to lowest). Develop a C program to sort the scores.	CO2, CO3	L3
3	A small warehouse tracks how many units of different products are shipped from multiple branches. Another dataset shows how much revenue each product	CO2, CO3	L3
	generates per unit. Develop a C program which combines these datasets to calculate the total revenue generated by each branch.		
4	A basic mobile contact manager stores first and last names separately. For displaying full names in the contact list, you need to join them manually. Additionally, the system must check the length of each full name to ensure it fits the screen. Perform these operations by developing a C program without using built-in string functions.	CO2, CO3	L3
5	A currency exchange booth allows users to convert between two currencies. Before confirming the exchange, the system simulates a swap of the values to preview the result without actually changing the original data. In other cases, it updates the actual values. Develop a C program that implements both behaviours using Call by Value and Call by reference.	CO2, CO3	L3
6	A local library needs to store and display details of its books, including title, author, and year of publication. Design a structure that can hold these details and develop a C program to display a list of all books entered.	CO2, CO3	L3

Note:

1. The laboratory syllabus consists of PART-A and PART-B. While PART-A has 8 conventional experiments, PART-B has 6 typical open-ended experiments. The maximum marks for the laboratory course are 100.
2. Open-ended experiments are a type of laboratory activity where the outcome is not predetermined, and students are given the freedom to explore, design, and conduct the experiment based on the problem statements as per the concepts defined by the course coordinator. It encourages creativity, critical thinking, and inquiry-based learning.
3. Both PART-A and PART-B are considered for CIE and SEE.
4. Students have answer 1(one) question from PART-A and 1(one) question from PART-B.
 - a) The questions set for SEE shall be from among the experiments under PART-A. It is evaluated for 70 marks out of the maximum 100 marks.
 - b) The open-ended question set for SEE shall be any other open-ended question and not selected from the experiments under PART-A. It shall be evaluated for 30 marks.

For continuous internal evaluation, during the semester, classwork, the typical open-ended questions shall be from PART-B, and any other similar questions to enhance the skill of the students

8. Text Book:

- iii. C: The Complete Reference, Herbert Schildt, McGraw Hill, 4th Edition
- iv. A Structured Programming Approach in C, Hassan Afyouni, Behrouz A. Forouzan., Cengage, 4th Edition

9. References:

- i. The 'C' Programming Language, Brian W. Kernighan and Dennis M. Ritchie, Prentice Hall of India, 2nd Edition

10. Evaluation Methodology

a) Continuous Internal Evaluation (CIE) = 50 marks

Assessment	Actual Weightage in Marks	Final weightage in Marks
Continuous Lab Evaluation	10	10
Intermediate CIE	20	20
Final LAB CIE	40	20
Total		50

b) Semester End Examination (SEE) = 50 marks

Component	Marks
Program Writeup development and execution	10
Program Execution, Evaluation of output, debugging and correctness	30
Viva-voce	10
Total	50

Total = 100 marks

Grading consideration: 50% CIE + 50% SEE

DEPARTMENT OF SCIENCE & HUMANITIES

Course	Indian Constitution and Engineering Ethics		
Course Code	BICO26107/207		
Course Category	AEC (NCCM)		
Hours/Week (L: T: P)	1:0:0	No. of Credits	PP
Self-Study hours/semester	20		
CIE Marks	100	SEE Marks	-

1. Course Description:

Students gain knowledge about the struggles faced by national leaders in achieving freedom and drafting the Constitution; the significance of Fundamental Rights and Duties of Indian citizens; the functioning of the Union and State Governments; the electoral process; constitutional values; and the principles of professional and engineering ethics.

2. Prerequisites:

Students are expected to have a basic awareness of the Indian Constitution, democratic governance, Fundamental Rights and Duties, the Preamble, constitutional values, and the structure and functioning of the Union and State Governments, as acquired through school education.

3. Course Objectives:

- Understand the necessity, making, salient features, Preamble, and the role of the Constituent Assembly in the Indian Constitution.
- Explain the Fundamental Rights (FRs), Directive Principles of State Policy (DPSPs), and Fundamental Duties (FDs) and their significance in society.
- Understand the structure and functioning of the Union Executive, Parliament, and the role of the Supreme Court, judicial review, and judicial activism.
- Understand the State Executive, Election Commission, electoral process, constitutional amendments, and emergency provisions of the Indian Constitution.
- Explain the principles of professional and engineering ethics, ethical responsibilities, Intellectual Property Rights (IPRs), safety, reliability, and ethical decision-making in engineering practice.

4. Wks covered through this course –WK1, WK4 and WK7

5. Course Outcomes:

<i>Course Outcome</i>	<i>Description</i>	<i>Mapped POs/PSOs</i>	<i>Blooms Taxonomy Level</i>
C107.1/C207.1	Explain the necessity, making, Preamble, and salient features of the Indian Constitution.	PO6	L2

C107.2/C207.2	Distinguish between the Fundamental Rights, Directive Principles of State Policy (DPSPs), and Fundamental Duties (FDs), and interpret their significance in society.	PO6	L2
C107.3/C207.3	Understand the structure and functioning of the Union and State Governments, Parliament, Judiciary, electoral process, constitutional amendments, and emergency provisions.	PO6	L2
C107.4/C207.4	Discuss the principles of professional and engineering ethics, Intellectual Property Rights (IPRs), safety, and ethical responsibilities.	PO6	L2

6.CO-PO Articulation Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C107.1/C207.1	-	-	-	-	-	1	-	-	-	-	-
C107.2/C207.2	-	-	-	-	-	1	-	-	-	-	-
C107.3/C207.3	-	-	-	-	-	1	-	-	-	-	-
C107.4/C207.4	-	-	-	-	-	1	-	-	-	-	-

7. Modular Topics

Module 1	Hours
Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after the adoption of the Constitution. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly. The Preamble of Indian Constitution & Key concepts of the Preamble. Salient features of India Constitution.	3
Module 2	Hours
FR's, FD's and DPSP's: Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building.	3
Module 3	Hours
Union Executive: Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Important Parliamentary Terminologies, Court of India.	3
Module 4	Hours
State Executive & Elections, Amendments and Emergency Provisions: State Executive, Election Commission, Elections & Electoral Process.	3

Amendment to Constitution (How and Why) and Important Constitutional Amendments till today. Emergency Provisions.	
Module 5	Hours
Professional Ethics: Ethics and Values. Types of Ethics. Scope and Aims of Professional and Engineering Ethics. Positive and Negative Aspects of Engineering Ethics. Clash of Ethics and Conflicts of Interest. Impediments to Responsibility. Trust and Reliability in Engineering. Intellectual Property Rights (IPRs). Risks, Safety, and Liability in Engineering.	3

8. Text Books:

- “Constitution of India” (for Competitive Exams) - Published by Naidhruva Edutech Learning Solutions, Bengaluru. – 2022.
- “Engineering Ethics”, M. Govindarajan, S. Natarajan, V.S. Senthilkumar, Prentice – Hall, 2004.

9. References:

- 1.“Samvidhana Odu” - for Students & Youths by Justice HN Nagamohan Dhas, Sahayana, kerekon.
- 2.“Constitution of India, Professional Ethics and Human Rights” by Shubham
- 3.Singles, Charles E. Haries, and et al: published by Cengage Learning India, Latest Edition – 2019.
- 4.“Introduction to the Constitution of India”, (Students Edition.) by Durga Das Basu (DD Basu): Prentice –Hall, 2008.
- 5.“The Constitution of India” by Merunandan K B: published by Merugu Publication, Second Edition, Bengaluru.
- 6.M. Govindarajan, S. Natarajan & V. S. Senthil Kumar-Professional Ethics and Human Values

10. Evaluation Methodology

- a) Continuous Internal Evaluation (CIE) = 50 Marks
 - b) Alternative Assessment tool (AAT) = 50 Marks
- Total = 100 Marks

Evaluation structure

Assessment	Actual Weightage in Marks	Final Weightage in Marks
CIA 1	50	Reduced to 25
CIA 2	50	Reduced to 25
AAT 1	25	25
AAT 2	25	25
SEE	NIL	NIL
TOTAL		100

INNOVATION & DESIGN THINKING LAB

Course	Innovation & Design Thinking Lab		
Course Code	BIDTL26108		
Course Category	AEC/SDC		
Hours/Week (L:T:P)	0:0:2	No. Of Credits	01
Self-Study hours/Semester	15		
CIE Marks	50	SEE Marks	50

1. Course Description:

The **Innovation & Design Thinking Lab (IDTL)** is a multidisciplinary, project-based course that introduces students to the principles of design thinking, innovation, and human-centered problem solving. The course enables students to identify real-world societal and community challenges through empathy, observation, and stakeholder engagement. Students work collaboratively in multidisciplinary teams to generate creative ideas, develop prototypes, evaluate solutions, and refine them based on user feedback. The course also promotes sustainability, entrepreneurship, ethical practices, and effective teamwork, fostering an innovation-driven mindset required for solving contemporary engineering and societal problems.

2. Prerequisites:

The course presumes prior exposure to higher secondary-level Science and Mathematics, enabling students to understand fundamental scientific concepts, willingness to engage in creative thinking, teamwork, and experiential learning, interest in innovation, problem solving, and societal challenges. Knowledge of basic scientific practices and graphical data representation is advantageous. Such foundational preparation supports the achievement of course outcomes related to analytical thinking, application of scientific principles to solve real world problems for societal benefits.

3. Course Objectives:

- Develop empathy towards users by identifying and understanding real-world societal and community problems through observation and stakeholder interaction.
- Apply design thinking principles to define problems, generate innovative ideas, and develop user-centric and sustainable engineering solutions.
- Promote multidisciplinary collaboration by working effectively in diverse teams to design, prototype, and refine innovative products or processes.
- Foster creativity, entrepreneurship, and responsible innovation by evaluating solutions considering societal impact, sustainability, ethics, and feasibility.

4. Wks covered through this course – WK2, WK3, WK5, WK6, WK7, WK8

5. Course Outcomes: By the end of the course students will be able to

Course Outcome	Description	Mapped POs/PSOs	Blooms Taxonomy Level
C108.1	Identify and analyze societal or community problems through empathy, stakeholder interaction, and problem definition using design thinking methodologies.	PO1, PO2, PO6	L1, L2, L3
C108.2	Generate innovative, sustainable, and user-centric solutions by applying design thinking principles and multidisciplinary collaboration.	PO2, PO3, PO7, PO9	L1, L2, L3
C108.3	Develop, test, and refine prototypes using appropriate tools and technologies available in the Innovation/Makers Lab based on user feedback.	PO1, PO3, PO7, PO9	L1, L2, L3
C108.4	Present and justify innovative solutions through effective communication, teamwork, and social entrepreneurship considering sustainability and scalability.	PO7, PO8, PO9, PO11	L1, L2

6. CO-PO Articulation Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C108.1	2	3	-	-	-	2	-	-	-	-	-
C108.2		2	3	-		-	2	-	3	-	-
C108.3	1		2	-		-	2	-	2	-	-
C108.4		-	-	-		-	2	2	2	-	3

7. Modular Topics

Week 1-3: Orientation and Team Formation
Week -1&2: Introduction to Social Entrepreneurship, Innovation and Design Thinking Group discussion on What is Innovation vs Invention. Why Design Thinking is important. Brief about 5 stages: Empathize – Define – Ideate – Prototype – Test. Week -3: Innovation warm-up activities, forming interdisciplinary teams, Instructions about Next week activities
Week 4-6: Empathy and Field Exploration
Week-4-6: Field (any public places of student's interest Eg- Village, Government Office, Industry. R&D institute, NGO etc) visits, stakeholder interviews and interaction. Recording all interaction through handwritten in activity book prescribed by the University.
Week 7-9: Problem Definition

Week-7: Documentation, categorization and Group discussion on interactions and problems/challenges. Week-8&9: Problem framing using “How Might We” approach, Identification of social problems and user insights through affinity Clustering and Problem Tree. Mention of clearly defined challenge statements.

Week 10-13: Ideation Sprint

Week- 10: Brainstorming interactions and Mind Mapping. Development of Ideas, Week-11: Idea Filtering - Shortlist of creative, eco -friendly and feasible ideas. Selection of one Suitable IDEA for next process, Week 12-13: Designing/Structuring of Prototype model

Week 14-15: Final Presentation/Idea Pitch

Week14-15: Preparation of final prototype/model, documentation and presentation. Final team presentation and idea pitch before the evaluation panel.

8. Evaluation Methodology:

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

To qualify and become eligible to appear for SEE, in the CIE, a student must score at least 40% of 50 marks, i.e., 20 marks.

To pass the SEE, a student must score at least 35% of 50 marks, i.e., 18 marks.

Notwithstanding the above, a student is considered to have passed the course, provided the combined total of CIE and SEE is at least 40 out of 100 marks

Evaluation Structure

Assessment	Actual Weightage in Marks	Final weightage in Marks
CIE1	50	Avg. of 2 CIEs
CIE2	50	
SEE	100	50
TOTAL		100
Grading consideration		50% CIE + 50% SEE

INTERDISCIPLINARY PROJECT BASED LEARNING

1. Course Description:

Course	Interdisciplinary Project Based Learning		
Course Code	BPRJ26208		
Course Category	AEC/SDC		
Hours/Week (L: T:P:S)	0:0:0:2	No. Of Credits	01
Self-Study hours/Semester	15		
CIE Marks	50	SEE Marks	50

The Interdisciplinary Project Work provides students with experiential learning opportunities through multidisciplinary projects addressing engineering, industrial, or societal challenges. Students identify problems, conduct background studies, design innovative solutions, develop and validate prototypes, and communicate project outcomes while working collaboratively in teams. The course emphasizes critical thinking, engineering design, sustainability, ethical practices, project management, and lifelong learning. It encourages the integration of knowledge from multiple disciplines to develop practical and socially relevant engineering solutions.

2. Prerequisites:

Basic knowledge of science, mathematics, and engineering fundamentals acquired during the first semester. Ability to work collaboratively in multidisciplinary teams. Interest in applying engineering concepts to solve real-world problems through project-based learning.

3. Course Objectives:

- Apply fundamental engineering knowledge to identify and formulate interdisciplinary problems of societal and industrial relevance.
- Design and develop innovative solutions through systematic project planning, teamwork, and application of engineering principles.
- Develop problem-solving, critical thinking, and project execution skills by implementing, testing, and validating engineering solutions.
- Enhance professional competencies including teamwork, project management, ethical practices, sustainability, and lifelong learning through project-based experiences.

4. Wks covered through this course –WK2, WK3, WK4, WK5, WK6, WK8

5. Course Outcomes:

Course Outcome	Description	Mapped POs/PSOs	Blooms Taxonomy Level
C208.1	Identify and analyze interdisciplinary engineering problems	PO1, PO2	L1, L2, L3
C208.2	Design innovative, sustainable and interdisciplinary solutions	PO2, PO3, PO7, PO9	L1, L2, L3
C208.3	Develop, integrate, test and validate prototypes	PO1, PO3, PO7, PO9	L1, L2, L3
C208.4	Demonstrate project management, documentation and professional practices	PO8, PO9, PO11	L1, L2

6. CO-PO Articulation Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C208.1	2	3	-	-	-	-	-	-	-	-	-
C208.2	-	2	3	-	-	-	2	-	2	-	-
C208.3	1	-	2	-	-	-	1	-	3	-	-
C208.4	-	-	-	-	-	-	-	2	2	-	2

7. Modular Topics

Week - 1, 2 & 3: Introduction, Orientation, Team Formation and Literature Survey
Week -1&2: Introduction to interdisciplinary project-based learning, project examples and real-world applications. Team formation of 4–6 students and selection of broad theme areas. Problem identification/refinement using Mind Mapping, 5W1H and SCAMPER. Week 3: Literature survey through journals, patents, projects and case studies. Identification of user needs, existing solutions, limitations and interdisciplinary requirements.
Week- 4, 5 and 6: Problem Definition and Solution Ideation
Week-4&5: Refinement of problem statement, scope, constraints, objectives and expected outcomes. Generation of multiple solution concepts and evaluation of technical, economic, social and environmental feasibility. Week-6: Selection of the best concept using a decision matrix. Preparation of preliminary sketches, block diagrams/flowcharts and resource plan.
Week -7, 8 and 9: Project Planning and Prototype Development – Stage 1
Week-7: Work breakdown structure (task division). Timeline for development. Safety & ethical considerations. task allocation and subsystem design. Week-8&9: Development of individual subsystems/modules using relevant engineering knowledge, Initial testing and mentor/peer reviews.
Week 10,11&12: Integration, Prototyping stage 2 and Testing

Week-10: Integration of subsystems. Debugging & Troubleshooting. Iterative Improvement.
Week-11&12: Testing against project objectives & user requirements. Analysis and documentation of results, failures and limitations.

Week 13 & 14: Refinement & Pre-Final Review

Week-13&14: Refining prototype for performance, cost, usability and sustainability. Mentor/Peer review and incorporation of feedback. Preparation of final report, poster, presentation and demonstration materials.

Week 15: Final Demo and Social Pitch

Presentation of problem, solution, interdisciplinary contribution, results, impact, sustainability and future scope. Project pitching highlighting innovation, feasibility and societal/industrial relevance.

Evaluation Methodology:

- Continuous Internal Evaluation (CIE) = 50 marks
- Semester End Examination (SEE) = 50 marks
- Total = 100 marks

Evaluation Structure

Assessment	Actual Weightage in Marks	Final weightage in Marks
CIE	50	50
SEE	100	50
TOTAL		100
Grading consideration		50% CIE + 50% SEE



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DEPARTMENT OF SCIENCE AND HUMANITIES

Course	ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ (SAMSKRUTIKA KANNADA)		
Course Code	BKSK26109/209		
Course Category	HSMC		
Hours/Week (L: T: P)	1:0:0	No. of Credits	01
Self-Study hours/semester	30		
CIE Marks	50	SEE Marks	50

1. Course Description:

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯವು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ, ಸಂಸ್ಕೃತಿ ಹಾಗೂ ಕರ್ನಾಟಕದ ಸಾಂಸ್ಕೃತಿಕ ಪರಂಪರೆಯ ಬಗ್ಗೆ ಸಮಗ್ರ ಅರಿವು ಮೂಡಿಸುವ ಉದ್ದೇಶವನ್ನು ಹೊಂದಿದೆ. ಪಠ್ಯವು ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಮುಖ ಕೃತಿಗಳು, ಲೇಖಕರು, ಕವಿಗಳು ಹಾಗೂ ಜಾನಪದ ಪರಂಪರೆಯನ್ನು ಪರಿಚಯಿಸುವ ಮೂಲಕ ಭಾಷಾಕೌಶಲ್ಯ, ಸಂವಹನ ಸಾಮರ್ಥ್ಯ, ನೈತಿಕ ಮೌಲ್ಯಗಳು ಮತ್ತು ಸಾಮಾಜಿಕ ಹೊಣೆಗಾರಿಕೆಯನ್ನು ಬೆಳೆಸುತ್ತದೆ. ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯ ಬಗ್ಗೆ ಗೌರವ, ಸಾಂಸ್ಕೃತಿಕ ಅರಿವು ಮತ್ತು ಜೀವಮಾನವಿಡೀ ಕಲಿಕೆಯ ಮನೋಭಾವವನ್ನು ಬೆಳೆಸುವಂತೆ ರೂಪಿಸಲಾಗಿದೆ.

2. Prerequisites:

- ವಿದ್ಯಾರ್ಥಿಯು ಕನ್ನಡ ಭಾಷೆಯ ಮೂಲಭೂತ ಓದು, ಬರವಣಿಗೆ ಮತ್ತು ಗ್ರಹಿಕೆ ಕೌಶಲ್ಯವನ್ನು ಹೊಂದಿರಬೇಕು.
- ಕರ್ನಾಟಕದ ಸಂಸ್ಕೃತಿ, ಇತಿಹಾಸ ಹಾಗೂ ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಮೂಲಭೂತ ಅರಿವು ಇದ್ದರೆ ಪಠ್ಯವನ್ನು ಸುಲಭವಾಗಿ ಅರ್ಥಮಾಡಿಕೊಳ್ಳಬಹುದು.
- ಎಸ್.ಎಸ್.ಎಲ್.ಸಿ., ಪಿ.ಯು.ಸಿ ಹಂತದಲ್ಲಿ ಕನ್ನಡವನ್ನು ಅಭ್ಯಾಸ ಮಾಡಿರುವುದು ಅಪೇಕ್ಷಣೀಯ, ಏಕೆಂದರೆ ಈ ಪಠ್ಯವು ಕನ್ನಡವನ್ನು ಪೂರ್ವದಲ್ಲಿ ಕಲಿತ ವಿದ್ಯಾರ್ಥಿಗಳಿಗಾಗಿ ರೂಪಿಸಲಾಗಿದೆ.

3. Course Objectives:

- ವೃತ್ತಿಪರ ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
- ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಪರಿಚಯಿಸುವುದು.
- ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು.
- ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳು ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
- ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

4. Course Outcomes: By the end of the course students will be able to,

Course Outcome	Description Approved by AICTE	Mapped POs/PSOs	Blooms Taxonomy Level
C109.1/ C209.1	ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಕುರಿತು ಅರಿವು ಮೂಡಿರುತ್ತದೆ	PO9	L2
C109.2/ C209.2	ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ, ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಹೆಚ್ಚಿಸುತ್ತದೆ. ಮತ್ತು ಹೆಚ್ಚಿನ ಓದಿಗೆ ಜ್ಞಾನಕ್ಕೆ ಸ್ಪೂರ್ತಿ ಮೂಡುತ್ತದೆ.	PO9	L2
C109.3/ C209.3	ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ತಿಳಿದುಕೊಂಡು ನಾಡಿನ ಇನ್ನಿತರ ವ್ಯಕ್ತಿಗಳ ಬಗ್ಗೆ ತಿಳಿದುಕೊಳ್ಳಲು ಕೌತುಕ ಹೆಚ್ಚಾಗುತ್ತದೆ.	PO9	L2
C109.4/ C209.4	ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.	PO9	L2

5. CO-PO Articulation Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C109.1/C209.1	-	-	-	-	-	-	-	-	1	-	-
C109.2/C209.2	-	-	-	-	-	-	-	-	1	-	-
C109.3/C209.3	-	-	-	-	-	-	-	-	1	-	-
C109.4/C209.4	-	-	-	-	-	-	-	-	1	-	-

6. Modular Topics

ಘಟಕ ೧ ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಮತ್ತು ಭಾಷೆ ಕುರಿತಾದ ಲೇಖನಗಳು:	Hours
1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ - ಹಂಪ ನಾಗರಾಜಯ್ಯ 2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ: ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ - ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ 3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ್ ಮತ್ತು ಪ್ರೊ.ವಿ. ಕೇಶವಮೂರ್ತಿ	3
ಘಟಕ ೨ ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ	Hours
4. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ, ಜೇಡರ ದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ 5. ಕೀರ್ತನೆಗಳು : ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ - ಪುರಂದರದಾಸರು 6. ತತ್ವಪದಗಳು : ಸಾವಿ ಕೊಡಗಳ ಸುಟ್ಟು - ಶಿಶುನಾಳ ಶರೀಫ	3
ಘಟಕ ೩ ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ	Hours
7. ಡಿ.ವಿ.ಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಆಯ್ದ ಕೆಲವು ಭಾಗಗಳು 8. ಕುರುಡು ಕಾಂಚಾಣ : ದ.ರಾ.ಬೇಂದ್ರೆ 9. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು	3
ಘಟಕ ೪ ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ	Hours
10. ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ: ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ - ಎ. ಎನ್. ಮೂರ್ತಿರಾವ್ 11. ಕರಕುಶಲ ಕಲರಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ	3
ಘಟಕ ೫ ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ	Hours
12. ಯುಗಾದಿ: ವಸುಧೇಂದ್ರ 13. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ.	3

7. Text Book:

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ - ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ 2020ರಿಂದ ಕನ್ನಡ ಮಾತೃಭಾಷೆ

ಯು ಇಂಜಿನಿಯರಿಂಗ್ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಕಡ್ಡಾಯವಾಗಿ ನಿಗದಿಪಡಿಸಿದ ಪಠ್ಯಪುಸ್ತಕ.
೧. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ- ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ, ಸಂ- ಡಾ. ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ.

8. References:

1. ಭಾಷಾಂತರದ ಸಾಂಸ್ಕೃತಿಕ ನೆಲೆಗಳು, ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ (ಸಂ), ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ, 1999.
2. ಆಡಳಿತ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕ, ಪ್ರಸಾರಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ 2019.

. Evaluation Methodology

- a) Continuous Internal Evaluation (CIE) = 50 marks
 - b) Semester End Examination (SEE) = 50 marks
- Total = 100 marks

Evaluation Structure

Assessment	Actual Weightage in Marks	Final weightage in Marks
CIE -1	50	(Average of 2 CIE + Assignment) 50
CIE-2	50	
Assignment (AAT)	20	
Semester End Examination	50	50
Total		100

Course	ಬಳಕೆ ಕನ್ನಡ (Balake Kannada)		
Course Code	BKBK26109/209		
Course Category	HSMC		
Hours/Week (L: T: P)	1:0:0	No. of Credits	01
Self-Study hours/semester	30		
CIE Marks	50	SEE Marks	50

1. Course Description:

“ಬಳಕೆ ಕನ್ನಡ” ಪಠ್ಯವು ಕನ್ನಡ ಭಾಷೆಯನ್ನು ದೈನಂದಿನ ಜೀವನದಲ್ಲಿ ಪರಿಣಾಮಕಾರಿಯಾಗಿ ಬಳಸುವ ಕೌಶಲ್ಯಗಳನ್ನು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಕಲಿಸುವ ಉದ್ದೇಶ ಹೊಂದಿದೆ. ಈ ಪಠ್ಯದಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯ ಮೂಲ ವ್ಯಾಕರಣ, ಸಂಭಾಷಣಾ ಕೌಶಲ್ಯ, ಶಿಷ್ಟ ಹಾಗೂ ಸರಿಯಾದ ಮಾತುಕತೆ, ಓದು, ಬರವಣಿಗೆ ಮತ್ತು ಆಲಿಸುವ ಕೌಶಲ್ಯಗಳ ಅಭ್ಯಾಸಕ್ಕೆ ಆದ್ಯತೆ ನೀಡಲಾಗಿದೆ.

2. Prerequisites:

- ಕನ್ನಡ ಭಾಷೆಯ ಕುರಿತು ಮೂಲಭೂತ ಆಸಕ್ತಿ.
 - ದೈನಂದಿನ ಸಂವಹನ ಕೌಶಲ್ಯಗಳನ್ನು ಕಲಿಯುವ ಮನೋಭಾವ.
- ಯಾವುದೇ ವಿಶೇಷ ಪೂರ್ವ ಜ್ಞಾನ ಅಗತ್ಯವಿಲ್ಲ.
- ಕನ್ನಡವನ್ನು ಪ್ರಾರಂಭಿಕ ಹಂತದಲ್ಲಿ ಕಲಿಯುವ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಸೂಕ್ತವಾದ ಪಠ್ಯಕ್ರಮ.
 - ಎಸ್.ಎಸ್. ಎಲ್ಸಿ ಪಿ.ಯು.ಸಿ ಹಂತದವರೆಗೂ ಕನ್ನಡವನ್ನು ಅಭ್ಯಾಸ ಮಾಡದೇ ಇರುವ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ (ಕನ್ನಡೇತರ ವಿದ್ಯಾರ್ಥಿಗಳು) ಏಕೆಂದರೆ ಈ ಪಠ್ಯವು ಕನ್ನಡವನ್ನು ಪೂರ್ವದಲ್ಲಿ ಕಲಿಯದೇ ಇರುವ ವಿದ್ಯಾರ್ಥಿಗಳಿಗಾಗಿ ರೂಪಿಸಲಾಗಿದೆ.

3. Course Objectives:

- To Create the awareness regarding the necessity of learning local language for comfortable and healthy life.
- To enable learners to Listen and understand the Kannada properly.
- To speak, read and write Kannada language as per requirement.
- To train the learners for correct state and its language, literature and General information about this state.

4. Course Outcomes: By the end of the course students will be able to,

Course Outcome	Description	Mapped POs/PSOs	Blooms Taxonomy Level

C109.1/ C209.1	ಕನ್ನಡ ಭಾಷೆಯ ಮಹತ್ವ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಕುರಿತು ಅರಿವು ಮೂಡಿಸಿಕೊಳ್ಳುವರು.	PO9	L2
C109.2/ C209.2	ಕನ್ನಡ ಭಾಷೆಯಲ್ಲಿ ಮೂಲಭೂತ ಶ್ರವಣ, ವಾಚನ ಮತ್ತು ಬರವಣಿಗೆಯ ಕೌಶಲ್ಯಗಳನ್ನು ಸಂವಹನಕ್ಕಾಗಿ ಕಲಿತು ದೈನಂದಿನ ಜೀವನದಲ್ಲಿ ಮತ್ತು ಸಂವಹನದಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಬಳಸುವ ಸಾಮರ್ಥ್ಯವನ್ನು ಹೊಂದುವರು.	PO9	L2
C109.3/ C209.3	ಶಿಷ್ಟ ಸಂಭಾಷಣೆಯನ್ನು ನಡೆಸುವ ಸಾಮರ್ಥ್ಯವನ್ನು ಅಭಿವೃದ್ಧಿಪಡಿಸಿಕೊಳ್ಳುವರು.	PO9	L2
C109.4/ C209.4	ಕ್ರಿಯಾಪದ ರೂಪಗಳು ಮತ್ತು ಪದಸಂಪತ್ತನ್ನು ದೈನಂದಿನ ಬಳಕೆಯಲ್ಲಿ ಅನ್ವಯಿಸುವ ಸಾಮರ್ಥ್ಯವನ್ನು ಅನ್ವಯಿಸುವ ಸಾಮರ್ಥ್ಯವನ್ನು ಹೊಂದುವರು.	PO9	L2

5. CO-PO Articulation Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C109.1/C209.1	-	-	-	-	-	-	-	-	1	-	-
C109.2/C209.2	-	-	-	-	-	-	-	-	1	-	-
C109.3/C209.3	-	-	-	-	-	-	-	-	1	-	-
C109.4/C209.4	-	-	-	-	-	-	-	-	1	-	-

6. Modular Topics

Module – 1	Hours
1. Introduction, Necessity of learning a local language. Methods to learn the Kannada language. 2. Easy learning of the Kannada language: A few tips. Hints for correct and polite conservation, Listening and speaking activities, Key to Transcription. 3. ವೈಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯಸೂಚಕ/ಸಂಬಂಧಿತ ಸರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು. Personal pronouns, possessive Forms, Interrogative words.	3
Module – 2	Hours
4. ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು – possessive forms of nouns, dubitive question and Relative nouns 5. ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣಬಣ್ಣ ವಿಶೇಷಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು Qualitative, Quantitative and Colour Adjectives Predictive Forms, Locative Case	3
Module - 3	Hours
6. ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು – Dative Cases and Numerals 7. ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು – Ordinal numerals and Plural markers 8. ನ್ಯೂನ/ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು & ವರ್ಣ ಗುಣವಾಚಕಗಳು – Defective/Negative Verbs & Colour Adjectives	3
Module - 4	Hours
9. ಅಪ್ಪಣೆ / ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತ್ತು ಒತ್ತಾಯ ಅರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು – Permission, Commands, encouraging and Urging words (Imperative words and sentences)	3

10. ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು – Accusative Cases and Potential Forms used in General Communication	
11. “ಇರು ಮತ್ತು ಇರಲ್ಲ” ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾ ಪದಗಳು – Helping Verbs “iru and iralla”, Corresponding Future and Negation Verbs.	
12. ಹೋಲಿಕೆ (ತರತಮ್ಯ) ಸಂಬಂಧ ಸೂಚಕ, ವಸ್ತು ಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ- Comparative, Relationships, Identification and Negation words.	
Module - 5	Hours
13. ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು – Different types of Tense and Verbs	
14. ದ್.ತ್, - ತು, ಇತ್ತು, ಆಲಿ, ಅಲ್ಲ, ಗ್, ಕ್, ಇದೆ, ಕ್ರಿಯಾ ಪ್ರತ್ಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲ ವಾಕ್ಯ ರಚನೆ – Formation of past, Future and present Tense with verbs forms	
15. ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು Kannada words in Conversation.	3

7. Text Book:

1. ಬಳಕೆ ಕನ್ನಡ – ಡಾ. ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ್, ಪ್ರಕಟಣೆ.

8. References:

1. ಮಾತಾಡುವ ಕನ್ನಡ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್, ಬೆಂಗಳೂರು. ಕನ್ನಡ ಭಾಷಾ ಕೈಪಿಡಿ ಸಂಗಮೇಶ್ ಸವದತ್ತಿ ಮಠ, ರೂಪರಶ್ಮಿ ಪ್ರಕಾಶನ, ಗುಲಬರ್ಗಾ, ೧೯೯೫.
2. ಕನ್ನಡ ಕಲಿ ಪಠ್ಯಪುಸ್ತಕ – ಲಿಂಗದೇವರು ಹಳೆಮನೆ, ಪ್ರಸಾರಾಂಗ, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.

9. Evaluation Methodology

- a) Continuous Internal Evaluation (CIE) = 50 marks
 - b) Semester End Examination (SEE) = 50 marks
- Total = 100 marks

Evaluation Structure

Assessment	Actual Weightage in Marks	Final weightage in Marks
CIE -1	50	(Average of 2 CIE + Assignment) 50
CIE-2	50	
Assignment (AAT)	20	
Semester End Examination	50	50
Total		100