Scheme of Teaching and Examinations-2025
Outcome-Based Education (OBE) and Choice-Based Credit System (CBCS)
(Effective from the academic year 2025-26)

I Semester **(Chemistry Group)**

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC	1BMATx101	Applied Mathematics-I (Stream Specific)	Maths Dept	3	2	0		03	50	50	100	04
2	ASC(IC)	1BCHEx102	Applied Chemistry (Stream Specific)	CHE Dept	3	0	2		03	50	50	100	04
3	ETC	1BAIA103/ BETC105x	Introduction to AI and Applications	Any Dept	3	0	0		03	50	50	100	03
4	ESC	1BESC104x	Engineering Science Course I	Respective Engg Dept	3	0	0		03	50	50	100	03
5	PLC(IC)	1BPLC105x	Programming Language Course	CSE & allied Dept	3	0	2		03	50	50	100	04
6	AEC	1BENG106	Communication Skills	Humanities Dept	1	0	0		02	50	50	100	01
7	AEC (NCMC)	1BICO107	Indian Constitution & Engineering Ethics	Humanities Dept	1	0	0		--	100	--	100	PP
8	AEC/SDC	1BIDTL158	Innovation and Design Thinking Lab **(Project-based learning)**	Any Dept	0	0	2		02	50	50	100	01
	TOTAL				**17**	**02**	**07**		**20**	**450**	**350**	**800**	**20**
9	**AICTE Activity Points** (students have to earn **100** activity points between 01 to 08 semesters)				Compulsory requirement for the award of a degree								

ASC-Applied Science Course, **ESC**- Engineering Science Courses, **IC** – Integrated Course (Practical Course Integrated with Theory Course), **PLC(IC)**- Programming Language Course (Integrated Course), **AEC**- Ability Enhancement Course, **NCMC:** Non Credit Mandatory Course, **AEC/SDC**- Ability Enhancement Course/Skill Development course, **TD/PSB**- Teaching Department / Paper Setting Board, **S- (SAAE)-**Students' Academic Activity Engagement Hours, **CIE** –Continuous Internal Evaluation, **SEE**- Semester End Examination, **PP** : (Pass/Pass) is assigned to a noncredit course. "PP" represents pass in a 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

Credit Definition:	
1-hour Lecture **(L)** per week=**1Credit**	04-Credit courses are designed for 50 hours of Teaching-Learning sessions
2-hoursTutorial**(T)** per week=**1Credit**	04-Credit (IC) courses are designed for 40 hours' theory and 10-12 hours of practical sessions
2-hours Practical / Drawing (**P**) per week=**1Credit**	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 designed for 12 hours of Teaching-Learning sessions

Applied Mathematics-I					Applied Chemistry				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
1BMATC101	Differential Calculus and Linear Algebra: CV Stream	3	2	0	1BCHEC102	Applied Chemistry for Sustainable Structure & Material Design (CV)	3	0	2
1BMATM101	Differential Calculus and Linear Algebra: ME Stream	3	2	0	1BCHEM102	**Applied Chemistry for Advanced Metal Protection and Sustainable Energy Systems** (ME)	3	0	2
1BMATE101	Differential Calculus and Linear Algebra; EEE stream	3	2	0	1BCHEE102	**Applied Chemistry for Emerging Electronics and Futuristic Devices** (EEE, ECE)	3	0	2
1BMATS101	Calculus And Linear Algebra: CSE stream	3	2	0	1BCHES102	Applied Chemistry for Smart Systems (CSE)	3	0	2
Engineering Science Courses-I (ESC-I)					**Programming Language Courses (PLC)**				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
1BESC104A	Building Sciences & Mechanics	3	0	0	1BPLC105E	Introduction to C Programming (For none IT programmes)	3	0	0
1BESC104B	Introduction to Electrical Engineering	3	0	0	1BPLC105B	Python Programming (for CSE and allied programmes)	3	0	0
1BESC104C	Introduction to Electronics and Communication Engineering	3	0	0					
1BESC104D	Introduction to Mechanical Engineering	3	0	0					
1BESC104E	Essentials of Information Technology	3	0	0					

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/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.

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 subjects prescribed for their stream, viz. CV, ME, EEE or CSE, under the heading Mathematics-I and Mathematics-II.

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

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 stream should not select Introduction to Building Sciences but any other two. One course shall selected under ESC-I and another course under ESC-II. The two courses must be different from the other.

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

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, and 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 eligible for the award of the degree. The points to be earned is:

1. **Regular students** admitted to a 4-year degree program must earn **100 Activity Points**.
2. **Lateral entry students** (joining from the second year) must earn **75 Activity Points**.
3. **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, earning Activity Points is mandatory for the **award of the degree**, and the points earned will be reflected on the **eighth semester Grade Card**.

If a student completes all the semesters (eight or six) at the end of the programme but fails to earn the required Activity Points, the eighth-semester Grade Card will be withheld until the requirement is fulfilled. Also, the degree will be awarded only after the Grade Card has been released.

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

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) Agreecultural 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).

Scheme of Teaching and Examinations-2025
Outcome-Based Education(OBE) and Choice Based Credit System(CBCS)
(Effective from the academic year 2025-26)

II Semester (For the students who have studied the Chemistry group in I semester)

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC	1BMATx201	Applied Mathematics -II (Stream Specific)	Maths Dept	3	2	0		03	50	50	100	04
2	ASC(IC)	1BPHYx202	Applied Physics (Stream Specific)	PHY Dept	3	0	2		03	50	50	100	04
3	ESC	1BCEDx203	Computer-Aided Engineering Drawing (Stream Specific)	ME dept	2	0	2		03	50	50	100	03
4	ESC	1Bxxx204x	Engineering Science Course-II	Respective Engg Dept	3	0	0		03	50	50	100	03
5	PSC	1Bxxx205	Programme Specific Courses	Respective Engg Dept	3	0	0		03	50	50	100	03
6	AEC (NCMC)	1BSKS206	Soft Skills	Humanities Dept	1	0	0		--	100	---	100	PP
7	PSC/ESC	1Bxxxl207x	Program-Specific Course Lab	Respective dept	0	0	2		02	50	50	100	01
8	AEC/SDC	1BPRJ258	Interdisciplinary Project-Based Learning	Combination of Departments	0	0	0	02	02	50	50	100	01
9	HSMC	1BKSK209(BKSK107)/ 1BKBK209(BKBK107)	Samskrutika Kannada/ Balake Kannada	Humanities Dept	1	0	0		01	50	50	100	01
				TOTAL	**16**	**02**	**06**		**21**	**500**	**400**	**900**	**20**

ASC-Applied Science Course, **IC** – Integrated Course (Practical Course Integrated with Theory Course), **ESC**- Engineering Science Courses, **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 non credit 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 **HSMC**-Humanity, Social Science and management Course, **AEC/SDC**- Ability Enhancement Course/Skill Development course, **TD/PSB**- Teaching Department / Paper Setting Board, **CIE** –Continuous Internal Evaluation, **SEE**- Semester End Examination, **S- (SAAE)-**Students' Academic Activity Engagement Hours,

Applied Mathematics-II					Applied Physics				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
1BMATC201	Differential Calculus and Numerical Methods: CV stream	3	2	0	1BPHYC202	Physics for Sustainable Structural Systems (CV stream)	3	0	2
1BMATM201	Multivariable Calculus and Numerical Methods: ME stream	3	2	0	1BPHYM202	Physics of Materials (Mech stream)	3	0	2
1BMATE201	Calculus, Laplace Transform, and Numerical Techniques: EEE stream	3	2	0	1BPHEC202	Quantum Physics and Electronic Sensors (ECE stream)	3	0	2
1BMATS201	Numerical Methods: CSE Stream	3	2	0	1BPHEE202	Electrical Engineering Materials (EEE)	3	0	2
					1BPHYS202	Quantum Physics and Applications (CSE stream)	3	0	2
Programme Specific Courses (PSC)					**Programme Specific Courses Lab (PSCL)**				
1BCIV205	Engineering Mechanics	3	0	0	1BMEML207	Mechanics and Materials Lab	0	0	2
1BEME205	Elements of Mechanical Engineering	3	0	0	1BEMEL207	Elements of Mechanical Engineering Lab	0	0	2
1BBEE205	Basics of Electrical Engineering	3	0	0	1BBEEL207	Basic Electrical Lab	0	0	2
1BECE205	Fundamentals of Electronics & Communication Engineering	3	0	0	1BECEL207	Fundamentals of Electronics & Communication Engineering Lab	0	0	2
1BEIT205	Programming in C	3	0	0	1BPOPL207	C Programming Lab	0	0	2
1BEBT205	Elements of Biotechnology and Biomimetics	3	0	0	1BSSAL207	Soil Science and Agronomy Field Lab	0	0	2
1BSSA205	Principles of Soil Science and Agronomy	3	0	0	1BEBTL207	Elements of Biotechnology Lab	0	0	2
1BEAE205	Elements of Aeronautical Engineering	3	0	0	1BEAEL207	Elements of Aeronautical Engineering Lab	0	0	2
1BECHE205	Elements of Chemical Engineering	3	0	0	1BECHEL207	Elements of Chemical Engineering Lab	0	0	2
Engineering Science Courses-II (ESC-II)					**Computer-Aided Engineering Drawing**				
1BESC204A	Building Sciences & Mechanics	3	0	0	**Code**	**Title**	**L**	**T**	**P**
1BESC204B	Introduction to Electrical Engineering	3	0	0	1BCEDC203	Computer-Aided Engineering Drawing for CV Stream	2	0	2
1BESC204C	Introduction to Electronics & Communication Engineering	3	0	0	1BCEDM203	Computer-Aided Engineering Drawing for ME stream Engineering	2	0	2
1BESC204D	Introduction to Mechanical Engineering	3	0	0	1BCEDEC203	Computer-Aided Engineering Drawing for EEE stream	2	0	2
1BESC204E	Essentials of Information Technology	3	0	0	1BCEDEE203	Computer-Aided Engineering Drawing for EEE stream (Only for EEE Students)	2	0	2
					1BCEDS203	Computer-Aided Engineering Drawing for CSE stream	2	0	2

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

(i)Theory sessions will be conducted for 3 hours per week, while the practical sessions will be conducted for 2 hours per week.

(ii)Theory component shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).

(iii)The practical component will 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 a 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-I** and **Applied Physics courses** that are aligned to their program stream.

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 group 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)** group.
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**.**
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 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 stream.
For the course ***Interdisciplinary Project*** **(BPRJ259)**, 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.

Scheme of Teaching and Examinations (2025)
Outcome-Based Education (OBE)and Choice-Based Credit System (CBCS)
(Effective from the academic year 2025-26)

I Semester **(Physic Group)**

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC	1BMATx101	Applied Mathematics -I (Stream Specific)	Maths Dept	3	2	0		03	50	50	100	04
2	ASC(IC)	1BPHYx102	Applied Physics (Stream Specific)	PHY Dept	3	0	2		03	50	50	100	04
3	ESC	1BCEDx103	Computer-Aided Engineering Drawing (Stream Specific)	ME Dept	2	0	2		03	50	50	100	03
4	ESC	1BXXX104x	Engineering Science Courses-I	Respective Engg Dept	3	0	0		03	50	50	100	03
5	PSC	1Bxxx105	Programme Specific Course	Respective Engg dept	3	0	0		03	50	50	100	03
6	AEC (NCMC)	1BSKS106	Soft Skills	Humanities Dept	1	0	0		-	100	---	100	PP
7	PSC	1BxxxL107	Program-Specific Course Lab	Respective Engg Dept	0	0	2		02	50	50	100	01
8	AEC/SDC	1BIDTL158	Innovation and Design Thinking Lab **(Project-based learning)**	Respective Dept	0	0	2		02	50	50	100	01
9	HSMS	1BKSK109(BKSK107)/ 1BKBK109(BKBK107)	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, **HSMS**-Humanity, Social Science and management Course, **S- (SAAE)** Students' Academic Activity Engagement Hours, **CIE –**Continuous Internal Evaluation, **SEE-**Semester End Examination,

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

Applied Mathematics-I					Applied Physics				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
1BMATC101	Differential Calculus and Linear Algebra: CV Stream	3	2	0	1BPHYC102	Physics for Sustainable Structural Systems (CV stream)	3	0	2
1BMATM101	Differential Calculus and Linear Algebra: ME Stream	3	2	0	1BPHYM102	Physics of Materials (Mech stream)	3	0	2
1BMATE101	Differential Calculus and Linear Algebra: EEE stream	3	2	0	1BPHEC102	Quantum Physics and Electronics Sensors (EEE stream)	3	0	2
1BMATS101	Calculus and Linear Algebra: CSE Stream	3	2	0	1BPHEE102	Electrical Engineering Materials (EEE stream-only for EEE students)	3	0	2
					1BPHYS102	Quantum Physics and Applications (CSE stream)	3	0	2
Computer-Aided Engineering Drawing					**Engineering Science Courses-I(ESC-I)**				
1BCEDC103	Computer-Aided Engineering Drawing for CV Stream	2	0	2	1BESC104A	Building Sciences and Mechanics	3	0	0
1BCEDM103	Computer-Aided Engineering Drawing for ME stream	2	0	2	1BESC104B	Introduction to Electrical Engineering	3	0	0
1BCEADEC103	Computer-Aided Engineering Drawing for EEE stream	2	0	2	1BESC104C	Introduction to Electronics & Communication Engineering	3	0	0
1BCEADEE103	Computer-Aided Engineering Drawing for EEE stream(only for EEE students)	2	0	2	1BESC104D	Introduction to Mechanical Engineering	3	0	0
1BCEDS103	Computer-Aided Engineering Drawing for CSE stream				1BESC104E	Essentials of Information Technology	3	0	0
Programme Specific Courses (PSC)					**Program-Specific Course Lab (PSCL)**				
1BCIV105	Engineering Mechanics	3	0	0	1BMEML107	Mechanics and Materials Lab	0	0	2
1BBEE105	Basics of Electrical Engineering	3	0	0	1BBEEL107	Basic Electrical Lab	0	0	2
1BECE105	Fundamentals of Electronics & Communication Engineering	3	0	0	1BECEL107	Fundamentals of Electronics & Communication Engineering Lab	0	0	2
1BEME105	Elements of Mechanical Engineering	3	0	0	1BEMEL107	Elements of Mechanical Engineering Lab	0	0	2
1BEIT105	Programming in C	3	0	0	1BPOPL107	C Programming Lab	0	0	2
1BEBT105	Elements of Biotechnology and Biomimetics	3	0	0	1BEBTL107	Elements of Biotechnology Lab	0	0	2
1BSSA105	Principles of Soil Science and Agronomy	3	0	0	1BSSAL107	Soil Science and Agronomy Field Lab	0	0	2
1BEAE105	Elements of Aeronautica Engineering	3	0	0	1BEAEL107	Elements of Aeronautica Engineering Lab	0	0	2
1BECHE105	Elements of Chemical Engineering	3	0	0	1BECHEL107	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).

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 group 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) group.**

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 stream should not select Introduction to Building Sciences 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.

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).

Scheme of Teaching and Examinations (2025)
Outcome-Based Education (OBE)and Choice-Based Credit System (CBCS)
(Effective from the academic year 2025-26)

II Semester (For the students who have studied Physics group in I semester)

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC	1BMATx201	Applied Mathematics -II (Stream Specific)	Maths Dept	3	2	0		03	50	50	100	04
2	ASC(IC)	1BCHEx202	Applied Chemistry (Stream Specific)	CHE Dept	3	0	2		03	50	50	100	04
3	ETC	1BAIA203/ BETC205x	Introduction to AI and Applications	Any Dept	3	0	0		03	50	50	100	03
4	ESC	1BESC204x	Engineering Science Course-II	Respective Engg Dept	3	0	0		03	50	50	100	03
5	PLC(IC)	1BPLC205x	Programming Language Course	CSE & allied Dept	3	0	2		03	50	50	100	04
6	AEC	1BENG206	Communication Skills	Humanities Dept	1	0	0		02	50	50	100	01
7	AEC (NCMC)	1BICO207	Indian Constitution & Engineering Ethics	Humanities Dept	1	0	0		01	100	0	100	PP
8	AEC/SDC	1BPRJ258	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

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					Applied Chemistry				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
1BMATC201	Differential Calculus and Numerical Methods: CV Stream	3	2	0	1BCHEC202	Applied Chemistry for Sustainable Structure & Material Design (CV)	3	0	2
1BMATM201	Multivariable Calculus and Numerical Methods: ME Stream	3	2	0	1BCHEM202	**Applied Chemistry for Advanced Metal Protection and Sustainable Energy Systems** (ME)	3	0	2
1BMATE201	Calculus, Laplace Transform And Numerical Techniques: EEE stream	3	2	0	1BCHEE202	**Applied Chemistry for Emerging Electronics and Futuristic Devices** (EEE, ECE)	3	0	2
1BMATS201	Numerical Methods: CSE Stream	3	2	0	1BCHES202	Applied Chemistry for Smart Systems (CSE)	3	0	2
Engineering Sciences Courses II(ESC-II)					**Programming Language Courses (PLC)**				
1BESC204A	Building Sciences & Mechanics	3	0	0	1BPLC205E	Introduction to C Programming (for non-IT programmes)	3	0	2
1BESC204B	Introduction to Electrical Engineering	3	0	0	1BPLC205B	Python Programming (For CSE and allied programmes)	3	0	2
1BESC204C	Introduction to Electronics & Communication Engineering	3	0	0					
1BESC204D	Introduction to Mechanical Engineering	3	0	0					
1BESC204E	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 stream.

For the course ***Interdisciplinary Project*** **(BPRJ259)**, 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.

Differential Calculus and Linear Algebra		Semester	1
Course Code	**1BMATC101**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40Hours Theory + 20Hours Tutorials	Total Marks	100
Credits	4 Credits	Exam Hours	3 Hours
Examination type (SEE)	**Theory**		

Course Outcomes (Course Skill Set)

CO1: Apply foundational concepts of calculus and differential equations to analyze geometric properties of curves, solve first and higher-order ordinary differential equations, and model physical phenomena in science and engineering.

CO2: Apply the principles of linear algebra to solve systems of linear equations, determine eigenvalues and eigenvectors, and analyze real-world problems such as traffic flow.

CO3: Demonstrate the applications of civil engineering and allied engineering science using modern ICT tools.

Module-1: Polar Curves and Curvature (8 Hours Theory + 4 Hours Tutorials)

Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves. Pedal equations. Curvature and radius of curvature - Cartesian, parametric, polar and pedal forms.

Textbook-1: Chapter- 4.7-4.11

Module-2: Series Expansion, Indeterminate Forms and Multivariable Calculus (8Hours Theory) + (4Hours Tutorials)

Statement and problems on Taylor's and Maclaurin's series expansion for one variable. Indeterminate forms - L'Hospital's rule. Partial differentiation, total derivative - differentiation of composite functions, Jacobian, Maxima and minima for the function of two variables.

Textbook-1: Chapter- 4.4-5.11

Module-3: Ordinary Differential Equations of First Order (8Hours Theory) + (4Hours Tutorials)

Linear and Bernoulli's differential equation. 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** $\frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$**.** Orthogonal trajectories**,** Law of natural growth and decay**.**

Textbook-1: Chapter- 11.9-11.12

Module-4: Ordinary Differential Equations of Higher Order (8Hours Theory) + (4Hours Tutorials)

Higher-order linear ordinary differential equations with constant coefficients, homogeneous and non-homogeneous equations (e^{ax}, sin(ax+b), cos(ax+b), x^n only), Method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations. Applications: Solving governing differential equations of Mass Spring.

Textbook-1: Chapter-13.1-13.8

Module-5: Linear Algebra (8Hours Theory) + (4Hours Tutorials)

Elementary row transformation of a matrix, Rank of a matrix. Consistency and Solution of system of linear equations - Gauss-elimination method and approximate solution by Gauss-Seidel method. Eigenvalues and Eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector. Applications: Traffic flow.

Textbook-1: Chapter-2.7-2.13, 28.6-28.9

Suggested Learning Resources: (Textbook/Reference Book):

Textbooks:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2021.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2018.
3. Gilbert Strang, Linear Algebra and its Applications, Cengage Publications, 4th Ed., 2022.

Reference books:

1. B.V. Ramana, Higher Engineering Mathematics, McGraw-Hill Education, 11th Ed., 2017
2. Srimanta Pal & Subodh C.Bhunia, Engineering Mathematics, Oxford University Press, 3rd Ed., 2016.
3. N. P. Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014.
5. David C Lay, Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018.

Web links and Video Lectures (e-Resources):

- http://academicearth.org/
- VTU e-Shikshana Program
- VTU EDUSAT Program
- https://nptel.ac.in/courses/111106135
- https://nptel.ac.in/courses/111105160
- https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/
- https://ocw.mit.edu/courses/18-02sc-multivariable-calculus-fall-2010/

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. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted, so that the delivered lessons shall develop students' theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self–study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students to group learning to improve their creative and analytical skills.
6. Show short-related video lectures in the following ways:

- As an introduction to new topics (pre-lecture activity).
- As a revision of topics (post-lecture activity).
- As additional examples (post-lecture activity).
- As an additional material of challenging topics (pre-and post-lecture activity).
- As a model solution of some exercises (post-lecture activity).

Assessment Structure:

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

The CIE Theory component consists of average of TWO IA tests for 25 marks and Continuous Comprehensive Assessments (CCA) for 25 marks.

- 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**.

Continuous Comprehensive Assessments (CCA):CCA will be conducted with a total of 25 marks. It is recommended to include a maximum of two learning activities aimed at enhancing the holistic development of students. These activities should align with course objectives and promote higher-order thinking and application-based learning.

Learning Activity-1: Tutorial: Practicing problems -Average of two objective type assessments for 15 marks each -GATE-based Aptitude Test **.**

Learning Activity-2: Choose either lab activity or seminar for 10 marks

Lab activity: Execute the following lab exercises with the aid of any modern technological tool (Matlab/ Mathematica/ Scilab/ Python/ Maxima, etc).

Seminars: The students have to present applications of mathematics related to syllabus as a group maximum of five members**.**

List of Lab activities:

1) 2D plots for Cartesian and polar curves,
2) Finding angle between polar curves,
3) Finding Radius of curvature,
4) Expansion of Taylor's and Maclaurin's series,
5) Finding partial derivatives and Jacobian,
6) Solution of first order and higher order ordinary differential equations,
7) Plotting solutions of ODE,
8) Finding rank, reduced echelon form, solving system of linear equations using Gauss elimination method,
9) Solving system of linear equations using Gauss-Seidel method,
10) Determine Eigenvalues and Eigenvectors.

Rubrics for Learning Activity (Based on the nature of learning activity, design the rubrics for each activity):

Activity-1	Superior (13-15)	Good (10-12)	Fair (7-9)	Needs Improvement (4-6)	Unacceptable (0-3)
Performance Indicator- 1 (CO-1/PO -1, PO-12, Mapping)	Demonstrates complete understanding of the topic	Shows good understanding with minor errors	some key points are missing	Shows little understanding	Very poor performance
Performance Indicator-2 (CO-2/PO-1/ PO-12, Mapping)	creatively to solve problems	Participates regularly but may need occasional prompting	Demonstrates partial understanding	major misconceptions present	Inadequate performance
Activity-2	9-10	7-8	5-6	3-4	1-2
Performance Indicator-3 (CO-3/PO-5 PO-12, Mapping)	perform tasks independently	Applies knowledge correctly	limited creativity.	Unable to apply knowledge appropriately.	Identical performance

Suggested Learning Activities may include (but are not limited to):

- Course Project
- Case Study Presentation
- Programming Assignment
- Tool/Software Exploration
- Literature Review
- Open Book Test (preferably at RBL4 and RBL5 levels)
- GATE-based Aptitude Test
- Assignment (at RBL3, RBL4, or RBL5 levels)
- Any other relevant and innovative academic activity
- Use of MOOCs and Online Platforms

Suggested Innovative Delivery Methods may include (but are not limited to):

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching
- Role Play

Differential Calculus and Numerical Methods		Semester	2
Course Code	**1BMATC201**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40Hours Theory + 20Hours Tutorials	Total Marks	100
Credits	4 Credits	Exam Hours	3 Hours
Examination type (SEE)	**Theory**		

Course outcome (Course Skill Set)

CO1: Apply the concepts of integral calculus, partial differential equations, and vector calculus to model and solve problems in engineering applications such as area, volume, heat conduction, and field analysis.

CO2: Apply appropriate numerical methods to find approximate solutions of algebraic, transcendental, and ordinary differential equations and to perform interpolation and numerical integration in engineering contexts.

CO3: Demonstrate the applications of civil engineering and allied engineering science using modern ICT tools.

Module-1: Integral Calculus **(8 Hours Theory + 4 Hours Tutorial)**

Multiple Integrals: Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates. Applications to find Area and Volume by double integral.

Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions.

Textbook -1. Chapter -7.1-7.16

Module-2: Partial Differential Equations (PDE) **(8 Hours Theory + 4 Hours Tutorial)**

Formation of PDEs by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivatives with respect to one independent variable only. Method of Separation of variables. Application of PDE: Derivation of one-dimensional heat equation and wave equation.

Module-3: Vector Calculus **(8 Hours Theory + 4 Hours Tutorial)**

Scalar and vector fields. Gradient, directional derivative, divergence and curl - physical interpretation, solenoidal vector fields, irrotational vector fields and scalar potential.

Vector Integration: Line integrals, work done by a force and flux, Statements of Green's theorem and Stoke's theorem, problems without verification.

Textbook -1. Chapter -8.4-8.14

Module-4: Numerical Methods - 1 (8 Hours Theory + 4 Hours Tutorial)

Solution of algebraic and transcendental equations: Regula-Falsi and Newton-Raphson methods, problems.

Interpolation: Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation formula.

Numerical integration: Trapezoidal, Simpson's $1/3^{rd}$ and $3/8^{th}$ rules.

Text Book -1. Chapter -28.1-28.2, 29.1-30.8

Module-5: Numerical Methods – 2 (8 Hours Theory + 4 Hours Tutorial)

Numerical solution of ordinary differential equations of first order and first degree: Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order, Milne's predictor-corrector method and Adams-Bashforth predictor-corrector method.

Textbook -1. Chapter -28.1-30.8

Suggested Learning Resources: (Textbook/Reference Book):

Textbooks:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44thEd., 2021.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10thEd., 2018.
3. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 8thEd., 2022.

Reference books:

1. B.V. Ramana, Higher Engineering Mathematics, McGraw-Hill Education, 11th Ed., 2017
2. Srimanta Pal & Subodh C.Bhunia, Engineering Mathematics, Oxford University Press, 3rd Ed., 2016.
3. N. P. Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014.
5. Steven V. Chapra and Raymond P. Canale, Applied Numerical Methods with Matlab for Engineers and Scientists, McGraw-Hill, 3rd Ed., 2011.
6. Richard L. Burden, Douglas J. Faires and A. M. Burden, Numerical Analysis, 10th Ed.,2010, Cengage Publishers.
7. S.S. Sastry, "Introductory Methods of Numerical Analysis", PHI Learning Private Limited, 5th Ed., 2012.

Web links and Video Lectures (e-Resources):

- http://academicearth.org/
- VTU e-Shikshana Program
- VTU EDUSAT Program
- https://nptel.ac.in/courses/111105160
- https://nptel.ac.in/courses/127106019
- https://ocw.mit.edu/courses/18-335j-introduction-to-numerical-methods-spring-2019/
- https://ocw.mit.edu/courses/18-330-introduction-to-numerical-analysis-spring-2012/pages/syllabus/

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. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self–study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students to group learning to improve their creative and analytical skills.
6. Show short-related video lectures in the following ways:
    - As an introduction to new topics (pre-lecture activity).
    - As a revision of topics (post-lecture activity).
    - As additional examples (post-lecture activity).
    - As an additional material of challenging topics (pre-and post-lecture activity).
    - As a model solution of some exercises (post-lecture activity).

Assessment Structure:

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

The CIE Theory component consists of average of TWO IA tests for 25 marks and Continuous Comprehensive Assessments (CCA) for 25 marks.

- 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**.

Continuous Comprehensive Assessments (CCA):

CCA will be conducted with a total of 25 marks. It is recommended to include a maximum of two learning activities aimed at enhancing the holistic development of students. These activities should align with course objectives and promote higher-order thinking and application-based learning.

Learning Activity-1: Tutorial: Practicing problems (Lab Activities/Surprise Test/ Seminar for 15 Marks) Execute the following lab exercises with the aid of any modern technological tool (Matlab/Mathematica/ Scilab/ Python/ Maxima, etc).

Learning Activity-2: Assignments (Marks-10).

List of Lab Activities:

1) Evaluate double integration and compute area and volume,
2) Evaluate triple integration and compute volume,
3) Finding gradient, divergence and curl,
4) Evaluate line integrals,
5) Regula Falsi and Newton Raphson method,
6) Interpolation,
7) Numerical integration,
8) Modified Euler's method,
9) Fourth order Runge -Kutta method,
10) Milne's method.

Rubrics for Learning Activity (Based on the nature of learning activity, design the rubrics for each activity):

Activity-1	**Superior (13-15)**	**Good (10-12)**	**Fair (7-9)**	**Needs Improvement (4-6)**	**Unacceptable (0-3)**
Performance Indicator- 1 (CO-1/PO -1, PO-12, Mapping)	**Demonstrates complete understanding of the topic**	**Shows good understanding with minor errors**	**some key points are missing**	**Shows little understanding**	**Very poor performance**
Performance Indicator-2 (CO-2/PO-1/ PO-12, Mapping)	**creatively to solve problems**	**Participates regularly but may need occasional prompting**	**Demonstrates partial understanding**	**major misconceptions present**	**Inadequate performance**
Activity-2	**9-10**	**7-8**	**5-6**	**3-4**	**1-2**
Performance Indicator-3 (CO-3/PO-5 PO-12, Mapping)	**perform tasks independently**	**Applies knowledge correctly**	**limited creativity.**	**Unable to apply knowledge appropriately.**	**Identical performance**

Suggested Learning Activities may include (but are not limited to):

- Course Project
- Case Study Presentation
- Programming Assignment

- Tool/Software Exploration
- Literature Review
- Open Book Test (preferably at RBL4 and RBL5 levels)
- GATE-based Aptitude Test
- Assignment (at RBL3, RBL4, or RBL5 levels)
- Any other relevant and innovative academic activity
- Use of MOOCs and Online Platforms

Suggested Innovative Delivery Methods may include (but are not limited to):

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching
- Role Play

Physics for Sustainable Structural Systems		Semester	I/II
Course Code	**1BPHYC102/202**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy (Theory and Lab hours)	40 hours theory and 10-12 hours of practical sessions	Total Marks	100
Credits	4	Exam Hours	3
Examination type (SEE)	Descriptive		

Course outcome (Course Skill Set)

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

1. Analyze the behavior of simple harmonic, damped, and forced oscillatory systems in mechanical and electrical contexts.
2. Evaluate wave propagation and structural response to dynamic loads such as earthquakes and blasts, incorporating modern mitigation strategies and smart materials.
3. Apply the principles of acoustics, radiometry, and photometry to design and evaluate systems for sound, light, and radiation measurements.
4. Demonstrate knowledge of non-destructive testing (NDT) techniques and select suitable methods for assessing material and structural integrity.
5. Assess the properties and applications of smart materials to enhance the performance and sustainability of engineering systems.

Module-1

Oscillations:

Simple harmonic motion (SHM), Differential equation for SHM, Springs: Stiffness factor and its physical significance, Series and Parallel combination of springs (Derivation), Types of springs and their applications. Theory of damped oscillations (Qualitative), Types of damping (Graphical Approach). Engineering applications of Damped oscillations, Theory of forced oscillations (Qualitative), Resonance, Sharpness of resonance. Resonance in LCR Circuits (Qualitative), Numerical Problems.

Text Books: 1,2, Reference Book : 1 Number of Hours:08

Module-2

Waves and their role in structural behavior:

Types of waves, Wave propagation in beams, rods, and slabs, Boundary effects, Wave dispersion, Damping in structures, Energy dissipation techniques in structures, Introduction to earthquakes, General characteristics, P-waves, S-waves, Love waves, and Rayleigh waves, Ground motion and structural response, Site effects and soil-structure interaction, Physics of earthquakes, Richter scale of measurement and earthquake-resistant measures, Tsunami (causes for tsunami, characteristics, adverse effects, risk reduction measures, engineeringstructures to withstand tsunami), Seismometer and Seismograph, Accelerometer

Text Book : 3, Reference Book : 4 Number of

Module-3

Acoustics, Radiometry and Photometry:

Acoustics: Introduction to Acoustics, Types of Acoustics, Reverberation and reverberation time, Absorption power and Absorption coefficient, Requisites for acoustics in auditorium, Sabine's formula (derivation), Measurement of absorption coefficient, Factors affecting the acoustics and remedial measures, Sound insulation and its measurements. Noise and its measurements, Impact of noise in multi-storied buildings.

Radiometry and Photometry: Radiation quantities, Spectral quantities, Relation between luminance and Radiant quantities, Reflectance and Transmittance, Photometry (cosine law and inverse square law).

Text Books :1,2, Reference Books :5, 7 Number of Hours:08

Module-4

Non Destructive Testing:

Introduction to NDT, Need for inspection, Types of inspection system, Benefits of NDT. Visual inspection, Liquid penetration test: Principles surface sreparation, Penetrant application and development, Eddy present testing: Inspection probes, Display methods, Ultrasonic testing: Principle, Generation of Ultrasonic, Probes, Radiography: Radiation sources, Attenuation of radiation, Shadow formation and distortion, Identification Markers, Numerical Problems.

Text Book : 4, Reference Book : 6 Number of Hours:08

Module-5

Smart Materials for Sustainable Structures:

Types of smart materials, Piezo, Magnetostrictive, Electrostrictive, Electro-rheological, Magneto-rheological, Shape memory alloys, Phase transformation in shape memory alloys, Overview of sensor technology, uses of sensors in intelligent structures, Classification of sensors, Temperature sensor, Vibration Sensor, Strain Gauge sensors, Basic concepts of structural health monitoring.

Text Book : 5, Reference Books :8,9 Number of Hours:08

PRACTICAL COMPONENTS OF IPCC

PART – A: FIXED SET OF EXPERIMENTS

1. Study of Forced Mechanical Oscillations and Resonance.
2. Study of the frequency response of Series & Parallel LCR circuits.
3. Determination of effective spring constant of the given springs in series and parallell combinations.
4. Kundt's Dust Tube – Determination of Velocity of Sound.
5. Verification of Inverse Square Law of Intensity of Light.
6. Study on types of damping (Pendulum and Damper / PHET)
7. Interpretation of graphs and images using XRD and SEM
8. Determination of wavelength of Ultrasonic using Ultrasonic Interferometer

9. Determination of Young's Modulus of the material of the given bar using Single Cantilever
10. STEP Interactive Physical Simulations. (Relevant to Theory part)
11. PHET Interactive Simulations (Relevant to Theory part)
12. Simple case study on acoustics (Auditorium, Cinema Hall, Etc)
13. Study of motion using spread Sheets
14. Data Analysis using Spread Sheets

(One Simulation Experiment is compulsory and must be conducted either in the Computer Laboratory for the entire batch or using dedicated systems within the Physics Laboratory as part of the experimental cycles.)

PART – B: OPEN ENDED EXPERIMENTS

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.

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

1. **Physics, Oscillations and Waves, Optics and Quantum Mechanics, H M Agarwal and R M Agarwal, Pearson, 2025**
1. **Engineering Physics, Satyendra Sharma and Jyotsna Sharma, Pearson, 2018.**
2. **Dynamics of Structures - Theory and Applications to Earthquake Engineering Anil K. Chopra, University of California at Berkeley, Fourth Edition. Prentice Hall**
3. **Non Destructive Testing - Hull, J. B., & John, V. (2015). Macmillan International Higher Education.**
4. **Smart Materials in Structural Health Monitoring, Control and Biomechanics, Suresh Bhalla (IIT Delhi), C. K. Soh, Yaowen Yang, Springer.**

Reference books / Manuals:

1. **Vibrations and Waves, A P French, MIT introductory Physics, 2003.**
2. **Engineering Physics by R. K. Gaur and S. L. Gupta, 2010 edition, Dhanpat Rai Publications Ltd., New Delhi-110002,**
3. **Engineering Physics, S L Kakani, Shubra Kakani, 3rd Edition, 2020, CBS Publishers and Distributers Pvt. Ltd., 2018.**
4. **Introduction to Seismology, Earthquakes, and Earth Structure, Stein, Seth, and Michael Wysession. Blackwell Publishing, 2003.**
5. **Photometry Radiometry and Measurements of Optical Losses, Micheal Bukshtab, Springer, 2nd edition.**
6. **Engineering Physics, S Mani Naidu, Pearson,2025**
7. **Building Science: Lighting and Accoustics, B. P. Singh and Devaraj Singh, Dhanpat Rai Publications (P) Ltc.,**
8. **Lagoudas, D. C. Shape Memory Alloys: Modeling and Engineering Applications. Springer, 2008. ISBN: 978-0-387-47684-1.**
9. **Holnicki-Szulc, J., & Rodellar, J. (Eds.). Smart Structures: Requirements and Potential Applications in Mechanical and Civil Engineering. Springer, 1999. ISBN: 978-0-7923-5612-7.**

Web links and Video Lectures (e-Resources):

1. **Simple Harmonic Motion (SHM) – NPTEL Lecture: https://www.youtube.com/watch?v=gnD8Se92hfk**
2. **Waves and Oscillations Playlist (SHM, damping, resonance, etc.)– NPTEL https://www.youtube.com/playlist?list=PLyqSpQzTE6M9X7oRXliYM8t0aaR_N0Csd**
3. **Simple Harmonic motion: https://www.youtube.com/watch?v=k2FvSzWeVxQ**
4. **Stress- strain curves :https://web.mit.edu/course/3/3.11/www/modules/ss.pdf**
5. **Stress curves: https://www.youtube.com/watch?v=f08Y39UiC-o**
6. **Acoustics: https://www.youtube.com/watch?v=fHBPvMDFyO8**
7. **INTRO – Fundamentals of Acoustics" (Lecture 1, NPTEL-NOC, IIT Madras) https://www.youtube.com/watch?pp=0gcJCfwAo7VqN5tD&v=rT9B44Q4Rko**
8. **Fundamentals of Acoustics playlist (multiple lectures on acoustic wave behavior, sound propagation, etc.) https://www.youtube.com/playlist?list=PLgMDNELGJ1CYWnDbcbVET5zCbN4aLEbZQ**
9. **Structural Health Monitoring of Composites (IIT Kanpur) – Full NPTEL Course: https://nptel.ac.in/courses/112104160**
10. **Course Introduction – Structural Health Monitoring (IITM – NPTEL): https://www.youtube.com/watch?v=It4aogUfQis**
11. **Smart Structures (IIT Kharagpur) – Covers smart materials, actuators, SHM: https://onlinecourses.nptel.ac.in/noc23_ae19/preview**

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. Self-Learning using AI Tools
2. Activity Based Learning
3. Gamification of Activities
4. Short Animations and Videos
5. Models and Working Models
6. Simulations and Interactive Simulations
7. Experiential Learning
8. Flipped Class Learning
9. Hybrid Learning
10. ICT Based Learning

Assessment Structure:

The assessment for each course is equally divided between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each component carrying **50% weightage** (i.e., 50 marks each).

The CIE Theory component will be 30 marks and CIE Practical component will be 20 marks.

The CIE Theory component consists of IA tests for 25 marks and Continuous Comprehensive Assessments (CCA) for 5 marks. The CIE Practical component for continuous assessments will be for 15 marks through rubrics and for lab tests will be for 5 marks.

- To qualify and become eligible to appear for SEE, in the **CIE theory component**, a student must score at least **40% of 30 marks**, i.e., **12 marks**.
- To qualify and become eligible to appear for SEE, in the **CIE Practical component**, a student must secure **a minimum of 40% of 20 marks**, i.e., **08 marks**.
- To pass the **SEE**, a student must secure **a minimum of 35% of 50 marks**, i.e., **18 marks**.
- A student is deemed to have **successfully completed the course** if the **combined total of CIE (and SEE is at least 40 out of 100 marks**.

Continuous Comprehensive Assessments (CCA):

CCA will be conducted for a total of 5 marks. It is recommended to include any one learning activity aimed at enhancing the holistic development of students. This activity should align with course objectives and promote higher-order thinking and application-based learning.

Learning Activity -1: (Marks- 5)

CIE Practical component:

The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report using a defined set of rubrics. Each experiment report can be evaluated for 30 marks. The summation of all the experiments marks to be scaled down to 15 marks.

The laboratory test (duration 03 hours) at the end of the last week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 5 marks. For laboratory test, the student is required to conduct one experiment each from both Part A and Part B.

Rubrics for Learning Activity (Based on the nature of learning activity, design the rubrics for each activity):

	Superior	Good	Fair	Needs Improvement	Unacceptable
Performance Indicator 1 (CO1 - PO1, PO2, PO4)	Accurately analyzes SHM, damping, and forced oscillations with real-world applications	Good conceptual understanding with minor errors	Basic understanding with limited application	Incomplete or partially correct responses	No meaningful understanding or application
Performance Indicator 2 (CO2 - PO1, PO2, PO3, PO4, PO5, PO11)	Thorough analysis of wave propagation and mitigation strategies	Good interpretation of dynamic responses and tools	Partial understanding of wave effects and materials	Weak analysis with limited justification	No application of wave dynamics or strategies

Performance Indicator 3 (CO3 - PO1, PO2, PO3, PO5, PO11)	Applies principles to design and evaluate acoustic, photometric, and radiometric systems accurately	Reasonable application with some inaccuracies	Limited design and evaluation with basic understanding	Minimal application with vague reasoning	No correct application of measurement principles
Performance Indicator 4 (CO4 - PO1, PO2, PO4, PO8, PO9)	Selects and justifies appropriate NDT techniques with clear reporting	Correct selection with minor interpretation issues	Basic understanding with partial justification	Poor method selection and unclear reporting	Incorrect or no NDT technique applied
Performance Indicator 5 (CO5 - PO1, PO4, PO5, PO7, PO11)	Effectively evaluates smart materials for sustainability and performance	Appropriate assessment with some technical gaps	General awareness without critical evaluation	Limited connection between material properties and applications	Fails to evaluate or identify smart material relevance

Rubrics for CIE – Continuous assessment:

	Superior	**Good**	**Fair**	**Needs Improvement**	**Unacceptable**
Performance Indicator 1 (CO1 - PO1, PO2, PO4)	Accurately analyzes SHM, damping, and forced oscillations with real-world applications	Good conceptual understanding with minor errors	Basic understanding with limited application	Incomplete or partially correct responses	No meaningful understanding or application
Performance Indicator 2 (CO2 - PO1, PO2, PO3, PO4, PO5, PO11)	Thorough analysis of wave propagation and mitigation strategies	Good interpretation of dynamic responses and tools	Partial understanding of wave effects and materials	Weak analysis with limited justification	No application of wave dynamics or strategies
Performance Indicator 3 (CO3 - PO1, PO2, PO3, PO5, PO11)	Applies principles to design and evaluate acoustic, photometric, and radiometric systems accurately	Reasonable application with some inaccuracies	Limited design and evaluation with basic understanding	Minimal application with vague reasoning	No correct application of measurement principles

Performance Indicator 4 (CO4 - PO1, PO2, PO4, PO11, PO10)	Selects and justifies appropriate NDT techniques with clear reporting	Correct selection with minor interpretation issues	Basic understanding with partial justification	Poor method selection and unclear reporting	Incorrect or no NDT technique applied
Performance Indicator 5 (CO5 - PO1, PO4, PO5, PO7, PO11)	Effectively evaluates smart materials for sustainability and performance	Appropriate assessment with some technical gaps	General awareness without critical evaluation	Limited connection between material properties and applications	Fails to evaluate or identify smart material relevance

Rubrics for SEE / CIE Test:

	Superior	**Good**	**Fair**	**Needs Improvement**	**Unacceptable**
Performance Indicator 1 (CO1 - PO1, PO2, PO4)	Accurately analyzes SHM, damping, and forced oscillations with real-world applications	Good conceptual understanding with minor errors	Basic understanding with limited application	Incomplete or partially correct responses	No meaningful understanding or application
Performance Indicator 2 (CO2 - PO1, PO2, PO3, PO4, PO5, PO11)	Thorough analysis of wave propagation and mitigation strategies	Good interpretation of dynamic responses and tools	Partial understanding of wave effects and materials	Weak analysis with limited justification	No application of wave dynamics or strategies
Performance Indicator 3 (CO3 - PO1, PO2, PO3, PO5, PO11)	Applies principles to design and evaluate acoustic, photometric, and radiometric systems accurately	Reasonable application with some inaccuracies	Limited design and evaluation with basic understanding	Minimal application with vague reasoning	No correct application of measurement principles
Performance Indicator 4 (CO4 - PO1, PO2, PO4, PO11)	Selects and justifies appropriate NDT techniques with clear reporting	Correct selection with minor interpretation issues	Basic understanding with partial justification	Poor method selection and unclear reporting	Incorrect or no NDT technique applied
Performance Indicator 5 (CO5 - PO1, PO4, PO5, PO7, PO11)	Effectively evaluates smart materials for sustainability and performance	Appropriate assessment with some technical gaps	General awareness without critical evaluation	Limited connection between material properties and applications	Fails to evaluate or identify smart material relevance

Suggested rubrics for Practical continuous assessment:

Performance Indicators	Excellent	Very Good	Good	Satisfactory
Fundamental Knowledge (4) (PO1)	The student has well depth knowledge of the topics related to the course (4)	Student has good knowledge of some of the topics related to course (3)	Student is capable of narrating the answer but not capable to show in depth knowledge (2)	Student has not understood the concepts clearly (1)
Design Of Experiment (5) (PO2 & PO3)	Student is capable of discussing more than one design for his/her problem statement and capable of proving the best suitable design with proper reason (5)	Student is capable of discussing few designs for his/her problem statement but not capable of selecting best (4)	Student is capable of discussing single design with its merits and de-merits (3)	Student is capable of explaining the design (1-2)
Implementation (8) (PO3 & PO8)	Student is capable of implementing the design with best suitable algorithm considering optimal solution. (7-8)	Student is capable of implementing the design with best suitable algorithm and should be capable of explaining it (5-6)	Student is capable of implementing the design with proper explanation. (3-4)	Student is capable of implementing the design. (1-2)
Result &Analysis (5) (PO4)	Student is able to run the program on various cases and compare the result with proper analysis. (5)	Student will be able to run the program for all the cases. (4)	Student will be able to run the code for few cases and analyze the output (3)	Student will be able to run the program but not able to analyze the output (1-2)
Demonstration (8) (PO9)	The lab record is well-organized, with clear sections (e.g., Introduction, Method, Results, Conclusion). Transitions between sections are smooth. (7-8)	The lab record is organized, with clear sections, but some sections are not well-defined. (5-6)	The lab record lacks clear organization or structure. Some sections are unclear or incomplete. (3-4)	The lab record is poorly organized, with missing or unclear sections. (1-2)

Note: Can add Engineering & IT tool usage based on the nature of the course

Suggested Learning Activities may include (but are not limited to):

- Course Project
- Case Study Presentation
- Programming Assignment
- Tool/Software Exploration

- Literature Review
- Open Book Test (preferably at RBL4 and RBL5 levels)
- GATE-based Aptitude Test
- Assignment (at RBL3, RBL4, or RBL5 levels)
- Any other relevant and innovative academic activity
- Use of MOOCs and Online Platforms

Suggested Innovative Delivery Methods may include (but are not limited to):

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching
- Role Play

Applied Chemistry for Sustainable Structures and Material Design		Semester	I/II
Course Code	**1BCHEC102/202**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy (Theory and Lab hours)	64	Total Marks	100
Credits	04	Exam Hours	03
Examination type (SEE)	Descriptive		

Course outcome (Course Skill Set)

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

CO1: Interpret the principles of chemistry related to engineering and technology.

CO2: Apply the knowledge of chemistry in solving engineering problems related to energy, materials, corrosion, analytical techniques and environmental contexts.

CO3: Analyze the appropriate chemical techniques suitable for engineering applications to reach the substantiated conclusions.

CO4: Apply the techniques of quantitative chemical analysis for engineering problems through experimental skills.

Module-1: Energy Systems and Green Fuels

Electrochemistry: Introduction, electrode potential, overview of Nerns't equation, concentration cell, numerical problems on concentration cells.

Energy systems: Introduction, classification of batteries, characteristics of battery-capacity, power density, cell balancing and cycle life. Construction, working, and applications of Lithium-ion battery. Fuel cell-definition, difference between battery and fuel cell, construction, working and applications of solid oxide fuel, silicon solar cell.

Green Fuels: Introduction, production of green hydrogen by photocatalytic water splitting by TiO_2 catalyst and its advantages.

Number of Hours: 08

Module-2: Materials for Structural Integrity

Polymer: Introduction, types of polymerization, synthesis, properties and engineering applications of chlorinated polyvinyl chloride (CPVC), polymethyl methacrylate (PMMA) and Kevlar fiber. Molecular weight of polymers: Number average and weight average molecular weight of polymers-numerical problems. Properties and industrial applications of carbon-based reinforced composites-graphene/carbon nanotubes as fillers.

Nanomaterials: Introduction, size dependent properties-surface area, catalytic property, thermal properties and antimicrobial activity. Concrete as composite material, composition of nano-concrete, synthesis of TiO_2 nanoparticles by sol-gel method for sensor applications.

Number of Hours: 08

Module-3: Conventional and Sustainable Construction Materials

Cement: Introduction, composition, manufacturing process of cement-wet process, process of setting and hardening of cement, special cements-composition, properties and applications.

Geopolymer concrete: Introduction, mechanism of geopolymerization and manufacturing process of geopolymer concrete.

Biopolymers: Introduction, synthesis, properties and applications of polylactic acid (PLA).

Photochromic coatings: Introduction, spiropyran as photochromic coating, working principle with chemical reactions and applications in constructions.

Piezoelectric cement composites: Introduction, piezoelectric materials in cement composites and its applications in civil engineering.

Number of Hours: 08

Module-4: Corrosion Science and Surface Protection

Metals and Alloys: Introduction, classification of metals: ferrous and non-ferrous. Composition, properties, applications of iron alloys - wrought iron, cast iron, pig iron and steel; aluminium alloys-Duralumin and Magnalumin.

Corrosion: Introduction, electrochemical theory of corrosion of steel in concrete, types of corrosion-differential metal corrosion, differential aeration corrosion-waterline and pitting corrosion and stress corrosion in civil structures. Corrosion control by galvanization and anodization. Corrosion penetration rate (CPR)-introduction and numerical problems.

Metal finishing: Introduction, technological importance of metal finishing, electroplating of chromium-decorative and hard chromium.

Number of Hours: 08

Module-5: Water Chemistry and Analytical Techniques

Water Chemistry: Introduction, significance of water quality parameters-pH, turbidity, chlorides, dissolved oxygen and alkalinity for environmental and construction applications. Hard water: Introduction, types, determination of total hardness by EDTA method and numerical problems. Waste water- introduction, determination of dissolved oxygen by Winkler's method, determination of chemical oxygen demand (COD) and numerical problems.

Analytical techniques: Potentiometric sensors: Principle, instrumentation and application in the estimation of iron in industrial effluents. Conductometric sensors: Principle, instrumentation and application in the determination of acid mixture in industrial effluents. Colorimetric sensor: Principle, instrumentation and application in the estimation of copper in brass alloy.

Number of Hours: 08

PRACTICAL COMPONENTS OF IPCC

LIST OF EXPERIMENTS

1. Estimation of total hardness of given water sample by EDTA method
2. Determination of chemical oxygen demand (COD) of industrial effluents
3. Estimation of percentage of CaO in cement by complexometric method
4. Estimation of iron in TMT bar by diphenyl amine indicator method
5. Determination of total alkalinity of given water sample
6. Estimation of acid mixture using conductometric sensor
7. Estimation of iron in rust sample using potentiometric sensor
8. Determination of pKa value of vinegar solution using pH sensor
9. Estimation of percentage of iron in steel industry effluent by using optical sensor
10. Determination of viscosity coefficient of green fuel using Ostwald's viscometer
11. Colorimetric determination of phenolic content in wastewater using smartphone
12. Interpretation of pka values of a week acid using origin software.

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

1. Textbook of Engineering Chemistry: S. S. Dara & S. S. Umare, S. Chand Publishing, ISBN:9788121903593

2. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi, 1st edition, 2012.

3. Engineering Chemistry: Jain & Jain, Publisher: Dhanpat Rai Publishing Company, ISBN: 978-935316118.

Reference books / Manuals:

1. Materials Science: S. K. Malik, Publisher: New Age International Publishers, ISBN: 978-8122418713.
2. Electrochemical Energy System: Dr. K. K. Rajeshwar (IIT Madras), Publisher: IIT Madras Open Courseware (Free PDF & videos), ISBN: N/A (Open Educational Resource).
3. Materials Science: S. K. Malik, Publisher: New Age International Publishers, ISBN: 978-8122418713.
4. "Applied Chemistry for Civil Engineering and Allied Branches" by Vrushabendra B, C Manasa and Srikantamurthy N, Publisher: Astitva Prakashan, ISBN: 9788119064465.

Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/113/104/113104021/
2. https://nptel.ac.in/courses/103/102/103102103/
3. https://www.youtube.com/watch?v=JvzH4QQOfSw
4. https://www.youtube.com/watch?v=1F9Vjae7k60
5. https://www.youtube.com/watch?v=xrsK9FUdvRE
6. https://www.youtube.com/watch?v=QNKPaZkWC9Q
7. https://www.youtube.com/watch?app=desktop&v=dwUVMVNSO2k
8. https://www.youtube.com/watch?v=MzTiZp01_qs
9. https://nptel.ac.in/courses/103/102/103102014/
10. https://www.youtube.com/watch?app=desktop&v=4Ur3eqGiLzc
11. https://www.youtube.com/watch?v=nU3a8dA0Oc4
12. https://www.youtube.com/watch?v=570mPvlxqPg
13. https://www.youtube.com/watch?v=1SOtM_Vq8es
14. https://www.youtube.com/watch?v=_Y2ePj3wr8M
15. https://www.youtube.com/watch?v=eT34ypRodB0

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. Self-Learning using AI Tools
2. Activity Based Learning
3. Models and Working Models
4. Simulations and Interactive Simulations
5. Experiential Learning
6. Flipped Class Learning
7. Hybrid Learning
8. ICT Based Learning

Assessment Structure: Please refer to VTU circular; https://vtu.ac.in/wp-content/uploads/2023/06/Revised-CIRCULAR-SEE-CIE-2022-scheme-1-1.pdf

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

To put it simply, evaluation techniques/methods are listed in the table for further understanding.

Course Assessment Plan (CAP) for Theory and Practical Integrated Courses (TPICs)	
	Continuous Internal Examinations (CIE)

Assessment	Max. Marks	*Component*	Max Marks	Min. Passing Marks	Evaluation details	Passing Marks
Theory	**25**	**IA**	**15**	**6**	**Average of the two IA each of 25 marks & scale down to 15**	**10/25**
		CIE-CCA	**10**	**4**	**Any two assessment (Assignment/Quiz/Seminar, etc)**	
Practical	**25**	**CIE**	**15**	**6**	**Record /Observation Book / Conduction & Evaluation**	**10/25**
		CIE Lab IA	**10**	**4**	**One test 50 marks & scale down to 10 Marks (DETAILS)**	
Finalization of Continuous Internal Examinations (CIE)						
Theory Marks + Lab Marks = 25 + 25 = 50 [Passing Marks (40%): 10 + 10 = 20/50]						**20/50**
Semester End Examinations (SEE)						
Theory	**50**	**Theory SEE conducted for 100 marks & then reduced to 50 Marks [Passing % = (35%)]**				**18/50**
Minimum marks for course completion (40 % in the Sum total of CIE and SEE)						**40/100**

CIE Practical component:

The CIE marks awarded in the case of the practical component shall be based on the continuous evaluation of the laboratory report using a defined set of rubrics. Each experiment report can be evaluated for 15 marks including compulsorily one open ended (PART B) experiment.

Rubrics for report evaluation:

Laboratory report/record	Conduction of experiments	Calculation/graph	Total
5 marks	5 marks	5 marks	15 marks

The average of all the experiments marks to be considered for CIE marks (15 marks).

The laboratory test (duration 02 hours) at the end of the last week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 10 marks. For laboratory test, the student is required to conduct one experiment either from volumetric or from instrumental (In Part-A only). Part B related open-ended experiment for project-based work (team/group wise) related to preparation, conduction and write up work only and not involved in the final CIE practical test.

Rubrics for Learning Activity (Based on the nature of learning activity, design the rubrics for each activity):

Performance Indicator (CO/PO Mapping)	Superior	Good	Fair	Needs Improvement	Unacceptable
Performance Indicator 1 (CO1 - PO1, PO2, PO3, PO4, PO6, PO11)	Demonstrates an in-depth understanding of corrosion mechanisms and expertly applies appropriate surface coating techniques for effective material protection.	Shows clear understanding of corrosion processes and applies relevant surface coating methods with reasonable effectiveness for material protection.	Provides a general understanding of corrosion mechanisms and applies basic surface coating techniques with limited accuracy.	Displays minimal understanding of corrosion and surface coatings; application is unclear or inappropriate for material protection.	Fails to demonstrate understanding of corrosion or surface coating techniques; no evidence of application in engineering systems.

Performance Indicator 2 (CO2 - PO1, PO2, PO3, PO6, PO11)	Demonstrates a thorough analysis of sustainable chemistry principles and critically evaluates various green energy fuels with strong justification.	Clearly analyses key sustainable chemistry concepts and evaluates green energy fuels with appropriate relevance	Shows a basic understanding of sustainable chemistry and provides a general evaluation of green fuels, but lacks depth.	Demonstrates minimal understanding of sustainable chemistry; evaluation of green fuels is weak.	Fails to analyse sustainable chemistry principles or evaluate green energy fuels.
Performance Indicator 3 (CO3 - PO1, PO2, PO3, PO11)	Thoroughly examines the synthesis methods and critically evaluates the applications of nanomaterials in advanced energy storage technologies.	Clearly examines common synthesis techniques and explains relevant applications of nanomaterials in energy storage technologies.	Demonstrates a basic understanding of nanomaterial synthesis and mentions general applications in energy storage.	Provides minimal explanation of synthesis, applications and shows limited understanding of nanomaterials in energy storage.	Fails to examine synthesis and application of nanomaterials.
Performance Indicator 4 (CO4 - PO1, PO2, PO3, PO11)	Effectively applies appropriate functional materials in diverse engineering applications with clear justification.	Correctly applies functional materials in relevant engineering contexts and shows reasonable understanding of their impact.	Shows basic application of functional materials with limited understanding.	Applies functional materials inaccurately and limited connection to performance.	Fails to apply functional materials appropriately and no understanding of their use in engineering.

Rubrics for CIE – Continuous assessment:

Performance Indicator (CO/PO Mapping)	Superior	Good	Fair	Needs Improvement	Unacceptable
Performance Indicator 1 (CO1 - PO1, PO2, PO3, PO4, PO6, PO11)	Demonstrates an in-depth understanding of corrosion mechanisms and expertly applies appropriate surface coating techniques for effective material protection.	Shows clear understanding of corrosion processes and applies relevant surface coating methods with reasonable effectiveness for material protection.	Provides a general understanding of corrosion mechanisms and applies basic surface coating techniques with limited accuracy.	Displays minimal understanding of corrosion and surface coatings; application is unclear or inappropriate for material protection.	Fails to demonstrate understanding of corrosion or surface coating techniques; no evidence of application in engineering systems.
Performance Indicator 2 (CO2 - PO1, PO2, PO3, PO6, PO11)	Demonstrates a thorough analysis of sustainable chemistry	Clearly analyses key sustainable chemistry concepts and evaluates green	Shows a basic understanding of sustainable chemistry and provides a	Demonstrates minimal understanding of sustainable chemistry;	Fails to analyse sustainable chemistry principles or

	principles and critically evaluates various green energy fuels with strong justification.	energy fuels with appropriate relevance	general evaluation of green fuels, but lacks depth.	evaluation of green fuels is weak.	evaluate green energy fuels.
Performance Indicator 3 (CO3 - PO1, PO2, PO3, PO11)	Thoroughly examines the synthesis methods and critically evaluates the applications of nanomaterials in advanced energy storage technologies.	Clearly examines common synthesis techniques and explains relevant applications of nanomaterials in energy storage technologies.	Demonstrates a basic understanding of nanomaterial synthesis and mentions general applications in energy storage.	Provides minimal explanation of synthesis, applications and shows limited understanding of nanomaterials in energy storage.	Fails to examine synthesis and application of nanomaterials.
Performance Indicator 4 (CO4 - PO1, PO2, PO3, PO11)	Effectively applies appropriate functional materials in diverse engineering applications with clear justification.	Correctly applies functional materials in relevant engineering contexts and shows reasonable understanding of their impact.	Shows basic application of functional materials with limited understanding.	Applies functional materials inaccurately and limited connection to performance.	Fails to apply functional materials appropriately and no understanding of their use in engineering.

Rubrics for SEE / CIE Test:

Performance Indicator (CO/PO Mapping)	Superior	Good	Fair	Needs Improvement	Unacceptable
Performance Indicator 1 (CO1 - PO1, PO2, PO3, PO4, PO6, PO11)	Demonstrates an in-depth understanding of corrosion mechanisms and expertly applies appropriate surface coating techniques for effective material protection.	Shows clear understanding of corrosion processes and applies relevant surface coating methods with reasonable effectiveness for material protection.	Provides a general understanding of corrosion mechanisms and applies basic surface coating techniques with limited accuracy.	Displays minimal understanding of corrosion and surface coatings; application is unclear or inappropriate for material protection.	Fails to demonstrate understanding of corrosion or surface coating techniques; no evidence of application in engineering systems.
Performance Indicator 2 (CO2 - PO1, PO2, PO3, PO6, PO11)	Demonstrates a thorough analysis of sustainable chemistry principles and critically evaluates various green	Clearly analyses key sustainable chemistry concepts and evaluates green energy fuels with appropriate relevance	Shows a basic understanding of sustainable chemistry and provides a general evaluation of green fuels, but lacks depth.	Demonstrates minimal understanding of sustainable chemistry; evaluation of green fuels is weak.	Fails to analyse sustainable chemistry principles or evaluate green energy fuels.

	energy fuels with strong justification.				
Performance Indicator 3 (CO3 - PO1, PO2, PO3, PO11)	Thoroughly examines the synthesis methods and critically evaluates the applications of nanomaterials in advanced energy storage technologies.	Clearly examines common synthesis techniques and explains relevant applications of nanomaterials in energy storage technologies.	Demonstrates a basic understanding of nanomaterial synthesis and mentions general applications in energy storage.	Provides minimal explanation of synthesis, applications and shows limited understanding of nanomaterials in energy storage.	Fails to examine synthesis and application of nanomaterials.
Performance Indicator 4 (CO4 - PO1, PO2, PO3, PO11)	Effectively applies appropriate functional materials in diverse engineering applications with clear justification.	Correctly applies functional materials in relevant engineering contexts and shows reasonable understanding of their impact.	Shows basic application of functional materials with limited understanding.	Applies functional materials inaccurately and limited connection to performance.	Fails to apply functional materials appropriately and no understanding of their use in engineering.

Suggested rubrics for Practical continuous assessment:

Performance Indicators	Excellent	Very Good	Good	Satisfactory
Fundamental Knowledge (4) (PO1)	The student has well depth knowledge of the topics related to the course (4)	Student has good knowledge of some of the topics related to course (3)	Student is capable of narrating the answer but not capable to show in depth knowledge(2)	Student has not understood the concepts clearly (1)
Design Of Experiment (5) (PO2 and PO3)	Student is capable of discussing more than one design for his/her problem statement and capable of proving the best suitable design with proper reason (5)	Student is capable of discussing few designs for his/her problem statement but not capable of selecting best(4)	Student is capable of discussing single design with its merits and de-merits(3)	Student is capable of explaining the design (1-2)
Implementation (8) (PO3 andPO8)	Student is capable of implementing the design with best suitable algorithm considering optimal solution. (7-8)	Student is capable of implementing the design with best suitable algorithm and should be capable of explaining it (5-6)	Student is capable of implementing the design with proper explanation.(3-4)	Student is capable of implementing the design. (1-2)
Result andAnalysis (5) (PO4)	Student is able to run the program on various cases and compare the result with proper analysis. (5)	Student will be able to run the program for all the cases.(4)	Student will be able to run the code for few cases and analyze the output(3)	Student will be able to run the program but not able to analyze the output(1-2)

Demonstration (8) (PO9)	The lab record is well-organized, with clear sections (e.g., Introduction, Method, Results, Conclusion). Transitions between sections are smooth. (7-8)	The lab record is organized, with clear sections, but some sections are not well-defined. (5-6)	The lab record lacks clear organization or structure. Some sections are unclear or incomplete. (3-4)	The lab record is poorly organized, with missing or unclear sections. (1-2)

Note: Can add Engineering and IT tool usage based on the nature of the course

Suggested Learning Activities may include (but are not limited to):

- Course Project
- Case Study Presentation
- Programming Assignment
- Tool/Software Exploration
- Literature Review
- Open Book Test (preferably at RBL4 and RBL5 levels)
- GATE-based Aptitude Test
- Assignment (at RBL3, RBL4, or RBL5 levels)
- Any other relevant and innovative academic activity
- Use of MOOCs and Online Platforms

Introduction to AI and Applications		Semester	I/II
Course Code	**1BAIA103/203**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	3	Exam Hours	3
Examination type (SEE)	Theory		

Course outcome (Course Skill Set)

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

CO1: Explain the concepts and types of artificial intelligence.
CO2: Illustrate basic machine learning methods for regression, classification and clustering.
CO3: Identify real-world applications across different disciplines.
CO4: Make use of prompt engineering techniques to interact with generative AI tools.
CO5: Outline recent trends in artificial intelligence and machine learning.

Module-1

Introduction to Artificial Intelligence: Artificial Intelligence, How Does AI Work?, Advantages and Disadvantages of Artificial Intelligence, History of Artificial Intelligence, Types of Artificial Intelligence, Weak AI, Strong AI, Reactive Machines, Limited Memory, Theory of Mind, Self-Awareness, Is Artificial Intelligence Same as Augmented Intelligence and Cognitive Computing, Machine Learning and Deep Learning.

Machine Intelligence: Defining Intelligence, Components of Intelligence, Differences Between Human and Machine Intelligence, Agent and Environment, Search, Uninformed Search Algorithms, Informed Search Algorithms: Pure Heuristic Search, Best-First Search Algorithm (Greedy Search).

Knowledge Representation: Introduction, Knowledge Representation, Knowledge-Based Agent, Types of Knowledge.

Textbook 1: Chapter 1 (1.1-1.5), Chapter 3 (3.1-3.7.2), Chapter 4 (4.1-4.4)

Number of Hours: 08

Module-2

Introduction to Prompt Engineering, Introduction to Prompt Engineering, The Evolution of Prompt Engineering, Types of Prompts, How Does Prompt Engineering Work?, Comprehending Prompt Engineering's Function in Communication, The Advantages of Prompt Engineering, The Future of LLM Communication.

Prompt Engineering Techniques for ChatGPT, Introduction to Prompt Engineering Techniques, Instructions Prompt Technique, Zero, One, and Few Shot Prompting, Self-Consistency Prompt.

Prompts for Creative Thinking: Introduction, Unlocking Imagination and Innovation.

Prompts for Effective Writing: Introduction, Igniting the Writing Process with Prompts.

Textbook 2: Chapters 1, 3, 4 & 5 Number of Hours: 08

Module-3

Machine Learning: Techniques in AI, Machine Learning Model, Regression Analysis in Machine Learning, Classification Techniques, Clustering Techniques, Naïve Bayes Classification, Neural Network, Support Vector Machine (SVM).

Textbook 1: Chapter 2 (2.1-2.8) Number of Hours: 08

Module-4

Trends in AI: AI and Ethical Concerns, AI as a Service (AIaaS), Recent trends in AI, Expert System, Internet of Things, Artificial Intelligence of Things (AIoT).

Textbook 1: Chapter 8 (8.1, 8.2, 8.4), Chapter 9 (9.1- 9.3) Number of Hours: 08

Module-5

Robotics, Robotics-an Application of AI, Drones Using AI, No Code AI, Low Code AI.

Textbook 1: Chapter 8 (8.3), Chapter 1 (1.7, 1.8, 1.10, 1.11)

Industrial Applications of AI: Application of AI in Healthcare, Application of AI in Finance, Application of AI in Retail, Application of AI in Agriculture, Application of AI in Education, Application of AI in Transportation, AI in Experimentation and Multi-disciplinary research.

Textbook 3: Chapter 3, Chapter 5 (5.1)

Number of Hours: 08

Suggested Learning Resources: (Textbook/ Reference Book/ Manuals):

Textbooks:

1. Reema Thareja, Artificial Intelligence: Beyond Classical AI, Pearson Education, 2023.
2. Ajantha Devi Vairamani and Anand Nayyar, Prompt Engineering: Empowering Communication, 1st Edition, CRC Press, Taylor & Francis Group, 2024. (DOI: https://doi.org/10.1201/9781032692319).
3. Saptarsi Goswami, Amit Kumar Das and Amlan Chakrabarti, "AI for Everyone – A Beginner's Handbook for Artificial Intelligence", Pearson, 2024.

Reference books / Manuals:

1. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach* (4th Edition), Pearson Education, 2023.
2. Elaine Rich, Kevin Knight, and Shivashankar B. Nair, *Artificial Intelligence*, McGraw Hill Education.
3. Tom Taulli, *Prompt Engineering for Generative AI: ChatGPT, LLMs, and Beyond*, Apress, Springer Nature.
4. Nilakshi Jain, Artificial Intelligence: Making A System Intelligent, First Edition, Wiley.

Web links and Video Lectures (e-Resources):

1. Elements of AI – *https://www.elementsofai.com*
2. CS50's Introduction to Artificial Intelligence with Python – Harvard *https://cs50.harvard.edu/ai/*
3. Google Machine Learning Crash Course – *https://developers.google.com/machine-learning/crash-course*
4. Learn Prompting (Open-Source Guide) – *https://learnprompting.org*
5. Google AI – Learn with Google AI *https://ai.google/education/*
6. Coursera – Machine Learning by Andrew Ng (Stanford University) *https://www.coursera.org/learn/machine-learning*
7. OpenAI Prompt Engineering Guide (for ChatGPT) *https://platform.openai.com/docs/guides/gpt-best-practices*
8. Prompt Engineering for Developers – DeepLearning.AI + OpenAI *https://www.deeplearning.ai/short-courses/chatgpt-prompt-engineering-for-developers/*
9. Ethics in AI – Google Responsible AI Practices *https://ai.google/responsibilities/responsible-ai-practices/*
10. Google Teachable Machine (Train AI models visually without code) https://teachablemachine.withgoogle.com

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.

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching

- Simulation and Virtual Labs
- ICT-Enabled Teaching
- Tool Demonstration

Assessment Structure:

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**.

Continuous Comprehensive Assessments (CCA):

CCA will be conducted for a total of 25 marks. It is recommended to include a maximum of two learning activities aimed at enhancing the holistic development of students. These activities should align with course outcomes and promote higher-order thinking and application-based learning.

Learning Activity -1: Practical Assignment on Creating Effective Prompts (Marks- 25)

INSTRUCTIONS:

1. Students must demonstrate the solutions to the course instructor and submit the record containing prompt creation (procedure), prompt execution and results with observations.
2. Course instructor must evaluate the student performance as per the rubrics.

Sl. No	Activity on Creating Effective Prompts
Note: To conduct the activity students can use any of the AI tools such as ChatGPT.	
1	**Basic Prompt writing:** Create two different prompts to ask an AI about the topic "Electricity." The first prompt should be vague, and the second prompt should be clear and specific. Compare the responses you get and describe which prompt gave a better answer and why.
2	**Zero-Shot Prompting**: Create a prompt that asks an AI to explain Ohm's Law without giving any example or background. Evaluate how well the AI explains the concept based on your prompt alone.
3	**One-Shot and Few-Shot Prompting:** Provide the AI with a single example of how to calculate the resistance in a simple circuit. Then write your own prompt asking the AI to solve a similar resistance calculation. After that, add two more examples to your prompt and observe any changes in the AI's response quality.
4	**Chain-of-Thought Prompting:** Develop a prompt that guides the AI step-by-step through calculating current flow in a circuit using Ohm's Law with resistors in series. Then, ask a final question for the AI to solve. Analyze how breaking down the reasoning steps impacts the accuracy of the answer.
5	**Prompt Refinement:** Start with an ambiguous prompt related to the "Water Cycle." Test the AI's response, note the confusion or errors, and then refine your prompt to make it clearer and more specific. Repeat this process twice and record how the AI's responses improve with each refinement. **Role-Based Prompting:** Create three prompts asking the AI to explain "Newton's Laws of Motion," each with a different role instruction: (a) as an expert engineer, (b) as a high school teacher, (c) as a beginner. Compare the tone, detail, and style of the responses.
6	**Creative Engineering Problem Prompts:** Craft a prompt that asks the AI to brainstorm ideas for designing a low-cost water purification system suitable for rural areas. Encourage creativity by adding phrases like **"limited resources"** and **"sustainability"**.

7	**Ethical Prompt Design Discussion:** Identify a biased prompt related to job descriptions (e.g. language with respect to a gender). Rewrite the prompt to remove bias and create a neutral, inclusive version. Explain why this revision is more ethical.
8	**Simulated Customer Support Chatbot:** Develop a prompt that instructs the AI to play the role of a technical support agent helping a customer troubleshoot a failure in an electronic circuit. Include instructions to keep the tone friendly and professional and to ask diagnostic questions.
9	**Multi-Language Prompting:** Develop a prompt that asks the AI to translate a simple engineering glossary (5 technical terms) from English to your native language. Then modify the prompt to request additional explanations of these terms in the translated language.
10	Review a curated set of different prompt types (e.g., for summarization, information extraction, paraphrasing, question answering) from a "Prompt Gallery." For each prompt type, match it with a real-world task (e.g., summarizing a lecture note, extracting names from a project report). Test at least three prompt templates on an AI tool or by role-play (students simulate being the AI), with varied wording. Record the outcomes and discuss which prompt (or template) was most effective for each task, and explain why you think it worked best. Reflect on how changing small parts of a prompt can alter model response quality, completeness, or accuracy.
11	Choose a real engineering challenge or societal problem relevant to your field (e.g., "Reducing plastic waste in campus cafeterias" or "Optimizing solar panel placement on campus rooftops"). Draft an initial prompt that asks an AI to propose practical solutions. Share the AI's (or peer's) answer in small groups and identify aspects that are missing, vague, or not actionable. Refine your prompt based on feedback (e.g., specify constraints, ask for step-by-step solutions, or require a list of pros and cons). Repeat the process one more time, refining again for further clarity or specificity. Document the entire prompt-refinement process and share the best solution generated, along with a brief analysis of how prompt improvements led to better responses.

Rubrics for Learning Activity (Creating Effective Prompts):

Component & CO-PO Mapping	Outstanding (5)	Exceeds Expectations (4)	Meets Expectations (3)	Needs Improvement (2)	Unsatisfactory (1)
Appropriate Use of Prompting Technique [CO4] [PO1, PO5]	Demonstrates precise and creative application of the intended prompting technique (e.g., zero-shot, few-shot, role-based) with full alignment to objectives.	Correctly applies the prompting technique with minor gaps or missed opportunities.	Uses the prompting technique, but with partial understanding or inconsistent application.	Limited understanding of the technique; incorrect or weak application.	No evidence of correct prompting technique use.
Analysis & Comparison of Responses [CO1] [PO2, PO4]	Provides thorough, insightful, and well-supported analysis of AI responses, comparisons highlight key strengths and weaknesses.	Provides clear analysis with relevant comparisons, though slightly less detailed.	Provides basic analysis with limited insight, comparisons are present but shallow.	Minimal analysis, comparisons are weak or incomplete.	No meaningful analysis or comparison.
Creativity & Problem-Solving [CO3, CO5] [PO3, PO11]	Demonstrates outstanding creativity and innovation in crafting prompts, especially for problem-solving or design tasks.	Demonstrates creativity and some innovation; solutions are practical.	Shows moderate creativity; prompts are functional but not innovative.	Minimal creativity; prompts are repetitive or unimaginative.	No creativity or problem-solving is evident.
Ethical Awareness & Inclusivity [CO-5] [PO7]	Identifies biases clearly and revises prompts to be fully ethical, inclusive, and culturally sensitive.	Identifies some biases and revises prompts to improve inclusivity.	Attempts bias identification, but revisions are incomplete or partly effective.	Minimal effort is made to address bias; inclusivity not fully considered.	No consideration of bias or ethics is used in prompts.
Clarity & Specificity of Prompts, Documentation & Reflection [CO1, CO4] [PO8, PO9, PO11]	Prompts are self-explanatory, specific, and well-structured for the intended activity; no ambiguity is present. Documentation is complete, well-organized, and includes deep reflection on improvements across iterations.	Prompts are clear and mostly specific; minor ambiguity is present. Documentation is complete with some reflection on prompt refinement.	Prompts are somewhat clear but could be more specific; moderate ambiguity. Documentation is present but lacks detail or depth in reflection.	Prompts are vague and lack clarity; high ambiguity. Incomplete documentation, reflection is minimal.	Prompts are unclear, incomplete, or irrelevant to the activity. No documentation or reflection provided as per schedule

Computer Aided Engineering Drawing for CV Stream		Semester	I/II
Course Code	1BCEDC103/203	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2 :0 :2 : 0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory (Conducted in batches similar to practical's)		

Course Outcomes

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

CO 1. Generate orthographic projections of points, lines, planes, and solids manually and with computer-aided tools.

CO 2. Develop the lateral surfaces of solids for real-world applications.

CO 3. Draw isometric views and convert isometric drawings to orthographic views.

CO 4. Create 3D models of basic building components.

Module-1

Introduction:

Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales.

Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves.

Orthographic Projections of Points, Lines and Planes:

Introduction to Orthographic projections, Orthographic projections of points in 1st and 3rd quadrants.

Orthographic projections of lines (Placed in First quadrant only as per BIS)

Orthographic projections of planes: triangular, square, rectangular, pentagonal, hexagonal and circular lamina (Placed in First quadrant only using change of position method).

Number of Hours: 08

Module-2

Orthographic Projection of Solids:

Orthographic projection of right regular solids (Resting on HP only and inclined to both the planes); Prisms, Pyramids, Cylinders & Cones.

Number of Hours: 08

Module-3

Section of Solids:

Introduction, Section planes, Sectional views: apparent shapes and true shapes, Sections of right regular prisms, pyramids, cylinders and cones resting with their base on HP. (Concepts only and No Problems for practice)

Development of Lateral Surfaces of Solids:

Development of lateral surfaces of right regular Prisms, Pyramids, Cylinders & Cones and their frustums and truncations. Problems on applications of development of lateral surfaces like funnels and trays.

Number of Hours: 08

Module-4

Isometric Views:

Introduction to Isometric views, Isometric projections, Isometric scale.
Isometric view of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres, Isometric view of combination of two simple solids, step block.

Conversion of simple isometric drawings into orthographic views: Problems on conversion of Isometric view of simple objects / engineering components into orthographic views.

Number of Hours: 08

Module-5

Building Components Drafting (For CIE Only):

Modeling Basic Building Components: foundations, columns, beams, slabs, walls, doors windows, staircase, assigning materials and rendering building components.
Drafting a 2D floor plan for a simple single-storey residential/commercial building, Converting the floor plan into 3D model with walls, openings, and roof structure.
Concept of building drawing

Number of Hours: 08

Suggested Learning Resources: (Textbook/ Reference Book/ Manuals):

Textbooks:

1. K. R. Gopalakrishna, & Sudhir Gopalakrishna: A Textbook of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2017
2. Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53rd Edition, Charotar Publishing House Pvt. Limited, 2023.

Reference books:

1. S. N. Lal and T. Madhusudhan, Engineering Visualisation, engage Learning India Pvt. Ltd.; First Edition, 2022
2. P.J. Shah, Computer Aided Engineering Drawing, S. Chand Publishing, 2021
3. M. B. Shah & B.C. Rana., Engineering Drawing, Pearson Education, Revised Edition, 2009
4. V.B. Sikka, A Course in Civil Engineering Drawing, 11th edition, S.K. Kataria & Sons, reprint 2024.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/112104172
- https://nptel.ac.in/courses/112102304
- https://nptel.ac.in/courses/112105294
- https://www.coursera.org/courses?query=3d%20modeling&utm
- https://www.gsourcedata.com/a-guide-to-the-world-of-civil-engineering-drawings-the-architectural-atlas/

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.

- Flipped Classroom
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching

Assessment Structure:

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**.

Continuous Internal Evaluation (CIE):
CIE shall be evaluated for 50 marks as detailed below:

The final CIE (50) = Class work marks (30) + Test marks (20)

- Class work marks should comprise of continuous evaluation of Drawing work of students as and when the Modules are covered based on the weightage as shown in the following table.

Module	**Max. Marks Weightage**	**Evaluation Weightage in marks**	
		Computer display and print out (a)	**Sketching (b)**
Module 1	20	15	05
Module 2	20	15	05
Module 3	20	15	05
Module 4	20	15	05
Module 5	20	15	05
Total	**100**	**75**	**25**
Consideration of Class work		Total of [(a) + (b)] = 100 **Scaled down to 30 Marks**	

- At least one **Test** covering all the modules is to be conducted for 100 marks and evaluation to be based as per SEE pattern, and the obtained marks is to be scaled down to **20 Marks.**

Semester End Examination (SEE):

- SEE shall be conducted in batches similar to practical's and evaluated for maximum of 100 Marks. Obtained marks shall be accounted for SEE final marks, reducing it by 50%.
- Two full questions shall be set from Modules 1, 2, 3 and 4. Students need to answer one full question from each module.
- Two full questions set from each Module shall cover the entire topic of the respective module.
- Question papers shall be provided by the University for each batch as per schedule.
- SEE shall be conducted by one Internal and one External Examiner.
- Evaluation shall be carried out jointly by both the examiners.
- The student may be awarded full marks, if he/she completes a solution on computer display without sketch.

- The weightage and distribution of marks for each Module is as shown in the following table:

Module	**Max. Marks Weightage**	**Evaluation Weightage in marks**	
		Computer display and print out (a)	**Sketching (b)**
Module 1	20	15	05
Module 2	30	25	05
Module 3	25	20	05
Module 4	25	20	05
Total	**100**	**80**	**20**
Consideration of SEE Marks		**Total of (a + b) ÷ 2 = Final SEE marks**	

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

"Jnana Sangama" Macche Belagavi - 590018

Innovation & Design Thinking Lab		Semester	1
Course Code:	**1BIDTL158**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P: S)	**0:0:2**	**SEE Marks**	**50**
Total Hours of Pedagogy	**2 (Full day of Saturday may be allotted)**	**Total Marks**	**100**
Credits	**1**	**Exam Hours**	
Examination type (SEE)	**Practical/Presentation/Seminar**		

Course Outcome (Course Skill Set) -

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

1. Empathize with community problems and define meaningful challenges.
2. Apply design thinking principles and multidisciplinary skills to develop user-centric solutions.
3. Build and test basic prototypes using tools available in the Atal Idea/Tinkering Lab or Makers Space.
4. Pitch socially relevant ideas with scalable models.
5. Collaborate effectively in diverse teams.

Week 1, 2 & 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 4–5: Empathy and Field Exploration

Week-4&5: 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 6, 7 and 8: Problem Definition

Week-6: Documentation, categorization and Group discussion on interactions and problems/challenges.

Week-7&8: 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 9, 10 &11: Ideation Sprint

Week-9&10: Presentation by teams on Defined Problems, Brainstorming interactions and Mind Mapping.

Week-10: Idea Filtering - Shortlist of creative, eco -friendly and feasible ideas. Selection of one Suitable IDEA for next process, Designing/Structuring of Prototype model.

Week 12, 13 &14: Rapid Prototyping using Atal Idea Lab/Makers Space
Week-12&13: Building low-fidelity and working models using tools like Arduino, 3D printers,: Digital fabrication, electronics kits and recycled materials **Week-14:** User testing, Feedback collection, Iteration - Observation Notes, Feedback Forms (Designing a business model for impact and scalability, if possible) Preparation of Draft of social venture plan
Week 15 &16: Final Demo and Social Pitch
Innovation showcase, Poster display, Project pitching to jury ***Presentation of the project with impact with assessment, prototype, and sustainability plan***
Teaching-Learning Process (Innovative Delivery Methods) **1.Activity Based Learning** **2.Group discussion, Presentations.** **3. one faculty member shall be assigned to group of 60 students or one division.** **4. Each group shall contain Min. 4 and Max. 6 students.** **5. Nature of the group shall be multidisciplinary. (Group shall be formed by selecting students from all branches)**

Assessment Structure:

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**.

Continuous Internal Evaluation (CIE) –

CIE Marks allocation Parameters for Social Entrepreneurship, Innovation & Design Thinking using Atal Idea/Tinkering Lab or Maker Space

CIE Parameters (50 Marks)

Sl. No.	CIE Component/Week	Marks	Description
1	Orientation Activities & Communication Skills	5	Participation in Week 1–3 orientation, communication and teamwork skill-building exercises.
2	Empathy & Field Exploration Documentation	10	Quality and completeness of field visit reflections, stakeholder interviews, and activity book.
3	Problem Definition and Framing	10	Clarity of challenge statements, use of "How Might We", Affinity Mapping, Problem Trees.
4	Ideation & Mind Mapping	5	Participation in brainstorming, mind mapping, idea filtering sessions.
5	Prototype Development & Iteration	10	Quality and creativity of prototype/model, user testing, feedback collection, iterations.
6	Final Presentation & Pitch	5	Project pitching, poster presentation, storytelling and scalability model.
7	Teamwork, Journal, and Engagement	5	Peer and mentor evaluation of participation, teamwork, journal updates.
8	Total CIE marks	50	Final CIE marks to be considered

***Minimum to Qualify for SEE: 20 out of 50 in CIE**

Semester End Examination (SEE) –

SEE to be conducted in batches where the students will exhibit their projects along with the presentation and Viva -voce. – 100 Marks

"SEE shall be conducted by one Internal and one External Examiner"

Sl. No.	Evaluation Parameter	Marks	Details
1	Prototype / Solution Demonstration	30	Working functionality, creativity, use of lab tools, relevance to the problem.
2	Final Presentation / Social Pitch	20	Clarity, storytelling, problem-solution fit, communication, visual aids.
3	Business Model or Sustainability Plan	10	Feasibility, cost-effectiveness, scalability, and alignment with SDGs.
4	Viva Voce	20	Individual understanding, contribution, tools used, learning outcomes.
5	Documentation Report / Portfolio	20	Project report, reflection, team activity log, stakeholder input summaries.

Submission Requirements:

- Handwritten activity book with CIE marks and Final project report (Typed or Handwritten).
- Final presentation ppt/pdf (hard and soft copy).
- Prototype or working model [physical or conceptual (shall be drawn/sketched clearly on card sheet paper)].
- Peer/team feedback and reflection entries (if applicable).

COMMUNICATION SKILLS		Semester	I / II
Course Code	**1BENG106/206**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	1:0:0	SEE Marks	50
Total Hours of Pedagogy	15 hours +15 hours	Total Marks	100
Credits	01	Exam Hours	02
Examination type (CIE+SEE)			

COURSE OUTCOMES

- **CO1:** Build essential verbal, non-verbal, and phonetic communication skills for clarity and effectiveness.
- **CO2:** Use interpersonal skills in group discussions, presentations, and professional interactions.
- **CO3:** Apply formal writing, email etiquette, and creative content development for employability.
- **CO4:** Communicate effectively in digital platforms, following netiquette and academic integrity.
- **CO5:** Prepare job applications, resumes, and perform confidently in interviews.

UNIT 1 COMMUNICATION SKILLS (3 Hours)

Glimpses of Essential English for Engineers (General Overview). 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.

Teaching Methodology	TBTL (Task-Based Teaching Learning) & Eclectic Approach
Language Lab	**Quiklrn.com**
Digital Tools	ALL 44 sounds of English in 75 minutes - https://www.youtube.com/watch?v=QxQUapA-2w4&t=51s. AI-based grammar and writing tools (e.g., Grammarly, ChatGPT, Quillbot) to analyze and classify parts of speech. AI-based pronunciation tools (Google Speech-to-Text) for real-time feedback
Reading Material	"**The Chimney Sweeper" by William Blake** Martin Luther King Jr's "I Have a Dream" Speech
Assessment Techniques and Tools	**Role Play**: Formal/informal scenarios, **Group Discussion (GD), Case Studies Analysis**: Identify barriers and suggest solutions, **Mini-Presentation**: Focused on proxemics. Observation Rubric (for body language, tone, time cues), (Sample Rubric, please refer the annexure), Video Recording + Self-evaluation Sheet.

UNIT 2 INTERPERSONAL SKILLS (3 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.

Teaching Methodology	TBTL (Task-Based Teaching Learning) & Eclectic Approach
Language Lab	**Quiklrn.com**
Digital Tools	Google Meet / Zoom + AI Transcription- Practice group discussions with live transcription. Grammarly - Highlights grammar issues with explanations. **Oxford Learner's Dictionaries** (https://www.oxfordlearnersdictionaries.com/) - Includes etymology, pronunciation, synonyms/antonyms.
Assessment Techniques and Tools	Group discussion performance (listening, turn-taking, clarity) Technical presentations (confidence, structure, clarity) Role plays (relevance, tone, spontaneity) Case Studies Oral communication rubric (clarity, relevance, tone, confidence, non-verbal cues), **Activity**: Read a short **interview of an achiever** (e.g., A. P. J. Abdul Kalam, Sudha Murthy) **LMS (Learning Management Systems)**: Moodle or Google Classroom for submissions and reflections. **Video Submissions**: Students submit videos of role plays or presentations for asynchronous review.

UNIT 3 ENGLISH FOR EMPLOYABILTY (3 Hours)

Writing: Formal 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).

Pedagogy	TBTL (Task-Based Teaching Learning) & Eclectic Approach
Language Lab	**Quiklrn.com**
Digital Tools	Grammarly – Check grammar, tone, spelling Canva – Free templates to create posters, ads, infographics Adobe Express – Visual storytelling and ad design
Assessment Techniques and Tools	**Paragraph Writing -** Descriptive, Argumentative, Expository, Short Story, Narrative - Paragraph rubric (structure, logic, vocabulary, grammar) Writing - **Tool**: Digital submission + rubric for content originality, reader engagement, clarity. **Speaking Skills -** Oral assessment rubric (intonation, clarity, accuracy) Email simulator (Google Forms/Canvas/Docs template)

UNIT 4 ENGLISH IN DIGITAL WORLD (3 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 behaviours – 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.

Pedagogy	TBTL (Task-Based Teaching Learning) & Eclectic Approach
Language Lab	**Quiklrn.com**
Digital Tools	Google Meet - Integrated with Gmail, free for students Google Classroom - Forum, assignments, comments
Assessment Techniques and Tools	Write a short essay (150–200 words) on the **problems and opportunities.** Evaluation rubric (structure, coherence, grammar). Grammar assessment rubric (before vs after comparison, understanding of corrections).

UNIT 5 APPLYING FOR JOBS (3 Hours)

Listening: TED Talks. **Speaking:** Mock Interview, Telephone Interviews. **Reading:** Reading a Job Interview- language used in formal professional settings, formal vs. informal tone, non-verbal communication cues, Statement of Purpose, Company Profile and Completing Comprehension Exercises **Writing:** Job Applications and Resumes **Grammar:** Conditional Clauses, Modal verbs **Vocabulary Development:** Technical Vocabulary, Purpose Statement.

Pedagogy **Language Lab**	TBTL (Task-Based Teaching Learning) & Eclectic Approach
Language Lab	**Quiklrn.com**
Assessment Techniques and Tools	Listening to professional talks, analyzing tone and structure - https://www.ted.com/talks Non-verbal cues in professional reading - https://www.youtube.com/c/Mindsight Grammar AI practice - https://quillbot.com/grammar-check
Assessment Techniques and Tools	TED Talk worksheet - Listening rubric (comprehension, inference, note-taking), Reading comprehension tests, Resume & Application rubric (content, layout, tone, language), Grammar MCQs / Editing worksheet, Scenario-based MCQs or roleplay, Vocabulary worksheet

Extra Reading

1. Kumar, A. R. (2008). *English for engineers and technologists*. Orient BlackSwan.

2. Raman, M., & Sharma, S. (2015). *Technical communication: Principles and practice* (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. Effective Technical Communication, 3e, By Ashraf M. Rizvi, Priyadarshi Patnaik, © 2024 | Published: September 12, 2024
5. Yadav, D. P. (2022). *A course in English pronunciation*. Notion Publications.

Learning Resources:

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

Other Digital Resources

- Google Docs + Voice Typing - https://docs.google.com
- LearnEnglish – https://learnenglish.britishcouncil.org/
- TakeIELTS - https://www.britishcouncil.in/exam/ielts
- British Council Apps - **bbcLearnEnglishonline Grammar**
  LearnEnglish Podcasts
  IELTS Word Power
  Bbclearningenglishgrammer online
  Sounds Right (Phonemic Chart)

CURRICULUM DESIGN

Pronunciation Phonology in the upper secondary English curriculum includes: diphthongs, consonants, consonant clusters, word stress, strong and weak forms of pronunciation, ellipsis, assimilation, linking, sentence stress, rhythm and intonation.

Vocabulary. Ther target vocabulary of around 600-800 vocabulary items at level 3. Upon completion of the unit, students must know around 2,500 vocabulary items.

Grammar Communicative competences at level 3 including relative clauses, conditional sentences (type 1 and 2), compound and complex sentences, simple present, present continuous, present perfect, past simple, past continuous, past perfect, future simple, future continuous, near future, conjunctions, modal verbs, phrasal verbs, passive voice, etc.

SPECIFIC OUTCOMES

Themes	Topics	Communicative Competences	Linguistic Knowledge
Our Academic Journey Our Technical Society Our Built and Natural Environment Our Future Innovations	Transition from school to engineering college Choosing an engineering discipline Student life and academic challenges Role of engineers in society Ethics in engineering Impact of technology on social structures Interdisciplinary collaboration Artificial intelligence and automation Emerging technologies in engineering Lifelong learning and professional development Entrepreneurship and start-ups in engineering The future of work in the tech-driven world	**Listening** Understand and identify the main points of dialogues, monologues of 330-350 words on familiar topics regularly encountered in life, work, school, etc., within the scope of the curriculum. Follow simple instructions such as recipes, how to use common utensils, etc. Listen and guess meanings (through the expressions and feelings of the speakers) in familiar monologues and conversations in everyday life Understand the main points of news programs, broadcasts, interviews, etc., on familiar topics which are clearly delivered in simple language, and with illustrative images.	**Pronunciation** Diphthongs Words with stress (specials cases) – Words without stress Sentence stress, assimilation, linking vowels with vowels Question intonation (consolidation and extension) Homophones **Vocabulary** Words related to themes and topics of higher proficiency. **Grammar** Present perfect (consolidation and extension) Past simple and past continuous Types on sentences: simple, compound and complex

Speaking

- Pronounce clearly and relatively accurately
- Words with or without stress, sentence stress, assimilation, and liaison.
- Speak and interact with fellow speakers about familiar topics, express personal views and exchange information about the topics covered in the curriculum.

Reading

- Read and comprehend the main points, specific contents of a text of 380-400 words on current and familiar topics.
- Read and understand the argument flow of texts, identify main conclusions in texts using clear language.
- Read to find and summarize short texts of everyday use such as simple letters, brochures, using words and structures from the original texts.

Writing

- Write simple connected and coherent texts of 280-300 words; write short reports based on suggestions, providing factual information and reasons for the recommendations made in the reports; collect short information from several sources and summarize it.
- Complete (write/fill) administrative forms such as resumes, letter of application for employment, etc.
- Write composition texts

Upon successful completion of the upper secondary English curriculum, students will be able to:

- Use English as a communication tool through the four skills of listening, speaking, reading and writing to meet basic and practical communication needs on familiar topics related to college, recreational activities, career, etc.
- Continue to formulate and develop basic knowledge of English, including pronunciation, vocabulary and grammar; and through English, have more extensive understanding of the landscape, people and culture of English-speaking countries and other countries in the world.
- Use English to improve the quality of learning other subjects in the general education curriculum.
- Use English for further education or immediate employment upon completion level 6.
- Use a variety of learning strategies to manage learning time, apply information technology in learning and self-learning, consolidate self-learning and self-assessment

methodology and take responsibility for learning outcomes, and form lifelong learning habits.

Mapping Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes*											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1									1	3		2
2										3		2
3										3		2
4									1	3		2
5									1	3		2

Course Assessment and Evaluation:

		What	To Whom	When/ Where (Frequency in the course)	Max Marks	Evidence Collected	Contributing to Course Outcomes
Direct Assessment	C I E	Internal assessment tests	Students	Two Tests (Average of the two will be computed)	25	Blue books/Answer Scripts	1 to 5
		Creative writing	Students	Assignment-1 (10) Assignment-2 (15)	15+10=25	Quiz Projects Presentations Assignment Questions and Answers	1 to 5
Indirect assessment Methods		Case Analysis	Students	-----	-----	-----	------
		Surprise Quiz		------	------	----	----
	S E E	Standard examination Students Feedback	Students	End of course (Answering 5 of 10 questions), 10 Case Studies 10 MCQs	30+10+10	Answer scripts Feedback Forms	1 to 5
		End of course Survey		End of course	-	Questionnaire	-

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's taxonomy) such as:

CIE and SEE Evaluation:

SL. No	Bloom's Category	Test 1	Test 2	Semester-End Examination
1	Remember	34%	34%	30%

2	Understand	55%	20%	30%
3	Apply	00%	23%	20%
4	Analyse	11%	00%	10%
5	Evaluate	00%	00%	00%
6	Create	00%	23%	10%

Course Assessment Methods:

- Continuous Assessment of Skills: Assignments/Quiz/Presentations/Projects
- Written Tests
- End Semester Examination

Sample Rubric for Presentation

Criteria	Excellent (2)	Good (1)	Needs Work (0)
Self-awareness	✓	✓	✓
Goal clarity	✓	✓	✓
Communication & delivery	✓	✓	✓
Insight into opportunities	✓	✓	✓
Realistic challenges	✓	✓	✓

Sample Rubric

Grammar & Writing Rubric (for Essays/Reports/Emails)

Criteria	Excellent (5)	Good (4)	Satisfactory (3)	Needs Improvement (1-2)
Clarity and Structure	Well-organized, coherent, clear transitions	Organized with minor lapses in clarity	Understandable but lacks coherence	Difficult to follow, lacks structure
Language Use	Professional, precise, varied vocabulary	Clear, mostly appropriate language	Some awkward phrasing or repetitive vocabulary	Frequent errors, unclear language
Grammar and Punctuation	Virtually no errors	Few minor errors	Several errors affecting readability	Multiple errors impacting readability
Relevance & Depth	Thorough, detailed analysis	Solid analysis with minor gaps	Basic analysis, lacks depth	

Model Question Paper
Course – Communication Skills

i) Answer the 10 marks MCQ compulsory questions from Part A. Each question carries one mark.
ii) Answer compulsory 10 marks case study questions Part B.
iii) Answer any five questions from Part C selecting one question from each unit. 6 marks each.

Q. No.		PART-A	CO's	LO	Marks
		Multiple choice questions. (Compulsory)			
1.		**Choose the correct option for the following.**	CO_{1-5}	LO_1	10X1=10
	a.	**What is the primary purpose of communication in engineering?** A) To entertain B) To inform and collaborate C) To confuse others D) To express personal opinions			
	b.	**Which of the following is considered a barrier to effective communication?** A) Clear articulation B) Technical jargon C) Active listening D) Open-ended questions			
	c.	**In terms of English pronunciation, which of the following is true for engineers?** A) Pronunciation is not important in technical communication. B) Clear pronunciation is essential for avoiding misunderstandings. C) Engineers should only focus on writing skills. D) Accents should be completely eliminated.			
	d.	**How many syllables are in the word "engineering"?** A) 2 B) 3 C) 4 D) 5			
	e.	**Which of the following prepositions correctly completes the sentence: "The report is due _____ Friday"?** A) in B) on C) at D) for.			
	f.	**What is the past tense of the verb "to communicate"?** A) Communicate B) Communicating C) Communicated D) Communicates			
	g.	**Which of the following is an example of mother tongue influence in English communication?** A) Using idiomatic expressions B) Mispronouncing words due to native language sounds C) Employing technical vocabulary correctly D) Using varied sentence structures			
	h.	**In reading comprehension, which skill is most important for engineers when reviewing technical documents?** A) Skimming for general ideas B) Memorizing all details C) Scanning for specific information D) Ignoring unfamiliar technical terms			
	i.	**Which of the following vocabulary words is most relevant to project management?** A) Ambiguous B) Deadline C) Casual D) Informal			
	j.	**When using tenses, which sentence is correct?** A) The engineer designs the project last year. B) The engineer design the project next year. C) The engineer will design the project next year. D) The engineer designed the project next year.			

Part – B (Co1-5) L3

Case Studies *(2 × 5 = 10 Marks)*
(Answer both the questions. Each carry 5 marks.)

Case Study 1 – Communication Barriers
You are working in a multinational company where your team includes members from different cultural backgrounds. During a meeting, some members misinterpret instructions due to differences in communication styles and accents.

- **Identify at least three barriers to communication in this scenario.**
- **Suggest three solutions to overcome them.**

Case Study 2 – Workplace Scenario
In a technical presentation, a student uses too many slides filled with text, speaks in a monotonous tone, and rarely makes eye contact with the audience.

- **Identify the issues with the presentation delivery.**
- **Suggest improvements for verbal and non-verbal communication.**

PART-C

Answer <u>ANY FIVE</u> questions selecting <u>ONE full</u> question from each unit. (6X5=30)

		UNIT – I			
1.		How can engineers ensure that their communication is considerate of the diverse backgrounds of their team members? Give two strategies you would implement.	CO1	LO_2	(6)
2.		How do interpersonal skills complement technical skills in the engineering field? Provide examples of how these skills can work together in a project.	CO1	LO_2	(6)
		UNIT – II			
3.		How does incorrect intonation impact the meaning of a sentence in technical discussions or job interviews? Illustrate with examples.	CO2	LO_2	(6)
4.		Discuss the role of intelligible pronunciation in making communication clearer. Identify English sounds that are often mispronounced by non-native.	CO2	LO_2	(6)
		UNIT – III			
5.		**Use the following idioms with their figurative meanings and construct workplace place -related sentences:**	CO3	LO6	(6)
		a. Hit the nail on the head b. Back to the drawing board c. In hot water d. Think outside the box e. A blessing in disguise f. Burn the midnight oil			
6.		**Complete the sentences by filling in the blanks with suitable <u>prepositions and articles</u>.** a. The team submitted the proposal _____ manager before the end of the day. b. She placed the confidential file _____desk in the conference room.	CO3	LO2	(6)

		c. Our office is located _____ corner of Main Street and Park Avenue. d. He arrived _____meeting room just a few minutes late. e. We will launch the new product _____second quarter of the financial year. f. There was an error _____final report, which needs immediate correction.			
		UNIT – IV			
7.		**Complete the sentences by forming the correct word (noun, verb, adjective, or adverb) from the word given in brackets**. a. The manager gave a very _____ presentation on the new project. *(inform)* b. His _____ in the final decision was minimal. *(involve)* c. The engineers worked _____ to meet the product launch deadline. *(efficient)* d. The software update led to a significant _____ in system performance. *(improve)* e. She handled the client's complaint with great _____. *(professional)* f. Innovation and creativity are key to _____ in a competitive market. *(succeed)*	CO4	LO2	(6)
8.		Fill in the blanks with the correct **tense of the verb** in brackets. a. By the time the meeting started, the manager _____ (prepare) all the necessary documents. b. I _____ (work) on this report since morning, and I still have two sections to complete. c. The team _____ (complete) the task before the deadline yesterday. d. While we _____ (discuss) the new project, the client walked in unexpectedly. e. She usually _____ (respond) to emails within an hour. f. If the supplier delivers on time, we _____ (be) ready for the launch next week.	CO4	LO2	(6)
		UNIT – V			
9.		Identify three common challenges engineers face during oral presentations and propose practical strategies to overcome them.	CO5	LO2	(6)
10.		How can voice modulation and body language enhance the effectiveness of a public speech in a technical seminar? Give examples.	CO5	LO2	(6)

Soft Skills	Semester	I/II	
Course Code	**1BSKS106/206**	**CIE Marks**	**100**
Teaching Hours/Week (L:T:P: S)	1:0:0	SEE Marks	--
Total Hours of Pedagogy	**Theory/Practical/Lab:** 15 Hours	Total Marks	100
Credits	PP	Exam Hours	--

COURSE OBJECTIVES

The competencies those are important for engineering students joining the digital age workforce or looking to become entrepreneurs are listed in 5 modules:

CO1: Apply social skills for clear communication, persuasion, self-awareness, and active listening.

CO2: Use emotional skills to build confidence, manage stress, and adapt to change.

CO3: Set ambitious goals, practice empathy, and apply creativity for problem-solving.

CO4: Demonstrate discipline, time management, and structured problem-solving.

CO5: Work in teams, negotiate, resolve conflicts, and think critically.

Module I – Social Skills (3 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.

Instructional Design	Each competency is taught and assessed through guided visualisations, reflections, explainers and hands on activities conducted during sessions build both conceptual understanding and real-world application.
Teaching Methodology	TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
Language Lab	Quicklrn.com
Experiential Learning Methods	To embed skills, participants get hands-on through: Guided reflections and explainers to connect concepts with relatable real-life situations Guided visualization to prompt reflection and self-discovery Role-plays and activities to practice behaviours in context

	Peer discussions to gain diverse perspectives.
Assessment Methods	**Formative:** Role-plays, activities, group discussions, peer feedback. **Summative:** Presentations, written reflections, problem-solving exercises.

Module II Emotional Skills I (3 hours)

- **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.

Instructional Design	Each competency is taught and assessed through guided visualisations, reflections, explainers and hands on activities conducted during lab sessions those build both conceptual understanding and real-world application.
Teaching Methodology	TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
Language Lab	Quicklrn.com
Experiential Learning Methods	• To embed skills, participants get hands-on through: • Guided reflections and explainers to connect concepts with relatable real-life situations • Guided visualization to prompt reflection and self-discovery • Role-plays and activities to practice behaviours in context • Peer discussions to gain diverse perspectives.
Assessment Methods	**Formative:** Role-plays, activities, group discussions, peer feedback. **Summative:** Presentations, written reflections, problem-solving exercises.

Module 3 Emotional Skills II (3 hours)

- 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).

Instructional Design	Each competency is taught and assessed through guided visualisations, reflections, explainers and hands on activities conducted during lab sessions those build both conceptual understanding and real-world application.
Teaching Methodology	TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
Language Lab	Quicklrn.com
Experiential Learning Methods	• To embed skills, participants get hands-on through: • Guided reflections and explainers to connect concepts with relatable real-life situations • Guided visualization to prompt reflection and self-discovery • Role-plays and activities to practice behaviours in context • Peer discussions to gain diverse perspectives.
Assessment Methods	**Formative:** Role-plays, activities, group discussions, peer feedback. **Summative:** Presentations, written reflections, problem-solving exercises.

Module 4 Professional Skills I (3 hours)

- **Problem Solving:** Identifying root causes, analysing 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.

Instructional Design	Each competency is taught and assessed through guided visualisations, reflections, explainers and hands on activities conducted during lab sessions those build both conceptual understanding and real-world application.
Teaching Methodology	TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach.
Language Lab	Quicklrn.com
Experiential Learning Methods	To embed skills, participants get hands-on through: Guided reflections and explainers to connect concepts with relatable real-life situations Guided visualization to prompt reflection and self-discovery Role-plays and activities to practice behaviours in context Peer discussions to gain diverse perspectives.
Assessment Methods	**Formative:** Role-plays, activities, group discussions, peer feedback. **Summative:** Presentations, written reflections, problem-solving exercises.

Module 5 Professional Skills II (3 hours)

- Collaboration & Teamwork: Working effectively in diverse teams, fostering trust, and achieving shared goals.

- Negotiation & Conflict Resolution: Strategies to resolve differences and reach win–win outcomes.
- Critical Thinking: The ability to analyze, evaluate, and synthesize information to make well-reasoned decisions.

Instructional Design	Each competency is taught and assessed through guided visualisations, reflections, explainers and hands on activities conducted during lab sessions those build both conceptual understanding and real-world application.
Teaching Methodology	TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, peer feedback. Eclectic Approach
Language Lab	Quicklrn.com
Experiential Learning Methods	To embed skills, participants get hands-on through: Guided reflections and explainers to connect concepts with relatable real-life situations Guided visualization to prompt reflection and self-discovery Role-plays and activities to practice behaviours in context Peer discussions to gain diverse perspectives.
Assessment Methods	**Formative:** Role-plays, group discussions, peer feedback. **Summative:** Presentations, written reflections, problem-solving exercises.

Extra Reading

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

Learning Resources:

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

Digital Resources

- Google Docs + Voice Typing - https://docs.google.com
- LearnEnglish – https://learnenglish.britishcouncil.org/
- TakeIELTS - https://www.britishcouncil.in/exam/ielts
- British Council Apps - **bbcLearnEnglishonline Grammar**
  LearnEnglish Podcasts
  IELTS Word Power
  Bbclearningenglishgrammer online
  Sounds Right (Phonemic Chart)

Mapping Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes*											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1									1	3		2
2										3		2
3										3		2
4									1	3		2
5									1	3		2

Assessment Plan – 100 Marks

CO Mapping & Components (100 Marks)

CO	Modules	Assessment Component	Description	Marks
CO1: Apply social skills for clear communication, persuasion, self-awareness, and active listening	Module I	Role-Play & Oral Presentation	Scenario-based role-play (persuasion, active listening) + short presentation; assessed on clarity, articulation, engagement, and non-verbal cues.	**20**
CO2: Use emotional skills to build confidence, manage stress, and adapt to change	Module II	Stress Management Activity & Reflection Journal	Guided stress-relief simulation + reflection linking EI concepts to personal experiences.	**20**
CO3: Set goals, practice empathy, and apply creativity for problem-solving	Module III	Goal-Setting & Creativity Project	SMART goal plan + creative problem-solving idea using mind-mapping or SCAMPER.	**20**
CO4: Demonstrate discipline, time management, and structured problem-solving	Module IV	Problem-Solving Exercise (Case-Based)	Apply 5 Whys/Fishbone diagram to a business/engineering problem; structured solution submission.	**20**
CO5: Work in teams, negotiate, resolve conflicts, and think critically	Module V	Group Debate/Negotiation Simulation	Teams negotiate a given scenario and defend solutions in a debate; assessed on teamwork, arguments, and conflict resolution.	**20**

Mark Distribution by Assessment Type

- **Formative (Continuous Assessment) – 50 Marks**
- **Summative (End of Course) – 50 Marks**

Bloom's Taxonomy Weightage (100 Marks)

Sl. No	Bloom's Category	Formative (Role-play, Reflection, Creativity, Case studies)	Summative (Presentation + Problem-solving)	Overall
1	Remember	20%	10%	10%
2	Understand	25%	20%	20%
3	Apply	35%	30%	30%
4	Analyse	20%	20%	20%
5	Evaluate	10%	15%	15%
6	Create	10%	10%	10%
Total		**100%**	**100%**	**100%**

Assessment Rubric – 100 Marks

CO's rubric is scaled **out of 20 marks**

CO1 – Role-Play & Oral Presentation (20 marks)

Criteria	Excellent (8)	Good (6)	Satisfactory (4)	Needs Improvement (2)	Marks
Clarity &Articulation	Speaks fluently, precise pronunciation	Minor lapses	Frequent lapses	Hesitant, unclear	4
Persuasion & Engagement	Strong persuasive appeal, engages fully	Reasonable persuasion	Weak persuasion	No strategy	4
Non-Verbal Communication	Confident posture, gestures, eye contact	Mostly confident	Minimal use	Poor body language	6
Active Listening	Accurately paraphrases, responds appropriately	Mostly accurate	Limited paraphrasing	Ignores cues	6

CO2 – Stress Management & Reflection Journal (20 marks)

Criteria	Excellent (8)	Good (6)	Satisfactory (4)	Needs Improvement (2)	Marks
Understanding of EI Concepts	Deep insight + examples	Good understanding	Basic understanding	Misunderstands	6
Application in Activity	Fully applies techniques	Mostly effective	Few techniques	No application	6

Criteria	Excellent (8)	Good (6)	Satisfactory (4)	Needs Improvement (2)	Marks
Reflection Quality	Highly personal, analytical	Some insights	Descriptive only	No reflection	4
Structure & Clarity	Well-organized	Mostly clear	Some disorganization	Poorly structured	4

CO3 – Goal-Setting & Creativity Project (20 marks)

Criteria	Excellent (8)	Good (6)	Satisfactory (4)	Needs Improvement (2)	Marks
SMART Goal Setting	All SMART criteria, inspiring	Most criteria	Some criteria	Vague	6
Creativity & Originality	Highly original	Some originality	Limited	None	6
Presentation & Visuals	Engaging, clear, strong visuals	Clear visuals	Basic visuals	Poor/no visuals	4
Feasibility & Relevance	Practical, relevant	Mostly practical	Partially relevant	Irrelevant	4

CO4 – Problem-Solving Exercise (20 marks)

Criteria	Excellent (8)	Good (6)	Satisfactory (4)	Needs Improvement (2)	Marks
Problem Analysis	Identifies all root causes	Most causes	Few causes	No clear causes	6
Application of Tools	Fully accurate	Mostly accurate	Partial	Incorrect	4
Solution Quality	Highly logical, feasible	Mostly logical	Some gaps	Illogical	4
Structure & Clarity	Clear flow	Mostly clear	Some unclear parts	Disorganized	6

CO5 – Debate/Negotiation Simulation (20 marks)

Criteria	Excellent (8)	Good (6)	Satisfactory (4)	Needs Improvement (2)	Marks
Team Collaboration	Fully cooperative	Mostly cooperative	Limited	Uncooperative	4
Argument Quality	Strong evidence-based reasoning	Mostly sound	Weak reasoning	No reasoning	6
Conflict Resolution	Balanced, win–win focus	Mostly balanced	Minimal attempt	Aggressive/avoidant	4
Critical Thinking	Insightful, anticipates counterpoints	Thoughtful	Limited depth	None	6

*** Final Marking CO1 (Criteria + Marks)**

- Understanding of EI Concepts → **5/6**
- Application in Activity → **4/6**
- Reflection Quality → **2/4**
- Structure & Clarity → **4/4**

Final Marks = 15/20

Indian Constitution and Engineering Ethics

Course Code	**1BICO107/207**	**CIE Marks**	**100**
Teaching Hours/Week (L: T:P: S)	**1:0:0**	**SEE Marks**	**---**
Total Hours of Pedagogy	**01Hours/Week**	**Total Marks**	**100**
Credits	**00**	**Exam Hours**	**-**

Course objectives: This course will enable the students

1. To know about the basic structure of the Indian Constitution.
2. To know the Fundamental Rights (FRs), DPSP's, and Fundamental Duties (FD's) of our constitution.
3. To know about our Union Government, political structure & codes, and procedures.
4. To know the State Executive & Elections system of India.
5. To learn the Amendments and Emergency Provisions, other important provisions given by the constitution.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective: Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools.

(i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning, (v) Personalized learning, (vi) Problems based learning through discussion.

Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills.

Module - 1

Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after the Constitution adoption. 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.

Module - 2

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.

Module - 3

Union Executive : Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism.

Module - 4

State Executive & Elections, Amendments and Emergency Provisions: State Executive, Election Commission, Elections & Electoral Process. Amendment to Constitution (How and Why) and Important Constitutional Amendments till today. Emergency Provisions.

Module-5

Professional Ethics: Ethics & Values. Types of Ethics. Scope & Aims of Professional & Engineering Ethics. Positive and Negative Faces of Engineering Ethics. Clash of Ethics, Conflicts of Interest. The impediments to Responsibility. Trust & Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering.

Course outcome (Course Skill Set) :

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

CO1	Analyse the basic structure of Indian Constitution.
CO2	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.
CO3	know about our Union Government, political structure & codes, procedures.
CO4	Understand our State Executive & Elections system of India.
CO5	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.

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

1. 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**.
2. To pass the **SEE**, a student must score at least **35% of 50 marks**, i.e., **18 marks**.

3. 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**.

Continuous Comprehensive Assessments (CCA):

CCA will be conducted for a total of 25 marks. It is recommended to include a maximum of two learning activities aimed at enhancing the holistic development of students. These activities should align with course objectives and promote higher-order thinking and application-based learning.

Learning Activity -1: (Marks- ___)

Learning Activity -2 (optional): (Marks- ___)

Suggested Learning Resources:

Textbook:

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

Reference Books:

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

Rubrics for Learning Activity (Based on the nature of learning activity, design the rubrics for each activity):

	Superior	Good	Fair	Needs Improvement	Unacceptable
Performance Indicator- 1 (CO/PO Mapping)					
Performance Indicator-2 (CO/PO Mapping)					
...					
Performance Indicator-n (CO/PO Mapping)					

Suggested Learning Activities may include (but are not limited to):

- Course Project
- Case Study Presentation
- Programming Assignment
- Tool/Software Exploration
- Literature Review
- Open Book Test (preferably at RBL4 and RBL5 levels)
- GATE-based Aptitude Test
- Assignment (at RBL3, RBL4, or RBL5 levels)
- Any other relevant and innovative academic activity
- Use of MOOCs and Online Platforms

Suggested Innovative Delivery Methods may include (but are not limited to):

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching
- Role Play

Theory - 01 Credit Course

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ - ಕನ್ನಡ ಬಲ್ಲ ಮತ್ತು ಕನ್ನಡ ಮಾತೃಭಾಷೆಯ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ನಿಗದಿಪಡಿಸಿದ ಪಠ್ಯಕ್ರಮ

Course Title:	ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ		
Course Code:	1BKSK109	CIE Marks	50
Course Type (Theory/Practical /Integrated	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	01 Theory
Total Hours of Pedagogy	15 hours	Credits	01

Course objectives : ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

The course (22KSK17/27) will enable the students,

1. ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಪರಿಚಯಿಸಿವುದು.
3. ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು.
4. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
5. ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching-Learning Process - General Instructions) :

These are sample Strategies, which teacher can use to accelerate the attainment of the course outcomes.

1. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡವನ್ನು ಬೋಧಿಸಲು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಪ್ರಸ್ತುತ ಪುಸ್ತಕ ಆಧಾರಿಸಿ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನವನ್ನು ಅನುಸರಿಸುವುದು. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಪ್ರೇರೇಪಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.
2. ಇತ್ತೀಚಿನ ತಂತ್ರಜ್ಞಾನದ ಅನುಕೂಲಗಳನ್ನು ಬಳಸಿಕೊಳ್ಳುವುದು - ಅಂದರೆ ಕವಿ-ಕಾವ್ಯ ಪರಿಚಯದಲ್ಲಿ ಕವಿಗಳ ಚಿತ್ರಣ ಮತ್ತು ಲೇಖನಗಳು ಮತ್ತು ಕಥೆ ಕಾವ್ಯಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧಪಟ್ಟ ಧ್ವನಿ ಚಿತ್ರಗಳು, ಸಂಭಾಷಣೆಗಳು, ಈಗಾಗಲೇ ಇತರ ವಿಮರ್ಶಕರು ಬರೆದಿರುವ ವಿಮರ್ಶಾತ್ಮಕ ವಿಷಯಗಳನ್ನು ಟಿಪಿಟಿ, ಡಿಜಿಟಲ್ ಮಾಧ್ಯಮಗಳ ಮುಖಾಂತರ ವಿಶ್ಲೇಷಿಸುವುದು.
3. ನವೀನ ಮಾದರಿಯ ಸಾಹಿತ್ಯ ಬೋಧನೆಗೆ ಸಂಬಂಧಪಟ್ಟ ವಿಧಾನಗಳನ್ನು ಶಿಕ್ಷಕರು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಅನುಕೂಲವಾಗುವ ರೀತಿಯಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳಬಹುದು.

ಘಟಕ -1 ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಮತ್ತು ಭಾಷೆ ಕುರಿತಾದ ಲೇಖನಗಳು (03 hours of pedagogy)

1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ - ಹಂಪ ನಾಗರಾಜಯ್ಯ
2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ : ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ - ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ
3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ. ವಿ. ಕೇಶವಮೂರ್ತಿ

ಘಟಕ - 2 ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ (03 hours of pedagogy)

1. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ.
2. ಕೀರ್ತನೆಗಳು : ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ – ಪುರಂದರದಾಸರು
   ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ - ಕನಕದಾಸರು
3. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು - ಶಿಶುನಾಳ ಶರೀಫ

ಘಟಕ -3 ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ (03 hours of pedagogy)

1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಆಯ್ದ ಕೆಲವು ಭಾಗಗಳು
2. ಕುರುಡು ಕಾಂಚಾಣ : ದಾ.ರಾ. ಬೇಂದ್ರೆ
3. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು

ಘಟಕ - 4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ (03 hours of pedagogy)

1. ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ : ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ – ಎ. ಎನ್. ಮೂರ್ತಿರಾವ್
2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ

ಘಟಕ - 5 ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ (03 hours of pedagogy)

1. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ
2. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ

Course outcome (Course Skill Set)

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ (22KSK17/27) ಪಠ್ಯ ಕಲಿಕೆಯ ನಂತರ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ :

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

CO1	ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಕುರಿತು ಅರಿವು ಮೂಡಿರುತ್ತದೆ.
CO2	ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಕಲಿತು ಹೆಚ್ಚಿನ ಓದಿಗೆ

	ಮತ್ತು ಜ್ಞಾನಕ್ಕೆ ಸ್ಪೂರ್ತಿ ಮೂಡುತ್ತದೆ.
CO3	ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಹೆಚ್ಚಾಗುತ್ತದೆ.
CO4	ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ತಿಳಿದುಕೊಂಡು ನಾಡಿನ ಇನ್ನಿತರ ವ್ಯಕ್ತಿಗಳ ಬಗ್ಗೆ ತಿಳಿದುಕೊಳ್ಳಲು ಕೌತುಕತೆ ಹೆಚ್ಚಾಗುತ್ತದೆ.
CO5	ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

Assessment Structure:
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

Continuous Comprehensive Assessments (CCA):
CCA will be conducted for a total of 25 marks. It is recommended to include a maximum of two learning activities aimed at enhancing the holistic development of students.
These activities should align with course objectives and promote higher-order thinking and application-based learning.Learning Activity -1: (Marks- ___)Learning Activity -2 (optional): (Marks- ___)

University Prescribed Textbook :

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

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

ವಿಶೇಷ ಸೂಚನೆ : 1. ಮೇಲಿನ ಪಠ್ಯಕ್ರಮಕ್ಕೆ ಸೀಮಿತವಾಗಿ ಅಂತಿಮ ಪರೀಕ್ಷೆಯ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ ಇರುತ್ತದೆ.

2. ಮೇಲಿನ ಪಠ್ಯಕ್ರಮವನ್ನು ಹೊರತುಪಡಿಸಿದ ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕದಲ್ಲಿನ ಉಳಿದ ಪದ್ಯ & ಗದ್ಯ ಭಾಗ ಹಾಗೂ ಇತರ ಲೇಖನಗಳನ್ನು ಹೆಚ್ಚುವರಿ ಪೂರಕ ಓದಿಗಾಗಿ ಬಳಸಿಕೊಳ್ಳಬಹುದು. ಅಂತಿಮ ಪರೀಕ್ಷೆಯಲ್ಲಿ ಈ ಪಾಠಗಳಿಂದ ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುವುದಿಲ್ಲ.

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3. ಹೆಚ್ಚಿನ ಮಾಹಿತಿ ಮತ್ತು ವಿವರಣೆಗಳಿಗೆ ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ (9900832331) ಇವರನ್ನು ಸಂಪರ್ಕಿಸಿ.

4. ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ, ಕೋರ್ಸ್ ಆಯ್ಕೆ ಮಾಹಿತಿ, ಅಧ್ಯಯನ ಸಾಮಗ್ರಿ & ಬಹು ಆಯ್ಕೆ ಮಾದರಿಯ ಪ್ರಶ್ನೆಗಳ ಕೈಪಿಡಿಗಾಗಿ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್ ಸೈಟ್ ನೋಡುವುದು.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- ✓ Contents related activities (Activity-based discussions)
- ✓ For active participation of students instruct the students to prepare Flowcharts and Handouts
- ✓ Organising Group wise discussions Connecting to placement activities
- ✓ Quizzes and Discussions, Seminars and assignments.

Theory - 01 Credit Course

ಬಳಕೆ ಕನ್ನಡ - baLake Kannada (Kannada for Usage)

ಕನ್ನಡ ಕಲಿಕೆಗಾಗಿ ನಿಗದಿಪಡಿಸಿದ ಪಠ್ಯಪುಸ್ತಕ - (Prescribed Textbook to Learn Kannada)

Course Title:	**ಬಳಕೆ ಕನ್ನಡ**		
Course Code:	**1BKBK109**	CIE Marks	50
Course Type (Theory/Practical /Integrated	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	01 Theory
Total Hours of Pedagogy	15 hours	Credits	01

Course objectives : ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

The course (1BKBK109) will enable the students,

1. To Create the awareness regarding the necessity of learning local language for comfortable and healthy life.
2. To enable learners to Listen and understand the Kannada language properly.
3. To speak, read and write Kannada language as per requirement.
4. To train the learners for correct and polite conservation.
5. To know about Karnataka state and its language, literature and General information about this state.

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching-Learning Process - General Instructions) :

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. **ಬಳಕೆ ಕನ್ನಡವನ್ನು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಬೋಧಿಸಲು ವಿಟಿಯು ಸೂಚಿಸಿರುವ ಪಠ್ಯಪುಸ್ತಕವನ್ನು ಉಪಯೋಗಿಸಬೇಕು.**
2. **ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಉತ್ತೇಜಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.**
3. **ಪ್ರತಿ ವಿದ್ಯಾರ್ಥಿ ಪುಸ್ತಕವನ್ನು ತರಗತಿಯಲ್ಲಿ ಬಳಸುವಂತೆ ನೋಡಿಕೊಳ್ಳುವುದು ಮತ್ತು ಪ್ರತಿ ಪಾಠ ಮತ್ತು ಪ್ರವಚನಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧಪಟ್ಟಂತೆ ಪೂರಕ ಚಟುವಟಿಕೆಗಳಿಗೆ ತೊಡಗಿಸತಕ್ಕದ್ದು.**
4. **ಡಿಜಿಟಲ್ ತಂತ್ರಜ್ಞಾನದ ಮುಖಾಂತರ ಇತ್ತೀಚೆಗೆ ಡಿಜಿಟಲೀಕರಣ ಗೊಂಡಿರುವ ಭಾಷೆ ಕಲಿಕೆಯ ವಿಧಾನಗಳನ್ನು ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ಮುಖಾಂತರ ಚರ್ಚಿಸಲು ಕ್ರಮಕ್ಕೆಗೊಳ್ಳುವುದು. ಇದರಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ತರಗತಿಯಲ್ಲಿ ಹೆಚ್ಚು ಏಕಾಗ್ರತೆಯಿಂದ ಪಾಠ ಕೇಳಲು ಮತ್ತು ಅಧ್ಯಯನದಲ್ಲಿ ತೊಡಗಲು ಅನುಕೂಲವಾಗುತ್ತದೆ.**
5. **ಭಾಷಾಕಲಿಕೆಯ ಪ್ರಯೋಗಾಲಯದ ಮುಖಾಂತರ ಬಹುಬೇಗ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಕಲಿಯಲು ಅನುಕೂಲವಾಗುವಂತೆ ಕಾರ್ಯಚಟುವಟಿಕೆಗಳನ್ನು ಮತ್ತು ಕ್ರಿಯಾ ಯೋಜನೆಗಳನ್ನು ರೂಪಿಸುವುದು.**

Module - 1

(03 hours of pedagogy)

1. Introduction, Necessity of learning a local language. Methods to learn the Kannada language.
2. Easy learning of a Kannada Language: A few tips. Hints for correct and polite conservation, Listening and Speaking Activities, Key to Transcription
3. ವೈಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯಸೂಚಕ/ಸಂಬಂಧಿತ ಸಾರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು - Personal Pronouns, Possessive Forms, Interrogative words

Module - 2 (03 hours of pedagogy)

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

Module - 3 (03 hours of pedagogy)

1. ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು - **Dative Cases, and Numerals**
2. ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು -**Ordinal numerals and Plural markers**
3. ನ್ಯೂನ/ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು & ವರ್ಣ ಗುಣವಾಚಕಗಳು –**Defective/Negative Verbs & Colour Adjectives**

Module- 4 (03 hours of pedagogy)

1. ಅಪ್ಪಣೆ / ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತು ಒತ್ತಾಯ ಆರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು **Permission, Commands, encouraging and Urging words (Imperative words and sentences)**
2. ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು **Accusative Cases and Potential Forms used in General Communication**
3. "ಇರು ಮತ್ತು ಇರಲ್ಲ" ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾ ಪದಗಳು - Helping Verbs "iru and iralla", Corresponding Future and Negation Verbs
4. ಹೋಲಿಕೆ (ತರತಮ) , ಸಂಬಂಧ ಸೂಚಕ, ವಸ್ತು ಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ- Comparitive, Relationship, Identification and Negation Words

Module - 5 (03 hours of pedagogy)

1. ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು -Different types of Tense, Time and Verbs
2. ದ್, -ತ್, - ತು, - ಇತು, - ಆಗಿ, - ಅಲ್ಲ, - ಗ್, -ಕ್, ಇದೆ, ಕ್ರಿಯಾ ಪ್ರತ್ಯಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲ ವಾಕ್ಯ ರಚನೆ - Formation of Past, Future and Present Tense Sentences with Verb Forms
3. **Kannada Vocabulary List :ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು -Kannada Words in Conversation**

Course outcome (Course Skill Set)

ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಅನುಕೂಲಗಳು ಮತ್ತು ಫಲಿತಾಂಶಗಳು:

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

CO1	To understand the necessity of learning of local language for comfortable life.
CO2	To speak, read and write Kannada language as per requirement.
CO3	To communicate (converse) in Kannada language in their daily life with kannada speakers.
CO4	To Listen and understand the Kannada language properly.
CO5	To speak in polite conservation.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than

35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Comprehensive Assessments (CCA):CCA will be conducted for a total of 25 marks. It is recommended to include a maximum of two learning activities aimed at enhancing the holistic development of students. These activities should align with course objectives and promote higher-order thinking and application-based learning.Learning Activity -1: (Marks- ___)Learning Activity -2 (optional): (Marks- ___)

University Prescribed Textbook :

ಬಳಕೆ ಕನ್ನಡ

ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ

ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ,

ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

ಸೂಚನೆ :

ವಿಶೇಷ ಸೂಚನೆ : 1. ಮೇಲಿನ ಪಠ್ಯಕ್ರಮಕ್ಕೆ ಸೀಮಿತವಾಗಿ ಅಂತಿಮ ಪರೀಕ್ಷೆಯ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ ಇರುತ್ತದೆ.

2. ಮೇಲಿನ ಪಠ್ಯಕ್ರಮವನ್ನು ಹೊರತುಪಡಿಸಿದ ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕದಲ್ಲಿನ ಉಳಿದ ಭಾಗಳನ್ನು ಹೆಚ್ಚುವರಿ ಪೂರಕ ಓದಿಗಾಗಿ ಬಳಸಿಕೊಳ್ಳಬಹುದು. ಅಂತಿಮ ಪರೀಕ್ಷೆಯಲ್ಲಿ ಈ ಪಾಠಗಳಿಂದ ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುವುದಿಲ್ಲ.

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3. ಹೆಚ್ಚಿನ ಮಾಹಿತಿ ಮತ್ತು ವಿವರಣೆಗಳಿಗೆ ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ (9900832331) ಇವರನ್ನು ಸಂಪರ್ಕಿಸಿ.

4. ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ, ಕೋರ್ಸ್ ಆಯ್ಕೆ ಮಾಹಿತಿ, ಅಧ್ಯಯನ ಸಾಮಗ್ರಿ & ಬಹು ಆಯ್ಕೆ ಮಾದರಿಯ ಪ್ರಶ್ನೆಗಳ ಕೈಪಿಡಿಗಾಗಿ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್ ಸೈಟ್ ನೋಡುವುದು.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- ✓ Contents related activities (Activity-based discussions)
- ✓ For active participation of students instruct the students to prepare Flowcharts and Handouts
- ✓ Organising Group wise discussions Connecting to placement activities
- ✓ Quizzes and Discussions.
- ✓ Seminars and assignments.

INTRODUCTION TO C PROGRAMMING		Semester	I/II
Course Code	**1BPLC205E/105E**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:02:0	SEE Marks	50
Total Hours of Pedagogy (Theory and Lab hours)	40 + 24 (Practical)	Total Marks	100
Credits	4	Exam Hours	3
Examination type (SEE)	Theory		

Course outcomes (Course Skill Set)

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

CO1: Explain the fundamental structure of a C program and primitive constructs.
CO2: Apply decision-making and iterative control structures to solve simple computational problems.
CO3: Develop programs using arrays and string operations to solve real-world problems.
CO4: Construct user-defined functions to modularize the solution to the given problems.
CO5: Build programs using structures and pointers for complex data representation and access.

Module-1

Flowchart and Algorithms: Art of Programming through Algorithms & Flowcharts.
Overview of C: History of C, Importance of C, Basic Structure of C Programs, Programming Style, Compiling and Executing a 'C' Program.
Constants, Variables and Data Types: Character Set, C Tokens, Keywords and Identifiers, Constants, Variables, Data Types, Declaration of Variables, Assigning Values to Variables, Defining Symbolic Constants, Declaring a Variables as Constants and Volatile, Input/Output Statements in C.

Textbook: Chapter 1. 6, 2.1, 2.2, 2.8, 2.9, 2.10, Chapter 3.2 to 3.14, Chapter 5.1 to 5.5

Number of Hours: 8

Module-2

Operators: Introduction to Operators, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Precedence of Arithmetic Operators.
Decision Making, Branching, Looping: Introduction, Decision Making with IF Statement, Simple IF Statement, The IF..ELSE Statement, Nesting of IF..ELSE Statements, The ELSE IF Ladder, The Switch Statement, The ?: Operator, The GOTO Statement, WHILE, DO, FOR, Jumps in LOOPS.

Textbook: Chapter 4.1 to 4.7, 4.12, Chapter 6.1 to 6.9, Chapter 7.1 to 7.5 Number of Hours: 8

Module-3

Arrays and Strings: Introduction, Declaration and Initialization of One-dimensional and Two-Dimensional Arrays, Declaring and Initializing String Variables, Example programs using arrays ,Reading Strings from Terminal, Writing Strings to Screen, Arithmetic Operations on Characters, Comparison of Two Strings, String-handling Functions.

Textbook: Chapter 8.1 to 8.6, Chapter 9.2 to 9.5, 9.7, 9.8 Number of Hours: 8

Module-4

User-defined Functions: Introduction, Need for User-defined Functions, A Multi-functional Program, Elements of User-defined Functions, Definition of Function, Return Values and their Types, Function Calls, Function Declaration, No Arguments and no Return Values, Arguments but no Return Values, Nesting of Functions.

Textbook: Chapter 10.1 to 10.8, 10.10 to 10.14

Number of Hours:8

Module-5

Structures and Pointers: Introduction, Defining a Structure, Declaring and Accessing Structure Variables and Members, Structure Initialization, Copying and Comparing Structure Variables, Array of Structures, Arrays within Structures.
Pointers: Introduction, Understanding Pointers, Accessing the Address of Variable, Declaring pointer variables, initialization of pointers, accessing variables through its pointer.

Textbook: Chapter 11.1 to 11.6, 11.8, 11.19, Chapter 12.1 to 12.6

Number of Hours:8

PRACTICAL COMPONENT OF IPCC

1. Develop a program to calculate the temperature converter from degree to Fahrenheit.
2. Develop a program to find the roots of quadratic equations.
3. Develop a program to find whether a given number is prime or not.
4. Develop a program to find key elements in an array using linear search.
5. Given age and gender of a person, develop a program to categorise senior citizen (male & female).
6. Generate Floyd's triangle for given rows.
7. Develop a program to find the transpose of a matrix.
8. Develop a program to concatenate two strings, find length of a string and copy one string to other using string operations.
9. Develop a modular program to find GCD and LCM of given numbers.
10. Develop a program to declare the structure of employees and display the employee records with higher salary among two employees.
11. Develop a program to add two numbers using the pointers to the variables**.**
12. Develop a program to find the sum of digits of a given number.
13. Develop a program to perform Matrix Multiplication.
14. Develop a program to create an array of structures to store book details and check whether a specific book, as requested by the user, is available or not.

Suggested Learning Resources: (Textbook/ Reference Book/ Manuals):

Textbooks:

1. Programming in ANSI C, 9e, E Balaguruswamy, Tata McGraw Hill Education.

Reference books / Manuals:

1. PROGRAMMING IN C, Reema Thareja, Oxford University, Third Edition, 2023**.**
2. The 'C' Programming Language, Brian W. Kernighan and Dennis M. Ritchie, Second Edition, Prentice Hall of India, 2015

Web links and Video Lectures (e-Resources):

1. elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html

2. https://nptel.ac.in/courses/106/105/106105171/ MOOC

Courses can be adopted for more clarity in understanding the topics and verities of problem-solving methods.

- https://www.tutorialspoint.com/what-is-an-algorithm-and-flowchart-in-c-language
- https://www.tutorialspoint.com/cprogramming/c_data_types.htm
- https://www.tutorialspoint.com/cprogramming/c_operators.htm
- https://www.ccbp.in/blog/articles/decision-making-statements-in-c
- https://www.tutorialspoint.com/cprogramming/c_arrays.htm
- https://www.geeksforgeeks.org/variables-in-c/
- https://www.w3schools.com/c/c_arrays.php
- https://www.programiz.com/c-programming/c-strings
- https://www.programiz.com/c-programming/c-pointers
- https://www.scaler.com/topics/c/structures-c/

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

Assessment Structure:

The assessment for each course is equally divided between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each component carrying **50% weightage** (i.e., 50 marks each).
The CIE Theory component will be 30marks and CIE Practical component will be 20 marks.

The CIE Theory component consists of IA tests for 25 marks and Continuous Comprehensive Assessments (CCA) for 5 marks. The CIE Practical component for continuous assessments will be for 15 marks through rubrics and for lab tests will be for 5 marks.

- To qualify and become eligible to appear for SEE, in the **CIE theory component**, a student must score at least **40% of 30 marks**, i.e., **12 marks**.
- To qualify and become eligible to appear for SEE, in the **CIE Practical component**, a student must secure **a minimum of 40% of 20 marks**, i.e., **08 marks**.
- To pass the **SEE**, a student must secure **a minimum of 35% of 50 marks**, i.e., **18 marks**.
- A student is deemed to have **successfully completed the course** if the **combined total of CIE and SEE is at least 40 out of 100 marks**.

Continuous Comprehensive Assessments (CCA):

CCA will be conducted for a total of 5 marks. It is recommended to include any, one learning activity aimed at enhancing the holistic development of students. This activity should align with course outcomes and promote higher-order thinking and application-based learning.

Learning Activity -1: Programming Assignment (Marks- 5)

INSTRUCTIONS:

1. Course instructor will refer to HackerRank or any other platform to derive the questions for problem-solving.
2. Course Instructor must identify programming problems from these sections: Statements (control), Arrays, Strings, Structures & Unions and Functions.
3. Courser instructor will assign question ONE from each section to the students for design of algorithm/flowchart, program and coding/execution.
4. Students must demonstrate the solutions to the course instructor and submit the record containing algorithm/flowchart, program, debugging/execution and results with observations.
5. Course instructor must evaluate the student performance as per the rubrics.

Rubrics for Learning Activity (Based on the nature of learning activity, Develop the rubrics for each activity):

Note: Marks obtained (25) is scaled down to 5.

Rubrics for Learning Activity:

Component & CO-PO Mapping	Outstanding (5)	Exceeds Expectations (4)	Meets Expectations (3)	Needs Improvement (2)	Unsatisfactory (1)
Clarity & Simplicity of algorithm/program [CO1] [PO9]	Algorithm/Programs are self-explanatory, specific, and well-structured for the intended activity; no ambiguity is present.	Programs are clear and mostly specific; minor ambiguity is present.	Programs are somewhat clear but could be more specific; moderate ambiguity.	Programs are vague and lack clarity; high ambiguity.	Programs are unclear, incomplete, or irrelevant to the activity.
Appropriate Use of language constructs and design of algorithm/program [CO2-5] [PO1, PO3]	Demonstrates precise and creative usage of the language construct and structured programming	Correctly applies the language construct with minor gaps or missed opportunities.	Uses the language construct, but with partial understanding or inconsistent usage.	Limited understanding of the language construct; incorrect or weak usage.	No evidence of correct/relevant language construct use.
Compilation, Debugging, Analysis & Comparison of Results for various cases. [CO2-5] [PO2, PO4, PO5]	Provides clear and correct results with analysis for multiple cases; comparisons among cases highlight key strengths and weaknesses.	Provides correct results with analysis for multiple cases, though slightly less detailed.	Provides correct results with limited analysis; comparisons are present but shallow.	Provides correct results. Minimal analysis: comparisons are weak or incomplete.	Results are partially correct. No meaningful analysis or comparison.
Creativity, efficiency of	Demonstrates outstanding	Demonstrates creativity and	Shows moderate creativity;	Minimal creativity:	No creativity or problem-

Problem-Solving/program [CO2-5] [PO3, PO11]	creativity and innovation in writing programs, especially for problem-solving or design tasks.	some innovation; Program solutions are practical.	programs are functional but not innovative.	programs are repetitive or unimaginative.	solving/Programming is evident.
Documentation & Reflection [CO1-5] [PO8/PO9/PO11]	Documentation is complete, well-organized, and includes deep reflection on improvements across iterations.	Documentation is complete with some reflection on program refinement.	Documentation is present but lacks detail or depth in reflection.	Incomplete documentation; reflection is minimal.	No documentation or reflection provided as per schedule.

Rubrics for CIE – Continuous assessment:

Component & CO-PO Mapping	Outstanding (5)	Exceeds Expectations (4)	Meets Expectations (3)	Needs Improvement (2)	Unsatisfactory (1)
Fundamental Knowledge: Understanding the problem statement [CO1] [PO1, PO2]	The student has in depth knowledge of the topics related to the problem. Student is able to completely understand the problem definition.	Student has good knowledge of some of the topics related to problem. Student is able to understand the problem definition.	Student is capable of narrating the answer but not capable to show in depth knowledge and the problem definition.	Student has not understood the concepts partially. Student is able to partially understand the problem definition	Student has not understood the concepts and the problem definition clearly.
Design of algorithm/flow chart and program [CO2-5] [PO2, PO3]	Student is capable of discussing more than one design for his/her problem statement and capable of proving the best suitable design with proper reason.	Student is capable of discussing few designs for his/her problem statement but not capable of selecting best.	Student is capable of discussing single design with its merits and de-merits.	Student is capable of explaining the design.	Student is capable of explaining the design partially.
Implementation (Program coding) with suitable tools [CO2-5] [PO5, PO8]	Student is capable of implementing the design with best suitable language structure considering optimal solution/optimal efficiency.	Student is capable of implementing the design with best suitable language structure and should be capable of explaining it.	Student is capable of implementing the design with proper explanation.	Student is capable of implementing the design.	Student is capable of implementing the design with errors.

Program debugging and testing with suitable tools [CO2-5] [PO5, PO8]	Student is capable to compile and debug the program with no errors (syntax, semantic and logical).	Student is able to compile and debug the program with errors (syntax, semantic and logical) and rectified errors with full understanding of error descriptions.	Student is able to compile and debug the program with errors (syntax, semantic and logical) and rectified errors with partial understanding of error descriptions.	Student is able to compile and debug the program with errors (syntax, semantic and logical) and rectified errors with no understanding of error descriptions.	Student is able to compile and debug the program with errors (syntax, semantic and logical) and rectified errors with assistance.
Results & interpretation /analysis [CO1-5] [PO4]	Student is able to run the program on various cases and compare the result with proper analysis.	Student is able to run the program for all the cases.	Student is able to run the code for few cases and analyze the result.	Student is able to run the program but not able to analyze the result.	Student is able to run the program but not able to verify the correctness of the result.
Demonstration and documentation [CO1-5] [PO8, PO9, PO11]	Demonstration and lab record is well-organized, with clear sections. The record is well structured with suitable formatting (e.g: font, spacing, labelling of figures and tables, equations numbered and etc).	Demonstration and lab record is organized, with clear sections, but some sections are not well-defined. The record is structured with formatting (e.g: font, spacing, labelling of figures and tables, equations numbered and etc).	Demonstration and lab record lacks clear organization or structure. Some sections are unclear or incomplete. The record is partially structured with formatting (e.g: font, spacing, labelling of figures and tables, equations numbered and etc).	Demonstration and lab record is poorly organized, with missing or unclear sections. The record is not properly structured with suitable formatting (e.g: font, spacing, labelling of figures and tables, equations numbered and etc).	Demonstration and lab record is poorly organized, with missing sections. Record not submitted on time. The record is not structured with minimum formatting (e.g: font, spacing, labelling of figures and tables, equations numbered and etc).

Rubrics for CIE Test:

Component & CO-PO Mapping	Excellent (5)	Good (4)	Fair (3)	Marginal (2)	Unsatisfactory (1)
Fundamental Knowledge (2) [CO1] [PO1]	The student has well depth knowledge of the topics related to the problem & course	Student has good knowledge of some of the topics related to problem & course	Student has average knowledge of some of the topics related to problem & course	Student is capable of narrating the answer but not capable to show in depth knowledge	Student has not understood the concepts clearly
Understanding of problem definition (1) [CO2+-5] [PO2]	Student is able to completely understand the problem definition	Student is able to understand the problem definition but not clearly	Student has a basic understanding of the problem definition that is partial or superficial	Student is able to Shows minimal or unclear understanding of the problem definition	Student is not able to understand the problem definition
Design and Implementation (3) [CO2-5] [PO3]	Student is capable of design and implementing with best suitable construct for the given problem definition	Student is capable of design and implementing with some construct for the given problem definition	Student is capable of design and implementing the core part of the construct for the given problem definition	Student is partially capable of design and implementing with some algorithm for the given problem definition	Student is not capable of design and implementing
Result & Analysis (2) [CO2-5] [PO4]	Student is able to run the program on various data inputs and compare the result with proper inference.	Student will be able to run the program on various data inputs and fair knowledge in comparing the result with proper inference	Student will be able to run the code for few data/datasets and analyze the output.	Student will be able to run the code for few data inputs but not analyze the output.	Student will be not able to run the program and not able to analyze the result.
Communication (Viva voce) (2) [CO1-5] [PO8, PO9]	Good Verbal & nonverbal communication skills with precise and correct terminologies/ answers.	Good verbal Communication skills with precise and correct terminologies/ answers.	Average Communication but with precise and correct terminologies/ answers.	Average Communication but with imprecise and incorrect terminologies/ answers	Poor Communication (Minimal interaction/answers)