RAMAIAH
Institute of Technology

CURRICULUM

Outcome Based Education
(Academic Year 2025 – 2026)

I & II Semester

RAMAIAH INSTITUTE OF TECHNOLOGY
(Autonomous Institute, affiliated to VTU)
Approved by AICTE, New Delhi & Govt. of Karnataka
Accredited by NBA & NAAC with A^+ Grade

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About the Institute:

Dr. M. S. Ramaiah a philanthropist, founded 'Gokula Education Foundation' in 1962 with an objective of serving the society. M S Ramaiah Institute of Technology (MSRIT) was established under the aegis of this foundation in the same year, creating a landmark in technical education in India. MSRIT offers 18 UG programs and 15 PG programs. All these programs are approved by AICTE. All eligible UG and PG programs are accredited by National Board of Accreditation (NBA). The institute is accredited with **'A+' grade by NAAC in March 2021** for 5 years. University Grants Commission (UGC) & Visvesvaraya Technological University (VTU) have conferred Autonomous Status to MSRIT for both UG and PG Programs since 2007. The institute has also been conferred autonomous status for Ph.D. program since 2021. The institute is a participant to the Technical Education Quality Improvement Program (TEQIP), an initiative of the Government of India. The institute has 400 competent faculty out of which 70% are doctorates. Some of the distinguished features of MSRIT are: State of the art laboratories, individual computing facility for all faculty members, all research departments active with sponsored funded projects and more than 300 scholars pursuing Ph.D. To promote research culture, the institute has established Centre of Excellence for Imaging Technologies, Centre for Advanced Materials Technology, Centre for Antennas and Radio Frequency systems (CARFS), Center for Cyber Physical Systems, Schneider Centre of Excellence & Centre for Bio and Energy Materials Innovation.

The Entrepreneurship Development Cell (EDC) and "Ramaiah Evolute" have been set up on campus to incubate startups. MSRIT has a strong Placement and Training department with a committed team, a good Mentoring/Proctorial system, a fully equipped Sports department, large air-conditioned library with good collection of book volumes and subscription to International and National Journals. The Digital Library subscribes to online e-journals from Elsevier Science Direct, IEEE, Taylor & Francis, Springer Link, etc. The Institute is a member of DELNET, CMTI and VTU E-Library Consortium. The Institute has a modern auditorium, recording studio, and several hi-tech conference halls with video conferencing facilities. The institute has excellent hostel facilities for boys and girls. MSRIT Alumni have distinguished themselves by occupying high positions in India and abroad and are in touch with the institute through an active Alumni Association.

As per the National Institutional Ranking Framework (NIRF), MoE, Government of India, M S Ramaiah Institute of Technology has achieved 75th rank among 1584 top Engineering Institutions & 31st Rank among 131 Schools of Architecture in India for the year 2025.

VISION OF THE INSTITUTE

To be an Institution of International Eminence, renowned for imparting quality technical education, cutting edge research and innovation to meet global socio-economic needs

MISSION OF THE INSTITUTE

RIT shall meet the global socio-economic needs through

1. Imparting quality technical education by nurturing a conducive learning environment through continuous improvement and customization
2. Establishing research clusters in emerging areas in collaboration with globally reputed organizations
3. Establishing innovative skills development, techno entrepreneurial activities and consultancy for socio-economic needs

QUALITY POLICY

We at Ramaiah Institute of Technology strive to deliver comprehensive, continually enhanced, global quality technical and management education through an established Quality Management System complemented by the synergistic interaction of the stake holders concerned

About the Departments:

DEPARTMENT OF MATHEMATICS:

The major focus of the department is to inculcate mathematical thinking in engineering students. For this, we teach core mathematics courses to students at undergraduate and postgraduate level as well as offer electives in Mathematics. The department has 26 dedicated & well qualified staff members (all with Ph.D.). In 2003, VTU recognized it as a Research and Development (R & D) center. From the department, 23 research scholars have been awarded Ph.D. At present, 13 full-time and 13 part-time research scholars have registered for the doctoral program. Current expertise of the faculty covers a broad range of areas including Fluid mechanics, Linear Algebra, Numerical Methods, Number Theory, Probability, Statistics and Queueing Theory. The department faculty have published many papers in national and international journals.In addition, the faculty members have also obtained extramural support to carry out research activities and projects sponsored by VTU, UGC, DST and TEQIP.

Vision

To mould the students to have strong Mathematical and analytical skills to meet the challenges open to them

Mission

To provide the students with a strong Mathematical foundation through courses which cater to the needs of industry, research and higher education.

DEPARTMENT OF PHYSICS:

The department of Physics has a team of dynamic and well-qualified faculty members (all with Ph.D.) with a passion for research. It is recognized as a Research & Development canter by VTU in April 2008 to offer Ph.D. programs. 12 scholars have been awarded Ph.D. from the department till now. At present, 8 full time and 3-part time research scholars are pursuing Ph.D. degree. 6 external funded research projects have been successfully completed and two projects are ongoing with total external funding of more than Rs.1 crore from BRNS, DST and VGST. The Department has very good infrastructure, well-equipped spacious laboratories, good computational and research facilities. In the last one year, 29 research papers have been published in International peer reviewed journals with high impact factor. At present, active research in the department is in the fields of Materials Science, Fluorescence spectroscopy, Crystallography, Liquid crystals, computational studies, Atomic and Molecular collisions.

Vision

To develop undergraduate courses of best academic standards comparable to universities of international repute and be a catalytic agent to help students to manifest their latent potential.

Mission

To provide the best training through teaching and research to enable the students to master the concepts in physics and apply successfully to real time problems and kindle their interest in cutting edge research areas.

DEPARTMENT OF CHEMISTRY:

The chemistry department is one of the oldest departments (established in 1962) of Ramaiah Institute of Technology. The department consists of 8 well qualified and experienced faculty members: all are doctorate holders. The department also has five non-teaching staff. The department aims at preparing the students for careers in all the fields of engineering aspects and also carry out basic and applied research work. The main activity of the department is to teach engineering chemistry theory and laboratory courses to the under graduate engineering students of all disciplines. Department is also involved in teaching technical chemistry for III semester BE chemical engineering students, along with respective laboratory and also handling open electives for higher semester students. The department is a recognized research centre by VTU. All faculty members are actively engaged in research work. 17 research scholars (11 full time and 6 part time) have registered for Ph.D. and awarded 26 PhD's from the Department. The faculty members of the department have published about 60 research papers in reputed international journals in the current academic year. The department has been conducting FDP's and zero-budget programs regularly for Research scholars.

Vision

Department strives for development of curriculum viewing emerging trends in technology with a balanced approach towards Institute Industry interaction and academic excellence along with research in basic sciences.

Mission

Providing outstanding teaching and quality training in chemistry to all students at all levels and in all disciplines and also develop and maintain research programs of national and international relevance and serve the society through unique expertise and talent found in the department.

DEPARTMENT OF HUMANITIES:

The Department of Humanities has 4 full time and 6 guest faculty members, with two doctorates. The department engages in teaching Communicative English, Professional writing skills in English, Constitution of India, Kannada, Communication skills for BE./B.Arch. students. Apart from this the department runs special classes/bridge courses in Communicative English to train NRI and rural students in English language usage. The faculty members engage in teaching-learning activities, research

publications and conducting workshops for students to build social skills and broaden critical and creative competencies.

The department is also equipped with an English Language lab located in LHC block. First Year BE students take this course as a part of the subject Communicative English, Professional writing skills in English. Building Vocabulary, Grammar, Listening, Speaking skills, Power Point presentations and Group activities form integral part of the course.

Vision

The department of Humanities, RIT aspires to achieve excellence in teaching and training the young engineering students in the areas of humanities and social sciences through outcome based quality education and nurture them to emerge as professional leaders, lifelong learners and responsible citizens of global community.

Mission

The mission of the department is to offer courses that aim to strengthen the students' creative and critical thinking, problem solving abilities, communication skills and broaden intellectual perspectives, to understand and deal with social realities through continuous learning experiences.

Knowledge and Attitude Profile (WK)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering insociety and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer topublic safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding andrespect, and of inclusive attitudes.

PROGRAM OUTCOMES (POs):

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

UG Ist Year Scheme for 2025 Batch

Scheme of Teaching Computer Science & Engineering Stream – for students of CSE, ISE, CSE(AI&ML), CSE (Cyber Security), AI&ML, AI&DS and BT

I SEMESTER (PHYSICS CYCLE)

Sl. No.	Course Code	Course Title	Teaching Department	Category	Total Credits				Total Contact hours / week			
					L	T	P	Total	L	T	P	S
1	MAC11	Calculus & Linear Algebra	Mathematics	ASC	3	1	0	4	3	2	0	3
2	PYC12	Quantum Physics & Applications	Physics	ASC (IC)	3	0	1	4	3	0	2	3
3	ESC13x	Engineering Science Course-I	CV,ME,EEE,ECE,ETE,EIE,MLE	ESC	3	0	0	3	3	0	0	3
4	PSCCS14	Programming in C	CSE, ISE, AI&ML AI&DS, CSE(AI&ML) & CSE(CY)	PSC	3	0	0	3	3	0	0	3
	OR											
	PSCBT14	Elements of Biotechnology & Biomimetic	BT	PSC	3	0	0	3	3	0	0	3
5	HSCP15/25	Soft Skills	Humanities	HSMC	1	0	0	1	1	0	0	1
6	HSCP16/26	Kannada Kali/ Kannada Manasu	Humanities	HSMC	1	0	0	1	1	0	0	1
7	AECP17/27	Innovation & Design Thinking Lab	Respective Departments	AEC	0	0	1	1	0	0	2	0
8	PSCLCS18	C Programming Lab	CSE, ISE, AI&ML AI&DS, CSE(AI&ML) & CSE(CY)	PSC	0	0	1	1	0	0	2	0
	OR											
	PSCLBT18	Elements of Biotechnology Lab	BT	PSC	0	0	1	1	0	0	2	0
9	MELC19	Computer-Aided Engineering Drawing – CS	ME	ESC	0	1	1	2	0	2	2	0
Total					**14**	**2**	**4**	**20**	**14**	**4**	**8**	**14**

AICTE Activity Points students have to earn 100 activity points between I to VIII semester	Compulsory requirement for the award of a degree

Where x= 1,2,3,4,5

Engineering Science Courses-I			
Sl. No.	**Course Code**	**Course Title**	**Not Applicable for**
1	ESC131	Building Sciences and Mechanics	CV
2	ESC132	Introduction to Electrical Engineering	EEE
3	ESC133	Introduction to Electronics & Communication Engineering	ECE
4	ESC134	Introduction to Mechanical Engineering	ME
5	ESC135	Essentials of Information Technology	CSE, ISE, CSE (CY), AI&ML, AI&DS, CSE(AI&ML), BT

Note:

1. Students of CSE, ISE, CSE(AI&ML), CSE (Cyber Security), AI&ML, AI&DS and BT shall opt for any one of the courses from the ESC-I group except, ESC135 - Essentials of Information Technology
2. Students of CSE, ISE, CSE(AI&ML), CSE (Cyber Security), AI&ML, AI&DS shall opt for PSCCS14 - Programming in C and PSCLCS18 - C Programming Lab whereas students of BT shall opt for PSCBT14 - Elements of Biotechnology & Biomimetic and PSCLBT18 - Elements of Biotechnology Lab

Nomenclature - S: Self Learning Hours, ASC-Applied Science Course, ESC- Engineering Science Courses, IC– Integrated Course (Practical Integrated with Theory Course), PSC – Program Specific Course, HSMC-Humanity, Social Science and Management Course, AEC- Ability Enhancement Course

Credit Definition:

- 1 credit = 1 hour/week of lecture (L)
- 1 credit = 2 hours/week of tutorial (T)
- 1 credit = 2 hours/week of practical(P)
- 1 credit = 1 hour/week of Self Learning Hours (S)

Student's Induction Program: The main aim of the induction program is to provide newly admitted students a broad understanding of society, relationships, and values. Along with the knowledge and skill of his/her study, students' character needs to be nurtured as an essential quality by which he/she would understand and fulfill the responsibility as an engineer. The following Motivating (Inspiring) Activities are to be covered over a period of 21 days: Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to Local areas, Familiarization with Department/Branch and Innovation, etc.

The Applied Physics Course is an Integrated course (IC), combining theory with practical components.

- Theory sessions shall be conducted for 3 hours per week, while the practical sessions shall be conducted for 2 hours per week.
- Theory components shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).
- The practical component shall be assessed only through CIE (No SEE).
- However, questions from the practical component of the Integrated course (IC) can be included in the SEE question paper.

Engineering Sciences Courses-I & II (ESC-I & 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 stream courses. Students are required to select and complete two courses that do not belong to their admitted program stream.

Program Specific Courses (PSC): Program Specific Courses (PSC) are a set of core courses tailored to a specific branch or discipline of engineering in which a student is enrolled. 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.

Program Specific Courses Laboratory (PSCL): A student is required to choose and pass laboratory course that is specific to their program stream.

AICTE Activity Points Requirement for BE Programs: 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 program 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.

Scheme of Teaching Computer Science & Engineering Stream – for students of CSE, ISE, CSE(AI&ML), CSE (Cyber Security), AI&ML, AI&DS and BT												
II SEMESTER (CHEMISTRY CYCLE)												
Sl. No.	**Course Code**	**Course Title**	**Teaching Department**	**Category**	**Total Credits**				**Total Contact hours / week**			
					L	**T**	**P**	**Total**	**L**	**T**	**P**	**S**
1	MAC21	Numerical Methods	Mathematics	ASC	3	1	0	4	3	2	0	3
2	CYC22	Applied Chemistry for Smart Systems	Chemistry	ASC (IC)	3	0	1	4	3	0	2	3
3	ESC23x	Engineering Science Course-II	CV, ME, EEE, ECE, ETE, EIE, MLE	ESC	3	0	0	3	3	0	0	3
4	PLC24	Python Programming (For IT & Allied)	CSE, ISE, CSE (CY), CSE (AI&ML), AI&ML, AI&DS, BT	PLC(IC)	3	0	1	4	3	0	2	3
5	ETC15/25	Introduction to AI & Applications	Respective Departments	ETC	3	0	0	3	3	0	0	3
6	HSCC16/26	Communication Skills	Humanities	HSMC	1	0	0	1	1	0	0	1
7	AECC17/27	Interdisciplinary Project-Based Learning	Respective Departments	AEC	0	0	1	1	0	0	2	0
8	HSCC18/28	Constitution of India & Engineering Ethics	Humanities	HSMC (NCMC)	0	0	0	0	1	0	0	0
Total					**16**	**1**	**3**	**20**	**17**	**2**	**6**	**16**

Where x= 1,2,3,4,5

Engineering Science Courses-II			
Sl. No.	**Course Code**	**Course Title**	**Not Applicable for**
1	ESC231	Building Sciences and Mechanics	CV
2	ESC232	Introduction to Electrical Engineering	EEE
3	ESC233	Introduction to Electronics & Communication Engineering	ECE
4	ESC234	Introduction to Mechanical Engineering	ME
5	ESC235	Essentials of Information Technology	CSE, ISE, CSE (CY), CSE (AI&ML), AI&ML, AI&DS, BT

Note:
Students of CSE, ISE, CSE(AI&ML), CSE (Cyber Security), AI&ML, AI&DS and BT shall opt for any one of the courses from the ESC-II group except, ESC235 - Essentials of Information Technology and the one selected in semester I.

Nomenclature - S: Self Learning Hours, ASC-Applied Science Course, ESC: Engineering Science Courses, IC : Integrated Course (Practical Integrated with Theory Course), PLC: Programming Language Course, ETC: Emerging Technology Course, HSMC: Humanity, Social Science and Management Course, AEC: Ability Enhancement Course, NCMC: Non-Credit Mandatory Course

Credit Definition:

- 1 credit = 1 hour/week of lecture (L)
- 1 credit = 2 hours/week of tutorial (T)
- 1 credit = 2 hours/week of practical(P)
- 1 credit = 1 hour/week of Self Learning Hours (S)

The Applied Chemistry Course is an Integrated course (IC), combining theory with practical components.

- Theory sessions shall be conducted for 3 hours per week, while the practical sessions shall be conducted for 2 hours per week.
- Theory components shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End

Examination (SEE).

- The practical component shall be assessed only through CIE (No SEE).
- However, questions from the practical component of the Integrated course (IC) can be included in the SEE question paper.

Engineering Sciences Courses-I & II (ESC-I & 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 stream courses. Students are required to select and complete two courses that do not belong to their admitted program stream.

Programming Language Course is an Integrated course (IC), combining theory with practical components: These courses are designed to broaden the technical knowledge of students beyond in IT skills. These courses enable students to gain a foundational understanding of programming languages. The students from Non-IT streams (CV, EEE & ME) shall choose Introduction to C Programming and the students enrolled in IT stream (CSE & Allied programs) shall choose Python Programming.

The Programming Language Course is an Integrated course (IC), combining theory with practical components**.**

- Theory sessions shall be conducted for 3 hours per week, while the practical sessions shall be conducted for 2 hours per week.
- Theory components shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).
- The practical component shall be assessed only through CIE (No SEE).
- However, questions from the practical component of the Integrated course (IC) can be included in the SEE question paper.

AICTE Activity Points Requirement for BE Programs: 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 program 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.

The Non-Credit Mandatory Course, Intra Institutional Internship: All the students shall have to undergo a mandatory Internship of 02 weeks during the intervening vacation of II and III semesters. Intra Institutional activities followed by a Viva-voce examination shall be conducted during IV semester based on which a student will be declared pass or fail. The internship shall be considered as a head of passing for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete internship requirements during subsequent semesters.

UG Ist Year Scheme for 2025 Batch

Scheme of Teaching Civil Engineering Stream – for students of CV

I SEMESTER (CHEMISTRY CYCLE)

Sl. No.	Course Code	Course Title	Teaching Department	Category	Total Credits				Total Contact hours / week			
					L	T	P	Total	L	T	P	S
1	MAV11	Differential Calculus & Linear Algebra	Mathematics	ASC	3	1	0	4	3	2	0	3
2	CYV12	Applied Chemistry for Sustainable Structure & Material Design	Chemistry	ASC(IC)	3	0	1	4	3	0	2	3
3	ESC13x	Engineering Science Course-I	CV, ME, EEE, ECE, ETE, EIE, MLE	ESC	3	0	0	3	3	0	0	3
4	PLC14	Introduction to C Programming (For Non-IT)	CSE, ISE, CSE (CY), CSE (AI&ML), AI&ML, AI&DS, BT	PLC (IC)	3	0	1	4	3	0	2	3
5	ETC15/25	Introduction to AI & Applications	Respective Departments	ETC	3	0	0	3	3	0	0	3
6	HSCC16/26	Communication Skills	Humanities	HSMC	1	0	0	1	1	0	0	1
7	AECC17/27	Interdisciplinary Project-Based Learning	Respective Departments	AEC	0	0	1	1	0	0	2	0
8	HSCC18/28	Constitution of India & Engineering Ethics	Humanities	HSMC	0	0	0	0	1	0	0	0
Total					**16**	**1**	**3**	**20**	**17**	**2**	**6**	**16**

Where x= 1,2,3,4,5

Engineering Science Courses-I			
Sl. No.	**Course Code**	**Course Title**	**Not Applicable for**
1	ESC131	Building Sciences and Mechanics	CV
2	ESC132	Introduction to Electrical Engineering	EEE
3	ESC133	Introduction to Electronics & Communication Engineering	ECE
4	ESC134	Introduction to Mechanical Engineering	ME
5	ESC135	Essentials of Information Technology	CSE, ISE, CSE (CY), AI&ML, AI&DS, CSE(AI&ML), BT

Note:
Students of CV shall opt for any one of the courses from the ESC-I group except, ESC131- Building Sciences and Mechanics.

Nomenclature -S: Self Learning Hours, ASC: Applied Science Course, ESC: Engineering Science Courses, IC: Integrated Course (Practical Integrated with Theory Course), PLC: Programming Language Course, ETC: Emerging Technology Course, HSMC: Humanity, Social Science and Management Course, AEC: Ability Enhancement Course, NCMC: Non-Credit Mandatory Course

Credit Definition:

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- 1 credit = 2 hours/week of practical(P)
- 1 credit = 1 hour/week of Self Learning Hours (S)

Student's Induction Program: The main aim of the induction program is to provide newly admitted students a broad understanding of society, relationships, and values. Along with the knowledge and skill of his/her study. Students' character needs to be nurtured as an essential quality by which he/she would understand and fulfill the responsibility as an engineer. The following Motivating (Inspiring) Activities are to be covered over a period of 21 days: Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to Local areas, Familiarization with Department/Branch and Innovation, etc.

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- The practical component shall be assessed only through CIE (No SEE).
- However, questions from the practical component of the Integrated course (IC) can be included in the SEE question paper.

Engineering Sciences Courses-I & II (ESC-I & 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 stream courses. Students are required to select and complete two courses that do not belong to their admitted program stream.

Programming Language Course is an Integrated course (IC), combining theory with practical components: These courses are designed to broaden the technical knowledge of students beyond in IT skills. These courses enable students to gain a foundational understanding of programming languages. The students from Non-IT streams (CV, EEE & ME) shall choose Introduction to C Programming and the students enrolled in IT stream (CSE & Allied programs) shall choose Python Programming.

The Programming Language Course is an Integrated course (IC), combining theory with practical components**.**

- Theory sessions shall be conducted for 3 hours per week, while the practical sessions shall be conducted for 2 hours per week.
- Theory components shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).
- The practical component shall be assessed only through CIE (No SEE).
- However, questions from the practical component of the Integrated course (IC) can be included in the SEE question paper.

AICTE Activity Points Requirement for BE Programs: 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:

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3. **Students transferred** from other universities directly into the V 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 program but fails to earn the required Activity Points, the VIII 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.

Scheme of Teaching Civil Engineering Stream – for students of CV												
II SEMESTER (PHYSICS CYCLE)												
Sl. No.	**Course Code**	**Course Title**	**Teaching Department**	**Category**	**Total Credits**				**Total Contact hours / week**			
					L	**T**	**P**	**Total**	**L**	**T**	**P**	**S**
1	MAV21	Differential Calculus & Numerical Methods	Mathematics	ASC	3	1	0	4	3	2	0	3
2	PYV22	Physics for Sustainable Structural Systems	Physics	ASC (IC)	3	0	1	4	3	0	2	3
3	ESC23x	Engineering Science Course-II	CV, ME, EEE, ECE, ETE, EIE, MLE	ESC	3	0	0	3	3	0	0	3
4	PSCCV24	Engineering Mechanics	CV	PSC	3	0	0	3	3	0	0	3
5	HSCP15/25	Soft Skills	Humanities	HSMC	1	0	0	1	1	0	0	1
6	HSCP16/26	Kannada Kali/ Kannada Manasu	Humanities	HSMC	1	0	0	1	1	0	0	1
7	AECP17/27	Innovation & Design Thinking Lab	Respective Departments	AEC	0	0	1	1	0	0	2	0
8	PSCLCV28	Mechanics & Materials Lab	CV	PSC	0	0	1	1	0	0	2	0
9	MELV29	Computer-Aided Engineering Drawing – CV	ME	ESC	0	1	1	2	0	2	2	0
Total					**14**	**2**	**4**	**20**	**14**	**4**	**8**	**14**
AICTE Activity Points students have to earn 100 activity points between I to VIII semester				Compulsory requirement for the award of a degree								

Where x= 1,2,3,4,5

Engineering Science Courses-II			
Sl. No.	**Course Code**	**Course Title**	**Not Applicable for**
1	ESC231	Building Sciences and Mechanics	CV
2	ESC232	Introduction to Electrical Engineering	EEE
3	ESC233	Introduction to Electronics & Communication Engineering	ECE
4	ESC234	Introduction to Mechanical Engineering	ME
5	ESC235	Essentials of Information Technology	CSE, ISE, CSE (CY), AI&ML, AI&DS, CSE(AI&ML), BT

Note:
Students of CV shall opt for any one of the courses from the ESC-II group except, ESC231 - Building Sciences and Mechanics and the one selected in semester I.

Nomenclature - S: Self Learning Hours, ASC-Applied Science Course, ESC- Engineering Science Courses, IC – Integrated Course (Practical Integrated with Theory Course), PSC – Program Specific Course, HSMC-Humanity, Social Science and Management Course, AEC- Ability Enhancement Course

Credit Definition:

- 1 credit = 1 hour/week of lecture (L)
- 1 credit = 2 hours/week of tutorial (T)
- 1 credit = 2 hours/week of practical(P)
- 1 credit = 1 hour/week of Self Learning Hours (S)

The Applied Physics Course is an Integrated course (IC), combining theory with practical components.

- Theory sessions shall be conducted for 3 hours per week, while the practical sessions shall be conducted for 2 hours per week.
- Theory components shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).
- The practical component shall be assessed only through CIE (No SEE).
- However, questions from the practical component of the Integrated course (IC) can be included in the SEE question paper.

Engineering Sciences Courses-I & II (ESC-I & 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 stream courses. Students are required to select and complete two courses that do not belong to their admitted program stream.

Program Specific Courses (PSC): Program Specific Courses (PSC) are a set of core courses tailored to a specific branch or discipline of engineering in which a student is enrolled. 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.

Program Specific Courses Laboratory (PSCL): A student is required to choose and pass laboratory course that is specific to their program stream.

AICTE Activity Points Requirement for BE Programs: 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 program 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.

The Non-Credit Mandatory Course, Intra Institutional Internship: All the students shall have to undergo a mandatory Internship of 02 weeks during the intervening vacation of II and III semesters. Intra Institutional activities followed by a Viva-voce examination shall be conducted during IV semester based on which a student will be declared pass or fail. The internship shall be considered as a head of passing for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete internship requirements during subsequent semesters.

UG Ist Year Scheme for 2025 Batch

Scheme of Teaching Electrical & Electronics Engineering Stream – for students of ECE, EEE, EIE, ETE and MLE

I SEMESTER (CHEMISTRY CYCLE)

Sl. No.	Course Code	Course Title	Teaching Department	Category	Total Credits				Total Contact hours / week			
					L	T	P	Total	L	T	P	S
1	MAE11	Differential Calculus & Linear Algebra	Mathematics	ASC	3	1	0	4	3	2	0	3
2	CYE12	Applied Chemistry for Emerging Electronics & Futuristic Devices	Chemistry	ASC(IC)	3	0	1	4	3	0	2	3
3	ESC13x	Engineering Science Course-I	CV, ME, EEE, ECE, ETE, EIE, MLE	ESC	3	0	0	3	3	0	0	3
4	PLC14	Introduction to C Programming (For Non-IT)	CSE, ISE, CSE (CY), CSE (AI&ML), AI&ML, AI&DS, BT	PLC (IC)	3	0	1	4	3	0	2	3
5	ETC15/25	Introduction to AI & Applications	Respective Departments	ETC	3	0	0	3	3	0	0	3
6	HSCC16/26	Communication Skills	Humanities	HSMC	1	0	0	1	1	0	0	1
7	AECC17/27	Interdisciplinary Project-Based Learning	Respective Departments	AEC	0	0	1	1	0	0	2	0
8	HSCC18/28	Constitution of India & Engineering Ethics	Humanities	HSMC	0	0	0	0	1	0	0	0
Total					**16**	**1**	**3**	**20**	**17**	**2**	**6**	**16**

Where x= 1,2,3,4,5

Engineering Science Courses-I			
Sl. No.	**Course Code**	**Course Title**	**Not Applicable for**
1	ESC131	Building Sciences and Mechanics	CV
2	ESC132	Introduction to Electrical Engineering	EEE
3	ESC133	Introduction to Electronics & Communication Engineering	ECE
4	ESC134	Introduction to Mechanical Engineering	ME
5	ESC135	Essentials of Information Technology	CSE, ISE, CSE (CY), AI&ML, AI&DS, CSE(AI&ML), BT

Note:
Students of EEE shall opt for any one of the courses from the ESC-I group except, ESC132 - Introduction to Electrical Engineering and students of ECE, EIE, ETC, MLE shall opt for any one of the courses from ESC-I group except ESC133 - Introduction to Electronics & Communication Engineering.

Nomenclature -S: Self Learning Hours, ASC: Applied Science Course, ESC: Engineering Science Courses, IC: Integrated Course (Practical Integrated with Theory Course), PLC: Programming Language Course, ETC: Emerging Technology Course, HSMC: Humanity, Social Science and Management Course, AEC: Ability Enhancement Course, NCMC: Non Credit Mandatory Course

Credit Definition:

- 1 credit = 1 hour/week of lecture (L)
- 1 credit = 2 hours/week of tutorial (T)
- 1 credit = 2 hours/week of practical(P)
- 1 credit = 1 hour/week of Self Learning Hours (S)

Student's Induction Program: The main aim of the induction program is to provide newly admitted students a broad understanding of society, relationships, and values. Along with the knowledge and skill of his/her study. Students' character needs to be nurtured as an essential quality by which he/she would understand and fulfill the

responsibility as an engineer. The following Motivating (Inspiring) Activities are to be covered over a period of 21 days: Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to Local areas, Familiarization with Department/Branch and Innovation, etc.

The Applied Chemistry Course is an Integrated course (IC), combining theory with practical components.

- Theory sessions shall be conducted for 3 hours per week, while the practical sessions shall be conducted for 2 hours per week.
- Theory components shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).
- The practical component shall be assessed only through CIE (No SEE).
- However, questions from the practical component of the Integrated course (IC) can be included in the SEE question paper.

Engineering Sciences Courses-I & II (ESC-I & 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 stream courses. Students are required to select and complete two courses that do not belong to their admitted program stream.

Programming Language Course is an Integrated course (IC), combining theory with practical components: These courses are designed to broaden the technical knowledge of students beyond in IT skills. These courses enable students to gain a foundational understanding of programming languages. The students from Non-IT streams (CV, EEE & ME) shall choose Introduction to C Programming and the students enrolled in IT stream (CSE & Allied programs) shall choose Python Programming.

The Programming Language Course is an Integrated course (IC), combining theory with practical components**.**

- Theory sessions shall be conducted for 3 hours per week, while the practical sessions shall be conducted for 2 hours per week.
- Theory components shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).
- The practical component shall be assessed only through CIE (No SEE).
- However, questions from the practical component of the Integrated course (IC) can be included in the SEE question paper.

AICTE Activity Points Requirement for BE Programs: 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 V 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 program but fails to earn the required Activity Points, the VIII 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.

Scheme of Teaching Electrical & Electronics Engineering Stream – for students of ECE, EEE, EIE, ETE and MLE												
II SEMESTER (PHYSICS CYCLE)												
Sl. No.	**Course Code**	**Course Title**	**Teaching Department**	**Category**	**Total Credits**				**Total Contact hours / week**			
					L	**T**	**P**	**Total**	**L**	**T**	**P**	**S**
1	MAE21	Calculus, Laplace Transform & Numerical Techniques	Mathematics	ASC	3	1	0	4	3	2	0	3
2	PYEE22	Physics of Electrical & Electronics Materials	Physics	ASC (IC)	3	0	1	4	3	0	2	3
	OR											
	PYEC22	Quantum Physics & Electronic Sensors	Physics	ASC (IC)	3	0	1	4	3	0	2	3
3	ESC23x	Engineering Science Course-II	CV, ME, EEE,ECE, ETE, EIE, MLE	ESC	3	0	0	3	3	0	0	3
4	PSCEE24	Basics of Electrical Engineering	EEE	PSC	3	0	0	3	3	0	0	3
	OR											
	PSCEC24	Fundamentals of Electronics & Communication Engineering	ECE, ETE, EIE, MLE	PSC	3	0	0	3	3	0	0	3
5	HSCP15/25	Soft Skills	Humanities	HSMC	1	0	0	1	1	0	0	1
6	HSCP16/26	Kannada Kali/ Kannada Manasu	Humanities	HSMC	1	0	0	1	1	0	0	1
7	AECP17/27	Innovation & Design Thinking Lab	Respective Departments	AEC	0	0	1	1	0	0	2	0
8	PSCLEE28	Basic Electrical Engineering Lab	EEE	PSC	0	0	1	1	0	0	2	0
	OR											
	PSCLEC28	Fundamentals of Electronics & Communication Engineering Lab	ECE, ETE, EIE, MLE	PSC	0	0	1	1	0	0	2	0
9	MELEE29	Computer-Aided Engineering Drawing – EE	ME	ESC	0	1	1	2	0	2	2	0
	OR											
	MELEC29	Computer-Aided Engineering Drawing – EC	ME	ESC	0	1	1	2	0	2	2	0
Total					**14**	**2**	**4**	**20**	**14**	**4**	**8**	**14**
AICTE Activity Points students have to earn 100 activity points between I to VIII semester				Compulsory requirement for the award of a degree								

Where x= 1,2,3,4,5

Engineering Science Courses-II			
Sl. No.	**Course Code**	**Course Title**	**Not Applicable for**
1	ESC231	Building Sciences and Mechanics	CV
2	ESC232	Introduction to Electrical Engineering	EEE
3	ESC233	Introduction to Electronics & Communication Engineering	ECE
4	ESC234	Introduction to Mechanical Engineering	ME
5	ESC235	Essentials of Information Technology	CSE, ISE, CSE (CY), AI&ML, AI&DS, CSE(AI&ML), BT

Note:
Students of EEE shall opt for any one of the courses from the ESC-II group except, ESC232 - Introduction to Electrical Engineering and students of ECE, EIE, ETC, MLE shall opt for any one of the courses from ESC-II group except ESC233 - Introduction to Electronics & Communication Engineering and the one selected in semester I.

Nomenclature - S: Self Learning Hours, ASC-Applied Science Course, ESC- Engineering Science Courses, IC – Integrated Course (Practical Integrated with Theory Course), PSC – Program Specific Course, HSMC-Humanity, Social Science and Management Course, AEC- Ability Enhancement Course

Credit Definition:

- 1 credit = 1 hour/week of lecture (L)
- 1 credit = 2 hours/week of tutorial (T)
- 1 credit = 2 hours/week of practical(P)
- 1 credit = 1 hour/week of Self Learning Hours (S)

The Applied Physics Course is an Integrated course (IC), combining theory with practical components.

- Theory sessions shall be conducted for 3 hours per week, while the practical sessions shall be conducted for 2 hours per week.
- Theory components shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).
- The practical component shall be assessed only through CIE (No SEE).
- However, questions from the practical component of the Integrated course (IC) can be included in the SEE question paper.

Engineering Sciences Courses-I & II (ESC-I & 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 stream courses. Students are required to select and complete two courses that do not belong to their admitted program stream.

Program Specific Courses (PSC): Program 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.

Program Specific Courses Laboratory (PSCL): A student is required to choose and pass laboratory course that is specific to their program stream.

AICTE Activity Points Requirement for BE Programs: 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 program 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.

The Non-Credit Mandatory Course, Intra Institutional Internship: All the students shall have to undergo a mandatory Internship of 02 weeks during the intervening vacation of II and III semesters. Intra Institutional activities followed by a Viva-voce examination shall be conducted during IV semester based on which a student will be declared pass or fail. The internship shall be considered as a head of passing for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete internship requirements during subsequent semesters.

UG Ist Year Scheme for 2025 Batch

Scheme of Teaching Mechanical Engineering Stream – for students of AS, CH, IEM and ME

I SEMESTER (CHEMISTRY CYCLE)

Sl. No.	Course Code	Course Title	Teaching Department	Category	Total Credits				Total Contact hours / week			
					L	T	P	Total	L	T	P	S
1	MAM11	Differential Calculus & Linear Algebra	Mathematics	ASC	3	1	0	4	3	2	0	3
2	CYM12	Applied Chemistry for Advanced Metal Protection & Sustainable Energy systems	Chemistry	ASC(IC)	3	0	1	4	3	0	2	3
3	ESC13x	Engineering Science Course-I	CV, ME, EEE, ECE, ETE, EIE, MLE	ESC	3	0	0	3	3	0	0	3
4	PLC14	Introduction to C Programming (For Non-IT)	CSE, ISE, CSE (CY), CSE (AI&ML), AI&ML, AI&DS, BT	PLC (IC)	3	0	1	4	3	0	2	3
5	ETC15/25	Introduction to AI & Applications	Respective Departments	ETC	3	0	0	3	3	0	0	3
6	HSCC16/26	Communication Skills	Humanities	HSMC	1	0	0	1	1	0	0	1
7	AECC17/27	Interdisciplinary Project-Based Learning	Respective Departments	AEC	0	0	1	1	0	0	2	0
8	HSCC18/28	Constitution of India & Engineering Ethics	Humanities	HSMC	0	0	0	0	1	0	0	0
Total					**16**	**1**	**3**	**20**	**17**	**2**	**6**	**16**

Where x= 1,2,3,4,5

Engineering Science Courses-I			
Sl. No.	**Course Code**	**Course Title**	**Not Applicable for**
1	ESC131	Building Sciences and Mechanics	CV
2	ESC132	Introduction to Electrical Engineering	EEE
3	ESC133	Introduction to Electronics & Communication Engineering	ECE
4	ESC134	Introduction to Mechanical Engineering	ME
5	ESC135	Essentials of Information Technology	CSE, ISE, CSE (CY), AI&ML, AI&DS, CSE(AI&ML), BT

Note:
Students of ME shall opt for any one of the courses from the ESC-I group except, ESC134 - Introduction to Mechanical Engineering.

Nomenclature -S: Self Learning Hours, ASC: Applied Science Course, ESC: Engineering Science Courses, IC: Integrated Course (Practical Integrated with Theory Course), PLC: Programming Language Course, ETC: Emerging Technology Course, HSMC: Humanity, Social Science and Management Course, AEC: Ability Enhancement Course, NCMC: Non Credit Mandatory Course

Credit Definition:

- 1 credit = 1 hour/week of lecture (L)
- 1 credit = 2 hours/week of tutorial (T)
- 1 credit = 2 hours/week of practical(P)
- 1 credit = 1 hour/week of Self Learning Hours (S)

Student's Induction Program: The main aim of the induction program is to provide newly admitted students a broad understanding of society, relationships, and values. Along with the knowledge and skill of his/her study. Students' character needs to be nurtured as an essential quality by which he/she would understand and fulfill the responsibility as an engineer. The following Motivating (Inspiring) Activities are to be covered over a period of 21 days: Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to Local areas, Familiarization with Department/Branch and Innovation, etc.

The Applied Chemistry Course is an Integrated course (IC), combining theory with practical components.

- Theory sessions shall be conducted for 3 hours per week, while the practical sessions shall be conducted for 2 hours per week.
- Theory components shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).
- The practical component shall be assessed only through CIE (No SEE).
- However, questions from the practical component of the Integrated course (IC) can be included in the SEE question paper.

Engineering Sciences Courses-I & II (ESC-I & 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 stream courses. Students are required to select and complete two courses that do not belong to their admitted program stream.

Programming Language Course is an Integrated course (IC), combining theory with practical components: These courses are designed to broaden the technical knowledge of students beyond in IT skills. These courses enable students to gain a foundational understanding of programming languages. The students from Non-IT streams (CV, EEE & ME) shall choose Introduction to C Programming and the students enrolled in IT stream (CSE & Allied programs) shall choose Python Programming.

The Programming Language Course is an Integrated course (IC), combining theory with practical components**.**

- Theory sessions shall be conducted for 3 hours per week, while the practical sessions shall be conducted for 2 hours per week.
- Theory components shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).
- The practical component shall be assessed only through CIE (No SEE).
- However, questions from the practical component of the Integrated course (IC) can be included in the SEE question paper.

AICTE Activity Points Requirement for BE Programs: 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 V 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 program but fails to earn the required Activity Points, the VIII 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.

Scheme of Teaching Mechanical Engineering Stream – for students of AS, CH, IEM and ME												
II SEMESTER (PHYSICS CYCLE)												
Sl. No.	**Course Code**	**Course Title**	**Teaching Department**	**Category**	**Total Credits**				**Total Contact hours / week**			
					L	**T**	**P**	**Total**	**L**	**T**	**P**	**S**
1	MAM21	Multivariable Calculus & Numerical Methods	Mathematics	ASC	3	1	0	4	3	2	0	3
2	PYM22	Physics of Materials	Physics	ASC (IC)	3	0	1	4	3	0	2	3
3	ESC23x	Engineering Science Course-II	CV, ME, EEE, ECE, ETE,EIE,MLE	ESC	3	0	0	3	3	0	0	3
4	PSCME24	Elements of Mechanical Engineering	ME/IEM	PSC	3	0	0	3	3	0	0	3
	OR											
	PSCCH24	Elements of Chemical Engineering	CH	PSC	3	0	0	3	3	0	0	3
	OR											
	PSCAS24	Elements of Aeronautical Engineering	AS	PSC	3	0	0	3	3	0	0	3
5	HSCP15/25	Soft Skills	Humanities	HSMC	1	0	0	1	1	0	0	1
6	HSCP16/26	Kannada Kali/ Kannada Manasu	Humanities	HSMC	1	0	0	1	1	0	0	1
7	AECP17/27	Innovation & Design Thinking Lab	Respective Departments	AEC	0	0	1	1	0	0	2	0
8	PSCLME28	Elements of Mechanical Engineering Lab/ Workshop	ME/IEM	PSC	0	0	1	1	0	0	2	0
	OR											
	PSCLCH28	Elements of Chemical Engineering Lab	CH	PSC	0	0	1	1	0	0	2	0
	OR											
	PSCLAS28	Elements of Aeronautical Engineering Lab	AS	PSC	0	0	1	1	0	0	2	0
9	MELM29	Computer-Aided Engineering Drawing – ME	ME	ESC	0	1	1	2	0	2	2	0
Total					**14**	**2**	**4**	**20**	**14**	**4**	**8**	**14**
AICTE Activity Points students have to earn 100 activity points between I to VIII semester				Compulsory requirement for the award of a degree								

Where x= 1,2,3,4,5

Engineering Science Courses-II			
Sl. No.	**Course Code**	**Course Title**	**Not Applicable for**
1	ESC231	Building Sciences and Mechanics	CV
2	ESC232	Introduction to Electrical Engineering	EEE
3	ESC233	Introduction to Electronics & Communication Engineering	ECE
4	ESC234	Introduction to Mechanical Engineering	ME
5	ESC235	Essentials of Information Technology	CSE, ISE, CSE (CY), AI&ML, AI&DS, CSE(AI&ML), BT

Note:
Students of ME, IEM, AS and CH shall opt for any one of the courses from the ESC-II group except, ESC234 - Introduction to Mechanical Engineering and the one selected in semester I

Nomenclature - S: Self Learning Hours, ASC-Applied Science Course, ESC- Engineering Science Courses, IC – Integrated Course (Practical Integrated with Theory Course), PSC – Program Specific Course, HSMC-Humanity, Social Science and Management Course, AEC- Ability Enhancement Course

Credit Definition:

- 1 credit = 1 hour/week of lecture (L)
- 1 credit = 2 hours/week of tutorial (T)
- 1 credit = 2 hours/week of practical(P)
- 1 credit = 1 hour/week of Self Learning Hours (S)

The Applied Physics Course is an Integrated course (IC), combining theory with practical components.

- Theory sessions shall be conducted for 3 hours per week, while the practical sessions shall be conducted for 2 hours per week.
- Theory components shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).
- The practical component shall be assessed only through CIE (No SEE).
- However, questions from the practical component of the Integrated course (IC) can be included in the SEE question paper.

Engineering Sciences Courses-I & II (ESC-I & 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 stream courses. Students are required to select and complete two courses that do not belong to their admitted program stream.

Program Specific Courses (PSC): Program Specific Courses (PSC) are a set of core courses tailored to a specific branch or discipline of engineering in which a student is enrolled. 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.

Program Specific Courses Laboratory (PSCL): A student is required to choose and pass laboratory course that is specific to their program stream.

AICTE Activity Points Requirement for BE Programs: 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 program 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.

The Non-Credit Mandatory Course, Intra Institutional Internship: All the students shall have to undergo a mandatory Internship of 02 weeks during the intervening vacation of II and III semesters. Intra Institutional activities followed by a Viva-voce examination shall be conducted during IV semester based on which a student will be declared pass or fail. The internship shall be considered as a head of passing for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete internship requirements during subsequent semesters.

COMPUTER SCIENCE & ENGINEERING STREAM

I SEMESTER

CALCULUS AND LINEAR ALGEBRA

Course Code: MAC11 **Credits:** 3:1:0
Pre-requisites: Nil **Contact Hours:** 45L+30T

Course Coordinators: Dr. S Ramprasad & Dr. Sushma S

Course Content

Unit I

Calculus

Taylor's and Maclaurin's series expansion for one variable. Introduction to polar coordinates and polar curves. Partial differentiation, total derivative, differentiation of composite functions, Jacobian, Taylor's and Maclaurin's series expansion for two variables. Maxima and minima for the function of two variables.

- Pedagogy / Course delivery tools:
  - Chalk & talk
- Links:
  - https://nptel.ac.in/courses/111105121
- Impartus recording:
  - https://a.impartus.com/ilc/#/course/2583981/1205
  - https://a.impartus.com/ilc/#/course/107625/1030

Unit II

Vector Calculus

Vector Differentiation: Scalar and vector fields, gradient, directional derivatives, divergence and curl - physical interpretation, solenoidal vector fields, irrotational vector fields and scalar potential.

Curvilinear coordinates: scale factors, base vectors, cylindrical polar coordinates, spherical polar coordinates, transformation between Cartesian and curvilinear systems, orthogonality.

- Pedagogy / Course delivery tools:
  - Chalk & talk, Power point presentation
- Links:
  - https://nptel.ac.in/courses/111105134
- Impartus recording:
  - https://a.impartus.com/ilc/#/course/107625/1030

Unit III

System of Linear equations, Eigenvalues and Eigenvectors

Elementary row transformation of a matrix, Echelon form, rank of a matrix. Consistency and solution of system of linear equations: Gauss elimination method, engineering applications.

Eigenvalues and Eigenvectors, Rayleigh power method, diagonalization of a matrix, solution of system of differential equations by matrix method.

- Pedagogy / Course delivery tools:
  - Chalk & talk, Power point presentation
- Links:
  - https://nptel.ac.in/courses/111105121
  - https://nptel.ac.in/courses/111105035
- Impartus recording:
  - https://a.impartus.com/ilc/#/course/2583981/1205
  - https://a.impartus.com/ilc/#/course/619570/1030
  - https://a.impartus.com/ilc/#/course/621524/1030

Unit IV

Vector Space

Vector spaces: definition and examples, subspace: definition and examples. Linear

combinations, linear span, linearly independent and dependent sets, basis and dimension, row space and column space of a matrix, inner products and orthogonality.

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation
- Links: ➢ https://nptel.ac.in/courses/111105035
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/621524/1030

Unit V

Linear Transformation

Definition and examples, algebra of linear transformations, matrix of a linear transformation. Singular, non-singular and invertible linear transformations, coordinate vectors, change of basis. Rank and nullity of linear transformations, Rank-Nullity theorem.

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation
- Links: ➢ https://nptel.ac.in/courses/111105121 ➢ https://nptel.ac.in/courses/111105035
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/619570/1030

Text books:

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

Reference books:

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

Course Outcomes (COs):

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

1. Apply series expansions, partial differentiation, and Jacobians to analyze multivariable functions (PO-1, PO-2)
2. Perform vector differentiation and analyze the transformations between cartesian and curvilinear systems (PO-1, PO-2)
3. Examine and solve the systems of linear equations and compute eigenvalues and eigenvectors (PO-1, PO-2)
4. Determine basis and dimension of a vector space, and apply inner products with orthogonality (PO-1, PO-2)
5. Characterize Linear transformations and find their rank and nullity (PO-1, 2)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal Test-I	30	CO1, CO2, CO3
Internal Test-II	30	CO3, CO4, CO5
Average of the two tests shall be taken for 30 marks		
Other Components		
Assignment	10	CO1, CO2, CO3
Quiz	10	CO3, CO4, CO5
Semester End Examination (SEE) (Scaled to 50 Marks)	100	CO1, CO2, CO3, CO4, CO5

QUANTUM PHYSICS AND APPLICATIONS

Course Code: PYC12 **Credits:** 3:0:1
Pre-requisites: Nil **Contact Hours:** 45L+30P

Course Coordinator: Dr. Seema Agarwal

Course Content

Unit I

Photonics

Lasers: Characteristics of LASER, Interaction of radiation with matter, Expression for energy density equation and its significance, Requisites of a Laser system, Conditions for Laser action, Principle, Construction and working of He-Ne laser, Semiconductor Laser, Application of Laser – Holography, LIDAR, Use of attenuators for single photon sources (Mach-Zehnder Interferometer)

Optical Fibers: Review of the principle and Propagation mechanism in Fibers, Angle of acceptance, Numerical aperture, fractional index change, Modes of propagation, Number of modes and V parameter, Types of optical fibers, Attenuation, and Mention of expression for attenuation coefficient, Applications: Point to point communication discussion with block diagram, Merits and demerits, Numerical problems.

- Pedagogy / Course delivery tools: ➢ Chalk & talk
- Links: ➢ https://nptel.ac.in/courses/108106135/03
- Impartus recording: ➢ https://nptel.ac.in/courses/108106135/03

Unit II

Quantum Mechanics

Wave-Particle dualism: de- Broglie Hypothesis and Matter Waves, de Broglie wavelength and derivation of expression by analogy, Phase Velocity and Group Velocity (Derivation for Vg, relation between Vp & Vg, relation between particle velocity and group velocity), Heisenberg's Uncertainty Principle and its application (Nonexistence of electron inside the nucleus -Relativistic), Wave Function, Physical Significance of a wave function and Born Interpretation, Time independent Schrodinger wave equation, Eigen functions and Eigen Values, Motion of a particle in a one dimensional potential well of infinite depth, Waveforms and Probabilities, Particle in a finite potential well and quantum mechanical tunnelling, Numerical Problems.

- Pedagogy / Course delivery tools: ➢ Chalk & talk
- Links: ➢ https://nptel.ac.in/courses/115106066
- Impartus recording: ➢ http://a.impartus.com/ilc/#/course/59743/295

Unit III

Electrical Properties of Metals and Semiconductors

Electrical Conductivity in metals: Resistivity and Mobility, Concept of Phonon, Matheissen's rule. Quantum free electron theory, Fermi energy, Fermi factor, Variation of Fermi factor with Temperature and Energy, F-D statistics, Density of states (derivation), Expression for EF (Derivation).

Semiconductors: Expression for concentration of electrons in conduction band

(derivation), holes concentration in valance band (only mention the expression), Law of mass action, Conductivity in semiconductors (derivation), Fermi level for intrinsic semiconductor (derivation), Hall effect, Expression for Hall coefficient (derivation) and its application. Numerical problems.

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation, videos
- Links: ➢ https://nptel.ac.in/courses/108108174/05
- Impartus recording: ➢ http://a.impartus.com/ilc/#/course/59743/295

Unit IV

Superconductivity

Zero resistance state, Persistent current, Meissner effect, Critical temperature, Critical current (Silsbee Effect) – Derivation of expression of critical current for a cylindrical wire using ampere's law, Critical field, Formation of Cooper pairs - Mediation of phonons, Two-fluid model, BCS Theory - Phase coherent state, Limitations of BCS theory, examples of systems with low and high electron-phonon coupling, Type-I and Type-II superconductors, Formation of Vortices, Explanation for upper critical field, Cooper pair tunnelling (Andreev reflection), Josephson junction, Flux quantization, DC and AC SQUID (Qualitative), MAGLEV, Numerical problems.

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation, videos
- Links: ➢ https://digimat.in/nptel/courses/video/115105131/L01.html
- Impartus recording: ➢ http://a.impartus.com/ilc/#/course/59743/295

Unit V

Quantum Computation

Principles of Quantum Information & Quantum Computing: Introduction to Quantum Computing, Moore's law- limitation of VLSI. the concept of qubit, Single particle quantum interference, Classical & quantum information comparison. Differences between classical & quantum computing, quantum superposition.

Wave Function in Ket Notation: Matrix form of wave function, Identity Operator, Determination of $I|0>$ and $I|1>$, Pauli Matrices and its operations on 0 and 1 states, Inner Product), Probability, Orthogonality, Orthonormality.

Properties of a qubit: Mathematical representation. Summation of probabilities, Representation of qubit by Bloch sphere, brief discussion on types of qubits (Superconducting qubits, trapped ion qubits, photonic qubits, and spin qubits)

Quantum Entanglement: the phenomenon of quantum entanglement, Entangled and non-entangled systems, Applications in quantum teleportation

Quantum Gates: Single Qubit Gates; Quantum Not Gate, Pauli Gates, Phase shift gate (S,P), Hadamard Gate. Multiple Qubit Gates; Controlled gate - CNOT Gate. Numerical problems.

- Pedagogy / Course delivery tools: ➢ Chalk & talk
- Links: ➢ https://www.youtube.com/watch?v=nGPr1QM_XrY
- Impartus recording: ➢ http://a.impartus.com/ilc/#/course/59743/295

Text books:

1. **Shatendra Sharma and Jyotsna Sharma -** Engineering Physics, Pearson, 2018.
2. **S O Pillai -** Solid State Physics, New Age International Publishers, 11th edition, 2025.
3. **Parag K Lala -** Quantum Computing, McGraw Hill, 2020.

Reference books:

1. **Resnick, Halliday and Jearl Walker -** Fundamentals of Physics, John Wiley & Sons, Inc., 11th edition, 2018.
2. **Kenneth S.Krane -** Modern Physics, Wiley-India- 3rd edition, 2019.
3. **Maria Luisa -** Quantum Computation and Logic: How Quantum Computers Have Inspired Logical Investigations, 2018

Practical Component (Lab experiments):

1. Plotting of forward and reverse bias characteristics of a Zener Diode and determination of breakdown voltage
2. Determination of numerical aperture, Acceptance angle and bending loss in Optical Fibre Cable
3. Measurement of capacitance and dielectric constant of a capacitor by charging and discharging it through a resistor
4. Determination of Planck's constant using LEDs
5. Verification of Stefan's law
6. Identification of different components (L,C or R) of a Black Box and calculation of their values through frequency response curves
7. Determination of Moment of inertia of an irregular body and calculation of rigidity modulus
8. Measurement of Young's Modulus of the material of the single cantilever beam
9. Determination of Energy gap of semiconductor
10. Determination of Fermi energy of a metal
11. Measurement of operating wavelength of semiconductor laser using Laser diffraction.
12. Calculation of thickness of given paper strip by the method of interference fringes (Air wedge)
13. Frequency response of series and parallel LCR circuits and calculation of Q-factor and band width
14. Determination of Hall coefficient and concentration of charge carriers of the semiconductor
15. Simulation of electrical experiments using PSPICE open source software
16. Predicting the outputs of various combinations of single and two-qubit gates using QUISKIT.

****Students are required to perform 12 prescribed experiments in the Physics lab from the above list**.**

Course Outcomes (COs):

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

1. Interpret the interaction of radiation with matter and the operational principles of Photonic devices and their applications (PO-1, PO-2)
2. Distinguish between phase and group velocities; solve Schrödinger's time-independent wave equation for the case of an infinite potential well (PO-1, PO-2)
3. Apply the quantum theory to understand the electrical conductivity of metals and semiconductors (PO-1, PO-2)
4. Describe the fundamental principles of superconductivity and their relevance in quantum systems and devices (PO-1, PO-2)
5. Illustrate the basic concepts of quantum computing, including qubits and quantum gates, and predict simple outcomes using theoretical circuit models. (PO-1, PO-2)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal Test-I	30	CO1, CO2, CO3
Internal Test-II	30	CO3, CO4, CO5
Average of the two tests shall be taken for 30 marks		
CIE practical component assessment		
Regular performance of experiments in the lab	15	CO1, CO2, CO3, CO4, CO5
Lab Test	05	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE) (Scaled to 50 Marks)	100	CO1, CO2, CO3, CO4, CO5

PROGRAMMING IN C

Course Code: PSCCS14 **Credits:** 3:0:0
Pre-requisites: Nil **Contact Hours:** 45L

Course Coordinator: Pallavi N

Course Content

Unit I

Introduction to Computing: Computer languages, Creating and Running Programs, System Development.

Overview of C: A Brief History of C, C Is a Middle-Level Language, C Is a Structured Language, C Is a Programmer's Language, Compilers Vs. Interpreters, The Form of a C Program, The Library and Linking, Separate Compilation, Compiling a C Program, C's Memory Map.

Expressions: The Basic Data Types, Modifying the Basic Types, Identifier Names, Variables, The Four C Scopes, Type Qualifiers, Storage Class Specifiers, Variable Initializations, Constants, Operators, Expressions.

- Pedagogy / Course delivery tools: ➢ Chalk & talk
- Links: ➢ https://onlinecourses.nptel.ac.in/noc23_cs02/preview

Unit II

Console I/O: Reading and Writing Characters, Reading and Writing Strings, Formatted Console I/O, printf(), scanf().

Statements: True and False in C, Selection Statements, Iteration Statements, Jump Statements, Expression Statements, Block Statements.

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation
- Links: ➢ https://onlinecourses.nptel.ac.in/noc23_cs02/preview /

Unit III

Arrays and Strings: Single-Dimension Arrays, generating a Pointer to an Array, Passing Single-Dimension Arrays to Functions, Strings, Two-Dimensional Arrays, Multidimensional Arrays, Array Initialization, Variable Length Arrays.

Pointers: What Are Pointers?, Pointer Variables, The Pointer Operators, Pointer Expressions, Pointers and Arrays, Multiple Indirection, Initializing Pointers.

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation
- Links: ➢ https://onlinecourses.nptel.ac.in/noc23_cs02/preview

Unit IV

Functions: The General Form of a Function, Understanding the Scope of a Function, Function Arguments, argc and argv—Arguments to main(), The return Statement, What Does main() Return?, Recursion, Function Prototypes, Declaring Variable Length Parameter Declarations, The inline Keyword.

Pointers (Contd…): Pointers to Functions, C's Dynamic Allocation Functions.

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation, Videos
- Links: ➢ https://onlinecourses.nptel.ac.in/noc23_cs02/preview

Unit V

Structures, Unions, Enumerations, and typedef: Structures, Arrays of Structures, Passing Structure to Functions, Structure Pointers, Arrays and Structures within Structures, Unions, Bit-Fields, Enumerations, Using sizeof to Ensure Portability, typedef.

- Pedagogy / Course delivery tools: ➢ Chalk & talk
- Links: ➢ https://onlinecourses.nptel.ac.in/noc23_cs02/preview

Text books:

1. **Schildt, Herbert.** - C the complete reference, Mc GrawHill, 4th edition.
2. **Hassan Afyouni, Behrouz A. Forouzan** - A Structured Programming Approach in C, Cengage, 4th edition.

Reference books:

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

Course Outcomes (COs):

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

1. Demonstrate fundamental concepts and language constructs of C programming (P0-1, PO-2, PO-5)
2. Make use of control structures and arrays to solve basic computational problems (P0-1, PO-2, PO-5)
3. Develop modular programs using user-defined functions for complex computational problems (P0-1, PO-2, PO-5, PO-11)
4. Construct user defined datatypes using structures, unions and enumerations to model simple real- world scenarios (P0-1, PO-2, PO-5, PO-11)
5. Choose suitable datatypes and language constructs to solve a given computational or real-world problem (P0-1, PO-2, PO-5, PO-11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal Test-I	30	CO1, CO2, CO3
Internal Test-II	30	CO3, CO4, CO5
Average of the two tests shall be taken for 30 marks		
Other Components		
Assignment	10	CO1, CO2, CO3
Quiz	10	CO3, CO4, CO5
Semester End Examination (SEE) (Scaled to 50 Marks)	100	CO1, CO2, CO3, CO4, CO5

ELEMENTS OF BIOTECHNOLOGY AND BIOMIMETICS

Course Code: PSCBT14 **Credits:** 3:0:0
Pre-requisites: Nil **Contact Hours:** 45L

Course Coordinator: Dr. Abhijith S R

Course Content

Unit I

Basics of Biology

Structure and functions of prokaryotic and eukaryotic cells. Biomolecules of life - Carbohydrates (examples of Mono, Di, Polysaccharides), Proteins (examples of enzymes, structural proteins, transport proteins, regulatory proteins, and hormones), Central dogma of Biology (DNA to RNA to Protein), Structure and types of DNA (A, B and Z) & RNA (ribosomal RNA, messenger RNA, t-RNA)

- Pedagogy / Course delivery tools:
  - Chalk & talk, Power point presentation
- Links:
  - https://onlinecourses.nptel.ac.in/noc21_bt05/preview

Unit II

Overview of Biotechnology

History, scope, and branches/types of biotechnology such as medical biotechnology (red) - focusing on healthcare; agricultural biotechnology (green) : improving crops and livestock; industrial biotechnology (white): using biological systems for industrial processes; environmental biotechnology (grey/brown): focused on environmental protection and remediation; marine biotechnology (blue): (oil slick), yellow biotechnology (food production),:probiotics and bioinformatics /computational biology; drug discovery

- Pedagogy / Course delivery tools:
  - Chalk & talk, Power point presentation
- Links:
  - https://onlinecourses.nptel.ac.in/noc21_bt05/preview

Unit III

Biotechnology Processes & Sustainability

Bioprocess stages: Bio Ethanol production from agri-waste (steps in upstream, and downstream processing, Biosafety levels, containment, cGMP/GLP and IPR issues). Circular bioeconomy and biotechnology's role in UN SDGs, Ethical, legal, and social issues in biotechnology, GI tags, specific case studies related to Basmati or Turmeric.

- Pedagogy / Course delivery tools:
  - Chalk & talk, Power point presentation
- Links:
  - https://onlinecourses.nptel.ac.in/noc20_bt21/preview
  - https://onlinecourses.nptel.ac.in/noc25_bt84/preview

Unit IV

AI in Biological Research

Role of AI in genomics. Role of AI in drug development, AI-assisted target design, AI in medical imaging and disease diagnosis, AI-driven personalized medicine and predictive healthcare, Role of AI in agriculture and crop improvement, Role of AI in fermentation industry and bioprocess optimization, Role of AI in Protein and enzyme engineering, Role of AI in biosensors and diagnostics.

- Pedagogy / Course delivery tools:
  - Chalk & talk, Power point presentation
- Links:
  - https://onlinecourses.nptel.ac.in/noc20_bt21/preview
  - https://onlinecourses.nptel.ac.in/noc25_ch96/preview

Unit V

Bioinspired Engineering and applications

Basics, history, and scope of biomimetic, Levels and approaches of biomimetic Bioinspired materials: nacre, bone, spider silk, cuticle-based composites, Self-cleaning surfaces, biocement, and living materials. Bioinspired mechanisms: fish/bird locomotion, termite mound passive cooling, Seashell-based, spider web-inspired, and insect eye-inspired innovations, mosquito proboscis inspired needles, Medical devices and drug delivery inspired by biology, Bioinspired energy and solar systems.

- Pedagogy / Course delivery tools:
  - Chalk & talk, Power point presentation
- Links:
  - https://onlinecourses.nptel.ac.in/noc22_ge24/preview

Text books:

1. **P. K. Gupta** - Elements of Biotechnology, Rastogi Publications, 468, 2010.
2. **Vogel, Steven.** - Cats' Paws and Catapults: Mechanical Worlds of Nature and People, W. W. Norton & Company, 2000.

Reference books:

1. **Singh B.D**. - Biotechnology: Expanding Horizons, Kalyani Publishers, 2019.
2. **Barnum, Susan R.** - Biotechnology: An Introduction, Cengage Learning, 2021.
3. **Bar-Cohen, Yoseph** - Biomimetics: Nature-Based Innovation, CRC Press, 2012.
4. **Mukherjee, A.K., and Ghosh, S.K.** - Biomimicry: Nature Inspired Solutions, Narosa Publishing House, 2018.
5. **Vincent, Julian F.V.** - Structural Biomaterials, Princeton University Press, 2012.
6. **Herren, Ray V.** - Introduction to Biotechnology, Cengage Learning, 2018.
7. **Nath, Bhaskar** - Advances in Biotechnology, Atlantic Publishers, 2020.

Course Outcomes (COs):

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

1. Understand the fundamental concepts of biotechnology (PO-1, PO-2).
2. Demonstrate a foundational understanding of core biotechnological techniques. (PO-1, PO-2, PO-5)
3. Apply introductory practical approach and ethics in biotechnology (PO-1, PO-5, PO-6, PO-7).
4. Apply the AI tools in biotechnology research (PO-1, PO-3,PO-5, PO-6, PO-11)
5. Integrate interdisciplinary thinking to address challenges in engineering sectors using biotechnology and biomimetics (PO- 1, PO-3, PO-5, PO-6, PO-11).

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal Test-I	30	CO1, CO2, CO3
Internal Test-II	30	CO3, CO4, CO5
Average of the two tests shall be taken for 30 marks		
Other Components		
Assignment	10	CO4 & CO5
Quiz	10	CO1, CO2, CO3
Semester End Examination (SEE) (Scaled to 50 Marks)	100	CO1, CO2, CO3, CO4, CO5

SOFT SKILLS

Course Code: HSCP15/25 **Credits:** 1:0:0
Pre-requisites: Nil **Contact Hours:** 15L+15P

Course Coordinator: Dr. Diwakar P

Course Content

Unit I

Social Skills

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.

- Pedagogy / Course delivery tools:
  - TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
- Language Lab
  - Quicklrn.com

Unit II

Emotional Skills I

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.

- Pedagogy / Course delivery tools:
  - TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
- Language Lab
  - Quicklrn.com

Unit III

Emotional Skills II

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).

- Pedagogy / Course delivery tools:
  - TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach

- Language Lab
  - Quicklrn.com

Unit IV
Professional Skills I

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.

- Pedagogy / Course delivery tools:
  - TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
- Language Lab
  - Quicklrn.com

Unit V
Professional Skills II

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.

- Pedagogy / Course delivery tools:
  - TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
- Language Lab
  - Quicklrn.com

Text books:

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

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:

- ❖ bbc Learn English online Grammar
- ❖ Learn English Podcasts
- ❖ IELTS Word Power
- ❖ Bbc learning English grammer online
- ❖ Sounds Right (Phonemic Chart)

Course Outcomes (COs):

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

1. Apply social skills for clear communication, persuasion, self-awareness, and active listening (PO-8, PO-9, PO-11)
2. Use emotional skills to build confidence, manage stress, and adapt to change (PO-9, PO-11)
3. Set ambitious goals, practice empathy, and apply creativity for problem-solving (PO- 9, PO-11)
4. Demonstrate discipline, time management, and structured problem-solving (PO-8, PO-9, PO-11)
5. Work in teams, negotiate, resolve conflicts, and think critically (PO-8, 9, 11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes attained**
Internal Test-I	30 (6 marks objective & 24 marks subjective pattern)	CO1, CO2, CO3
Internal Test-II	30 (6 marks objective & 24 marks subjective pattern)	CO4, CO5
Average of the two internal tests shall be taken for 30 marks.		
Other components		
Assignment-I	10	CO1, CO2, CO3
Assignment-II	10	CO3, CO4, CO5
Semester End Examination (SEE)	50 (10 marks objective & 40 marks subjective pattern)	CO1, CO2, CO3, CO4, CO5

KANNADA KALI

Course Code: HSCP16/26K **Credits:** 1:0:0

Pre-requisites: - **Contact Hours:** 15L

Course Coordinator: Mrs. Kanya Kumari S

Course Content

Unit I

(Parichaya) - Introduction

Kannada Bhashe - About Kannada Language, Eight Kannada Authors – JnanpiTh Awardies. Introduction to Kannada Language, Karnataka State and Literature.

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

Unit II

Kannada PadagaLu mattu Vaakyagalu. Kannada Words and Sentences

naamapadagaLu – Sarva naamapadagaLu – (Nouns-Pronouns) and it's usage in Kannada.

Kannada naamavisheshanagaLu - (Adjectives-Interrogatives) kriyapadagaLu, kriya visheshaNagaLu- (verb-adverb)

Sambhashaneyalli Prashnarthaka padagalu – vaakyagaLu mattu kriyapadagaLu-visheshaNagaLu (Kannada- Interrogative words & Sentences and verb-adverb in Conversation)

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

Unit III

Kannada Bhasheyalli Sambhashanegalu- Conversations in Kannada:

Samanya Sambhashaneyalli Kannadada Padagalu mattu Vaakyagalu.

(Kannada Words and Sentences in General Conversation with activities)

Vicharaneya / Bedikeya vakyagalu (Enquiry /Request sentences in Conversation)

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

Unit IV

Kannada padagaLu (eakavachana, bahuvachanagaLu, virudda padagaLu, dina nityadalli baLasuva padagaLu mattu sankya vyavaste

Sambhashaneyalli Eakavachana mattu Bhahuvachana- (Singular and Plural nouns) Conversation- Sambhashaneyalli Linga rupagaLu- Genders in Conversation

Viruddha padagalu /Virodarthaka padagalu (Antonyms) Asamanjasa Uchcharane (Inappropriate Pronunciation)

Sankhya Vyavasthe (Numbers system) -Samaya /Kalakke Sambhandhisida padhagalu (Words Relating to time) – Dikkugalige sambhadisida padhagalu (Words Relating to Directions)

Aaharakke sambandisida padagaLu (Names connected with food)
Manavana shareerada bhagagalu / Angagalu (Parts of the Human body) Manava Sambhandhada da padhagalu (Terms Relating to Human Relationship)
Manavana Bhavanegalige sambandisida Padagalu (Words Relating to Human's feelings and Emotions)
Vaasada staLakke sambhandisidanthaha padhagalu (Words Relating to place of leaving)

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

Unit V

Kannada akshara maale (Kannada alphabets and their practices with pronunciations)

swara aksharagaLu –vyanjanaksharagaLu.
Shabdakosha (Vocabulary) - Exercises to test their knowledge of understanding the Language.
tantragnana mattu AaDalita padagaLu-Technical and administrative worlds in Kannada

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

Text Book:

1. **Dr. L.Thimmesh, Prof. Keshava muurthy -** BaLake kannada Prasarangaa, VTU, 2020

Reference Books:

1. **Smt. Kanya Kumari S** – Kannada Kali, Kinnari publications, 1st edition, Bengaluru, 2022
2. **Lingadevaru Halemane** – Kannada Kali, Prasaranga Kannada University Hampi, 6th edition, 2019

Course Outcomes (COs):

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

1. Develop vocabulary (PO-9)
2. Identify the basic Kannada language skill (PO-9)
3. Develop listing & speaking skill in Kannada language (PO-9, PO-11)
4. Enrich language skill (PO-11)
5. Apply Kannada language skill for various purpose (PO-11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes attained**
Internal Test-I	30	CO1, CO2, CO3
Internal Test-II	30	CO4, CO5
Average of the two internal tests shall be taken for 30 marks		
Other components		
Assignment	10	CO1, CO2
Quiz	10	CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

ಕನ್ನಡ ಮನಸು

Course Code: HSCP16/26M **Credits:** 1:0:0

Pre-requisites: - **Contact Hours:** 15L

Course Coordinator: Mrs. Kanya Kumari S

ಘಟಕ -೧ (Unit I)

ಲೇಖನಗಳು (Articles)

ಕನ್ನಡ ಭಾಷೆ ನಾಡು -ನುಡಿ
ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ
ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ
ವಚನಗಳು - ಅಕ್ಕಮಹಾದೇವಿ -ಬಸವಣ್ಣ -ಅಲ್ಲಮಪ್ರಭು

- Pedagogy / Course delivery tools: ➢ Chalk & talk

ಘಟಕ-೨ (Unit II)

ಕಾವ್ಯಭಾಗ (Poetry)

ವಚನಗಳು ಮತ್ತು ಕೀರ್ತನೆ : ಪುರಂದರ ದಾಸರು
ತತ್ವ ಪದಗಳು : ಶಿಶುನಾಳ ಶರೀಫರು

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

ಘಟಕ-೩ (Unit III)

ಆಧುನಿಕ ಕಾವ್ಯಗಳು

ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗ -ಡಿ.ವಿ.ಜಿ
ಕುರುಡು ಕಾಂಚಾಣ - ದ.ರಾ .ಬೇಂದ್ರೆ

- Pedagogy / Course delivery tools: ➢ Chalk & talk

ಘಟಕ-೪ (Unit IV)

ತಾಂತ್ರಿಕ ಧುರೀಣರು (ವ್ಯಕ್ತಿ ಪರಿಚಯ) ಕಥೆ -ಪ್ರವಾಸ ಕಥನ

ಡಾ.ಸರ್.ಎಂ.ವಿಶ್ವೇಶ್ವರಯ್ಯ - ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ - ಎ. ಎನ್. ಮೂರ್ತಿರಾಯರು
ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ
ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಡಾ. ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ

- Pedagogy / Course delivery tools: ➢ Chalk & talk

ಘಟಕ-೫ (Unit V)

ಕಂಪ್ಯೂಟರ್ ಹಾಗು ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ

"ಕ" ಮತ್ತು "ಬ" ಬರಹ ತಂತ್ರಾಂಶಗಳು
ತಾಂತ್ರಿಕ ಪದಕೋಶ: ತಾಂತ್ರಿಕ ಹಾಗು ಪಾರಿಭಾಷಿಕ ಕನ್ನಡ ಪದಗಳು

- Pedagogy / Course delivery tools: ➢ Chalk & talk

ಪಠ್ಯ ಪುಸ್ತಕ (Text book):

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ - ಡಾ. ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ - ವಿಶ್ರಾಂತ ಕುಲಪತಿಗಳು, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ, ಪ್ರಸಾರಾಂಗ - ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಪ್ರಥಮ ಮುದ್ರಣ, ೨೦೨೦

ಪೂರಕ ಪಠ್ಯ (Reference book):

೧. ಕನ್ನಡ ಮನಸು - ಪ್ರಸಾರಾಂಗ, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ, ಆರನೇ ಮುದ್ರಣ, ೨೦೧೯
೨. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಕೋಶ - ಡಾ. ರಾಜಪ್ಪ ದಳವಾಯಿ, ೨೦೧೮

Course Outcomes (COs):

ಕನ್ನಡ ಮನಸು ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು

೧. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡದ ಜೊತೆಗೆ ಕ್ರಿಯಾತ್ಮಕ, ಸಾಹಿತ್ಯ, ಸಂಸ್ಕೃತಿ ಮತ್ತು ನಾಡು ನುಡಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು (P0-11)
೨. ಕನ್ನಡ ಭಾಷೆಯ ವ್ಯಾಕರಣ, ಭಾಷಾ ರಚನೆಯ ನಿಯಮಗಳನ್ನು ಪರಿಚಯಿಸುವುದು (P0-9)
೩. ಕನ್ನಡ ಭಾಷಾ ಬರಹದಲ್ಲಿ ಕಂಡು ಬರುವ ದೋಷಗಳು, ಅವುಗಳ ನಿವಾರಣೆ (P0-9)
೪. ಸಾಮಾನ್ಯ ಅರ್ಜಿಗಳು, ಸರ್ಕಾರಿ ಹಾಗು ಅರೆ ಸರ್ಕಾರಿ ಪತ್ರ ವ್ಯವಹಾರದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡಿಸುವುದು (P0-11)
೫. ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆ ಬಗ್ಗೆ ಆಸಕ್ತಿ ಮೂಡಿಸುವುದು ಮತ್ತು ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ, ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗು ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು (P0-11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes attained**
Internal Test-I	30	CO1, CO2, CO3
Internal Test-II	30	CO4, CO5
Avarege of the two internal test two will be taken for 30 marks		
Other components		
Assignment	10	CO1, CO2
Quiz	10	CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

INNOVATION & DESIGN THINKING LAB

Course Code: AECP17/27 **Credits: 0:0:1**

Pre-requisites: Nil **Contact Hours: 30P**

Course Coordinator: Dr. Anita Kanavalli

Course Content

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

Course Outcomes (COs):

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

1. Empathize with community problems and define meaningful challenges. (PO1, PO2, PO8, PO9)
2. Apply design thinking principles and multidisciplinary skills to develop user-centric solutions. (PO1, PO2, PO3, PO4, PO8, PO9)
3. Build and test basic prototypes using tools available in the Atal Idea/Tinkering Lab or Makers Space. (PO1, PO2, PO3, PO4, PO6, PO8, PO9)
4. Pitch socially relevant ideas with scalable models. (PO1, PO2, PO3, PO4, PO6, PO8, PO9)
5. Collaborate effectively in diverse teams. (PO1, PO2, PO3, PO4, PO6, PO8, PO-9)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes attained**
Weekly evaluation of laboratory reports after the conduction of every experiment.	30	CO1, CO2, CO3
Other components		
Practical test 20	20	CO1, CO2, CO3
Semester End Examination (SEE)	50	CO1, CO2, CO3

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)

C PROGRAMMING LAB

Course Code: PSCLCS18 **Credits:** 0:0:1
Pre-requisites: - **Contact Hours:** 30P

Course Coordinator: Pallavi N

Course Content

Sl. No.	Topics Covered
1.	Basic Data Types
2.	Operators, Expressions.
3.	Console I/O
4.	Statements
5.	Arrays
6.	Two-Dimensional Arrays
7.	Strings
8.	Pointers
9.	Functions
10.	Declaring Variable Length Parameter
11.	Pointers to Functions
12.	Structures
13.	Unions
14.	Enumerations, and typedef

Note: Each Lab Session is of two hours' duration/week (Sample Programs)

Session No	Programming Assignments	Duration
1.	• Develop a C program that helps a robot calculate the shortest travel distance between two locations on a 2D plane using their coordinates • Develop a C program to convert temperatures between Celsius and Fahrenheit using symbolic constants • Develop a C program to calculate the Simple Interest using principal, rate, and time as inputs. Validate that the user enters positive values only.	2hr
2.	• Develop a C program to compute an electricity bill where the first 100 units cost ₹5 each, the next 100 units cost ₹7 each, and units above 200 cost ₹10 each.	2hr

	• Develop a C program for a company to generate an employee's salary slip. The program should take Basic Pay as input and calculate HRA, DA, Gross Salary, Tax, and Net Salary according to the specified percentages, then display all components	
3.	• Develop a C program for KYC verification. The program should read a unique ID (PAN, Aadhaar, APAAR ID, Driving License, or Passport) and verify it against existing records. Display 'Verified' if a match is found, otherwise display 'Not Verified' • Develop a C program that evaluates a student's marks and assigns a grade based on predefined ranges A (≥90), B (75–89), C (60–74), D (50–59), F (<50) using an efficient control structure.	2hr
4.	• Develop a C program for a math application that reads the coefficients of a quadratic equation from the user, determines the type of roots based on the discriminant, and displays the roots • Develop a C program to calculate railway ticket fares with discounts based on age, including free travel for young children, partial discounts for minors and seniors, and full fare for other passengers	2hr
5.	• Develop a C program that reads numbers continuously from the user and stops reading when a negative number is entered. • Develop a C program to print all numbers from 1 to 50 except multiples of 5 using continue • Develop a C program where the user enters a password. If the password is incorrect, use goto to allow the user to retry until the correct password is entered.	
6.	• Develop a C program for a college library's digital bookshelf system. Each book has a unique Book ID, and the bookshelf is organized in ascending order of Book IDs. The program should efficiently check whether a book with a given Book ID is available in the shelf and display the result. • Develop a C program to help a sports teacher prepare the result sheet for a 100-meter race. The program should accept the scores of all students and sort them in descending order (from highest to lowest) so that the result sheet can be generated. • Develop a C program that simulates traffic light behavior. Based on the color entered by the user (Red → Stop, Yellow → Get Ready, Green → Go), the program should output the corresponding instruction for drivers.	2hr

7.	• Develop a C program for an e-commerce site that calculates the discount for an order. Implement a function that computes the discount based on the order amount and returns the discounted amount to the main program. The main program should then display the final payable amount • Develop a C program for a warehouse management system that computes the total revenue for each branch. The program should use data on units shipped per product from each branch and the revenue per unit of each product. Calculates and displays the total revenue generated by each branch.	2hr
8.	• Develop a C program to manage contact names by combining first and last names manually (a basic mobile contact manager) and verifying that the resulting full name does not exceed a specified display limit. • Develop a C program to search for a user-provided keyword within a course description string and Display a message indicating whether the keyword was found or not.	2hr
9.	• Develop a C program to represent a library reading hall seating chart using a 2D array. Each seat is marked as 1 if occupied and 0 if empty. Display the chart and provide functionality to count and update seats • Develop a C program for a college maintains the marks of students in two separate exams. The marks of n students across m subjects are stored in two matrices for reporting purposes. (Matrix A: Marks from Exam 1, Matrix B: Marks from Exam 2)	2hr
10.	• Develop a C program for currency exchange that allows users to either preview a swap of currency values without changing the original data or confirm the swap to update the values permanently. Use call by value for preview and call by reference for actual updates • Develop a C program for an ATM system where transactions can either preview the effect on balance (call by value) or update the balance permanently (call by reference). • Develop a C program for a hospital management system using function prototypes to manage registration, billing, and report printing.	2hr
11.	• Develop a C program to calculate the factorial of a user-entered number using recursion, as required for computing permutations and combinations in a lottery system. • Develop a C program that uses a structure to store the title, author, and publication year of multiple books, and then displays the complete list of books	2hr

	• Develop a C program for a banking application where Deposit, Withdraw, and Balance Enquiry are implemented as functions, and an array of function pointers is used to invoke these operations from a menu	
12.	• Develop a C program to store and display details of n employees using an array of structures, including EmpID, Name, and Salary • Develop a C program to manage student information using a student structure, allowing input and display of a single student's Name, USN, and Marks. • Develop a C program to simulate a payment system where the user selects a payment type (cash, credit, or debit) using enum and enters the corresponding details, stored using a union, and then displays the payment information	2hr

Text Book:

1. **Hassan Afyouni, Behrouz A. Forouzan -** A Structured Programming Approach in C, 4th edition, Cengage.

Reference Books:

1. **Schildt, Herbert** - C the complete reference, 4th edition, Mc GrawHill.
2. **Brian W. Kernighan, Dennis M. Ritchie** - The 'C' Programming Language, 2nd edition, Prentice Hall of India.

Course Outcomes (COs):

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

1. Develop programs in C to solve simple computational problems. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-8)
2. Make use of C language derived datatypes to solve simple real-world problems. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-8)
3. Build a document consisting of experiment setup, design, implementation and results with inferences. (PO-1, PO-2, PO-3, PO-8, PO-9, PO-11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes attained**
Lab Test	20	CO1, CO2, CO3
Weekly Evaluation and Lab Record	30	CO1, CO2, CO3
The Final CIE out of 50 Marks = Marks of Lab Record + Marks scored in Lab Test + Marks Scored in Continuous Evaluation		
Semester-End Examination (SEE)	50	CO1, CO2, CO3

ELEMENTS OF BIOTECHNOLOGY LAB

Course Code: PSCLBT18 **Credits:** 0:0:1
Pre-requisites: Nil **Contact Hours:** 30P
Course Coordinators: Dr. Abijith S R, Dr. Bindu S & Dr. Prabha M

Course Contents

List of Experiments:

1. Preparation of standard buffers
2. Estimation of carbohydrates and protein with error analysis
3. Sterilization of glassware using dry and wet heat
4. Onion root tip — stages of mitosis & mitotic index
5. Counting of Yeast Cells with hemocytometer.
6. Observation of prokaryotic and eukaryotic cells (Preparation of permanent slides)
7. Study of Enzyme Activity: Amylase or Catalase Assay
8. Antimicrobial activity: Antimicrobial Sensitivity Testing using Plant Extracts or Antibiotics
9. Bio fertilizers: inoculation of *Tichoderma*/*Rhizobium*/*Azotobacter*/VAM on seeds
10. Fermentation of Local Fruits for Alcohol or Acid Production
11. Estimation of pigments (chlorophyll, anthocyanin, lycopene) from fruits and vegetables
12. Biomimetic Demonstrations: lotus leaf effect (water droplet rolling), self-cleaning surface models, seashell hardness tests.
13. Antagonist properties of Soil fungus using dual culture
14. PCR Amplification (Demo or Virtual Lab)

Students are required to perform twelve prescribed experiments from the above list, along with one open-ended experiment.

Reference Books/Manuals:

1. **Karp G.** - Cell and Molecular Biology: Concepts and Experiments, Wiley, pp. 1–848, 2018.
2. **Brown T. A.** - Gene Cloning and DNA Analysis: An Introduction, Wiley-Blackwell, pp. 1–312, 2016.
3. **Pelczar M. J., Chan E. C. S., Krieg N.R.** - Microbiology: Concepts and Applications, Tata McGraw-Hill, pp. 1– 896, 2009.
4. **Voet D., Voet J. G., Pratt C.W.** - Fundamentals of Biochemistry: Life at the Molecular Level, Wiley, pp. 1–1200, 2016

Web links and Video Lectures (e-Resources):

1. Biotechnology & Biomedical Engineering Virtual Labs – Amrita Vishwa Vidyapeetham, https://vlab.amrita.edu/?sub=3
2. Microbiology Virtual Lab – IIT Bombay, https://vlab.co.in/mainsite/Virtual-Labs.php?id=36
3. Biochemistry Virtual Lab – IIT Bombay, https://vlab.co.in/mainsite/Virtual-Labs.php?id=39

Course Outcomes (COs):

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

1. Describe the fundamental concepts of biotechnology, biomolecules, cell structure, and biomimetic principles (PO-1, PO-2)
2. Apply biotechnological techniques such as PCR, microbial culture, and enzyme assays in laboratory settings (PO-1, PO-2, PO-5).
3. Analyze applications of biotechnology and biomimicry across engineering domains to solve practical problems (PO-1, PO-3, PO-4, PO-5).
4. Design and present experimental models or prototypes integrating biological concepts with engineering solutions (PO -1, PO-2, PO-3, PO-4, PO-5).
5. Demonstrate teamwork, communication, and problem-solving skills through interdisciplinary project activities (PO - 1, PO-2, PO-5, PO-8).

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Weekly evaluation of laboratory journals/ reports after the conduction of every experiment.	30	CO1, CO2, CO3, CO4, CO5
Practical test	20	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

COMPUTER AIDED ENGINEERING DRAWING - CS

Course Code: MELCS19 **Credits:** 0:0:1
Pre-requisites: Nil **Contact Hours:** 30P
Course Coordinator: Dr. Mohandas K N

Course Contents

Unit I

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 and RPP & LPP of 2D environment. 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:
Orthographic projections: Definitions - Planes of projection, reference line and conventions employed, Projections of points in First and Third quadrants (**No problems**), Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (**No problems**).

Orthographic Projections of Planes viz triangle, square, rectangle, pentagon, hexagon, and circular laminae (**Placed in First quadrant only using change of position method**).

- Pedagogy/Course delivery tools: ➢ Chalk and talk, Power point presentation
- Links: Orthographic Projections ➢ https://www.youtube.com/watch?v=uePTMVQlIA4
- Links: Orthographic projections of plane ➢ https://www.youtube.com/watch?v=GguSUmNxc8Q

Unit II

Development of Lateral Surfaces of Solids:
Development of sectioned (**Section plane perpendicular to VP and inclined to HP bisecting the axis only**) lateral surfaces of right regular prism, cylinder, pyramid and cone resting **with base on HP only.**

- Pedagogy/Course delivery tools: ➢ Chalk and talk, Power point presentation
- Links: Development of lateral surfaces ➢ https://www.youtube.com/watch?v=U5mz9_W-xdI

Unit III

Orthographic Projection of Solids:
Orthographic projection of right regular solids (**Solids Resting on HP only**): Prism & Pyramid (triangle, square,rectangle, pentagon, hexagon), Cylinder, Cone and Cube **(No freely suspended problems)**.

- Pedagogy/Course ➢ Chalk and talk, Power point presentation

delivery tools:

- Links: Orthographic projection of Solids
  - https://www.youtube.com/watch?v=vu06T5caWpc&list=PLzDhXNnURXs8bfbPmddiS_ACDRW1WoWb

Unit IV

Isometric Projections:

Isometric scale, Isometric projection of hexahedron (cube), right regular prism, pyramid, cylinder, cone, sphere and frustum of solid. Isometric projection of combination of two simple solids **(Co-axial only)**.

- Pedagogy/Course delivery tools:
  - Chalk and talk, Power point presentation
- Links: Isometric Projection
  - https://www.youtube.com/watch?v=Vo9LC9d7FQA&t=3374s

Unit V

Multidisciplinary Applications & Practice: (For CIE only)

Free hand Sketching: True free hand, Guided Free hand, Roads**.**

Drawing Simple Mechanisms: Bicycles, Tricycles, Gear trains.

Electric Wiring and lighting diagrams: Like, Automatic fire alarm.

Basic Building Drawing: Architectural floor plan, basic foundation drawing.

Electronics Engineering Drawings: Simple Electronics Circuit Drawings, practice on layers concept.

- Pedagogy/Course delivery tools:
  - Chalk and talk, Power point presentation
- Links: Free hand sketching
  - https://www.youtube.com/watch?v=Ess0dmJB2lo
- Links: Electric wiring and lighting diagram
  - https://www.youtube.com/watch?v=c67wlH2lJL8
- Links: Electronics Engineering Drawings
  - https://www.youtube.com/watch?v=RpF7oFC-LPY

Text books:

1. **Sudhir Gopalakrishna & K. R. Gopalakrishna** - A Textbook of Engineering Graphics, Techno Series, 2024.
2. **N. D. Bhatt** - Engineering Drawing, Charotar Publishing house Pvt. Ltd, 2024.

Reference books:

1. **M H Annaiah** - Computer Aided Engineering Drawing, New Age International Private Limited, 7th edition, 2022.

Course Outcomes (COs):

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

1. Demonstrate the usage of suitable software for creating basic and applied engineering drawings. (PO-1, PO-5, PO-8, PO-9, PO-11)
2. Conceptually sketch and draw developments for typical lateral surfaces. (PO-1, PO-5, PO-8, PO-9)
3. Exhibit the knowledge of orthographic and isometric projections of typical solids. (PO-1, PO-5, PO-8, PO-9)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Class work and Print out	30	CO1,CO2,CO3
Assignments	10	CO1,CO2,CO3
Tests	10	CO1,CO2,CO3
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

CIVIL ENGINEERING STREAM
I SEMESTER

DIFFERENTIAL CALCULUS & LINEAR ALGEBRA

Course Code: MAV11 **Credits:** 3:1:0

Pre-requisites: - **Contact Hours:** 45L+30T

Course Coordinators: Dr. B. Azghar Pasha & Dr. Uma M

Course Contents

Unit I

Polar Curves and Curvature

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/111105121
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/107625/1030
  ➢ https://a.impartus.com/ilc/#/course/59742/295

Unit II

Series Expansion and Multivariable Calculus

Taylor's and Maclaurin's series expansion for one variable, Partial differentiation, Total derivative – differentiation of composite functions, Jacobian, Taylor's and Maclaurin's series expansion for two variables, Maxima and minima for the function of two variables.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation
- Links: ➢ https://nptel.ac.in/courses/111105121
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/2583981/1205

Unit III

Ordinary Differential Equations of First Order

Review of Linear and Bernoulli's differential equation, Exact and reducible to exact differential equations with integrating factor: $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ and $\frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$. Orthogonal trajectories**,** Law of natural growth and decay, Newton's law of cooling, Circuit problems**.**

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, Videos
- Links: ➢ https://nptel.ac.in/courses/111105121
  ➢ https://nptel.ac.in/courses/111106100
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/59742/295
  ➢ https://a.impartus.com/ilc/#/course/2583981/1205

Unit IV

Ordinary Differential Equations of Higher Order

Higher-order ordinary differential equations with constant coefficients, homogeneous and non- homogeneous equations- e^{ax}, sin(ax+b), cos(ax+b), x^n and $e^{ax}V(x)$, Method of variation of parameters, Cauchy's and Legendre's differential equations, Engineering Applications.

- Pedagogy / Course delivery tools:
  - Chalk and talk, Power Point Presentation, Videos
- Links:
  - https://nptel.ac.in/courses/111105121
  - https://nptel.ac.in/courses/111106100
- Impartus recording:
  - https://a.impartus.com/ilc/#/course/59742/295
  - https://a.impartus.com/ilc/#/course/2583981/1205

Unit V

Linear Algebra

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, Engineering applications.

- Pedagogy / Course delivery tools:
  - Chalk and talk, Power Point Presentation, Videos
- Links:
  - https://nptel.ac.in/courses/111108066
  - https://nptel.ac.in/courses/111105035
- Impartus recording:
  - https://a.impartus.com/ilc/#/course/2583981/1205
  - https://a.impartus.com/ilc/#/course/619570/1030

Text books:

1. **E. Kreyszig** - Advanced Engineering Mathematics, John Wiley & Sons, 10th edition, 2018.
2. **B.S. Grewal** - Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2021.
3. **Seymour Lipschutz and Marc Lipson** -Linear Algebra, Schaum's outlines series, 4th edition, 2008.
4. **Gilbert Strang** - Linear Algebra and its Applications, Cengage Publications, 4th edition, 2022.

Reference books:

1. **Srimanta Pal & Subodh C. Bhunia** - Engineering Mathematics, Oxford University Press, 3rd edition, 2016.
2. **N. P.Bali and Manish Goyal** - A Text book of Engineering Mathematics, Laxmi Publications, 10th edition, 2022.
3. **H.K. Dass and Er. Rajnish Verma** - Higher Engineering Mathematics, S.Chand Publication, 3rd edition, 2014.
4. **Ray Wylie, Louis C. Barrett** - Advanced Engineering Mathematics, McGraw Hill Book Co., New York, 6th edition, 2017.

5. **David C Lay -** Linear Algebra and its Applications - Pearson Publishers, 4th edition, 2018.
6. **Gareth Williams** - Linear Algebra with Applications, Jones Bartlett Publishers Inc., 6th edition, 2017.

Course Outcomes (COs):

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

1. Analyze polar curves, formulate pedal equations and evaluate radius of curvature (PO-1, PO-2)
2. Apply series expansions, partial differentiation, and Jacobians to analyze multivariable functions (PO-1, PO-2)
3. Formulate and solve first order differential equations and apply them to analyze engineering problems (PO-1, PO-2)
4. Solve linear differential equations with constant & variable coefficients (PO-1, PO-2)
5. Apply direct and iterative methods to obtain solutions of linear systems and determine eigenvalues and eigenvectors (PO-1, PO-2)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal Test-I	30	CO1, CO2, CO3
Internal Test-II	30	CO3, CO4, CO5
Average of the two internal tests will be taken for 30 marks.		
Other components		
Quiz	10	CO1, CO2, CO3
Assignment	10	CO3, CO4, CO5
Semester End Examination (SEE) (Scaled to 50 Marks)	100	CO1, CO2, CO3, CO4, CO5

APPLIED CHEMISTRY FOR SUSTAINABLE STRUCTURES AND MATERIAL DESIGN

Course Code: CYV12 **Credits:** 3:0:1
Pre-requisites: - **Contact Hours:** 45L + 30P
Course Coordinators: Dr Nagaraju Kottam & Dr Sharanabasappa Patil

Course Contents

Unit I

Energy Systems and Green Fuels

Electrochemistry: Introduction, electrode potential, Derivation of Nernst equation, concentration cell, numerical problems.

Energy systems: Introduction, classification of batteries, characteristics of battery (Cycle life, efficiency of battery, Shelf life), construction & working of Lithium-ion battery and its applications, **Fuel cell**-definition, difference between battery and fuel cell-construction and working of solid oxide fuel cell, construction of silicon solar cell-advantages, applications and limitations.

Green Fuels: Introduction, green hydrogen production by TiO_2 photocatalytical method and applications.

Self-study: Ion selective electrodes, sodium - ion battery, Advanced materials for transportation applications.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos.
- Links: ➢ https://nptel.ac.in/courses/113/104/113104021/
- Impartus recording: ➢ http://msrit.edu/study-material/chemistry.html

Unit II

Metals and Alloys: Properties, Corrosion Science and Surface Protection

Metals and Alloys: Introduction, composition, properties, applications of iron and its alloys wrought iron, cast iron, pig iron.

Corrosion: Introduction, electrochemical theory of corrosion, types-differential metal corrosion, pitting corrosion, and stress corrosion in civil structures. Corrosion control by galvanization and anodization, corrosion penetration rate (CPR)-definition and importance.

Metal Finishing: Introduction, importance of metal finishing, electroplating of chromium decorative, Electroless plating of copper.

Self-study: Chrome and non-chrome coatings for aerospace applications, bio corrosion, soil corrosion, advanced non-metal coatings for aerospace and construction materials.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos.
- Links ➢ https://nptel.ac.in/courses/103/102/103102103/
- Impartus recording: ➢ http://msrit.edu/study-material/chemistry.html

Unit III

Materials and Composite Materials for Structural Integrity

Polymer: Introduction, Molecular weight of polymers: Number and weight average molecular weight of polymers. Numerical problems. synthesis, properties and applications of Teflon, PMMA, glass transition temperature (Tg), factors and its significance,

Polymer composites: Kevlar and epoxy resins synthesis, properties and industrial applications.

Nanomaterials: Introduction, top-down & bottom-up approaches, thermal properties and antimicrobial activity, synthesis of nanomaterials by solution combustion and hydrothermal method, characterization techniques (XRD, TEM and SEM only mention & introduction) and applications of nanomaterials.

Self-study: advanced composite material for aerospace applications, fiber glass for industrial applications.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos.
- Links: ➢ https://nptel.ac.in/courses/103/102/103102103/
- Impartus recording: ➢ http://msrit.edu/study-material/chemistry.html

Unit IV

Water Technology - Ananlysis and Treatment

Water Technology: Introduction, significance of water quality parameters- pH, turbidity, chlorides, dissolved oxygen, hard water types, determination of total hardness by EDTA method, determination of COD, determination of dissolved oxygen by Winkler's method. Numerical problems on hardness and COD.

Analytical Techniques: Introduction, potentiometric sensors: principle, instrumentation and application in estimation of iron in industrial effluents, conductometric sensors: principle, instrumentation and application in determination of acid mixture in water and industrial effluents, colorimetric sensor: principle, instrumentation and estimation of copper in brass alloy.

Self-study: Nanomembranes for water purification, Nanosensors for detection of toxic metals, NO_x and CO_x gas detection.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos.
- Links: ➢ https://nptel.ac.in/courses/103/102/103102103/
- Impartus recording: ➢ http://msrit.edu/study-material/chemistry.html

Unit V

Chemistry of 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 and manufacturing process of geopolymer concrete, Polylactic acid (PLA)-synthesis, properties and applications (biopolymer).

Coatings: Introduction, spiropyran as photochromic coating-chemical reactions and applications in construction activities, different types of paints (anti corrosive paint, cement based paints and silicate paints)

Self-study: Nanomaterials to improve cement strength and sustainability(Eg: Nano silica and carbon nanotubes), role of nanomaterials in paint industry.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos.
- Links: ➢ https://nptel.ac.in/courses/113/104/113104021/
- Impartus recording: ➢ http://msrit.edu/study-material/chemistry.html

Text Books:

1. **Suba Ramesh and S. Vairam** - Engineering Chemistry, A Text book of Chemistry for Engineers, Wiley India, 2020.
2. **P. C. Jain and Monica Jain** - A Text book of Engineering Chemistry, Dhanapat Rai Publications, New Delhi, 17th edition, 2018.
3. **R.V. Gadag and Nithyananda Shetty -** A Text book of Engineering Chemistry, Med tech Publishers, 1st edition, 2019.

Reference Books:

1. **Sankar P. Dey, Nayim Sepay** - A Textbook of Green Chemistry, 1st edition, Techno World Publisher, 2021.
2. **M.G. Fontana** - Corrosion Engineering, McGraw Hill Publications, New York, 1987.
3. **F.W. Billmeyer** - Text book of Polymer Science, Wiley Inter Science Publications, 1994.
4. **Bharath Bhushan -** Hand book of Nanotechnology, Spinger-Verlag Berlin Heidelberg, New York, 2004.

PRACTICAL MODULE
Course Contents

PART A: Any Five (choice based) - Instrumental

1. Estimation of copper present in electroplating effluent by optical sensor (Colorimetrically).
2. Estimation of acid mixture (HCl & CH_3COOH) by conductometric method.
3. Analysis of iron content present in E-waste effluent potentiometrically.
4. Determination of pKa of vinegar using pH sensor (Membrane electrode - Glass electrode).
5. Estimation of sodium present in soil/an effluent sample using flame photometer.
6. Determination of Viscosity Coefficient of a lubricant sample (Ostwald's Viscometer).

PART B: Any Five (choice-based)-Volumetric and other Techniques

7. Assessment of suitability of drinking and industrial water by estimation of total hardness by EDTA method.
8. Determination of COD of an industrial effluent sample.
9. Estimation of copper in electroplating effluent sample iodometrically.

10. Estimation of percentage of iron in rust solution.
11. Synthesis of semiconducting metal oxide ($ZnO/Fe_2O_3/CuO/Al_2O_3$) nanomaterial.
12. Determination of rate of corrosion of mild steel by weight loss method.

PART C : Open Ended Experiments: (Any Two)

13. Verification of Nernst's equation and measurement of single electrode potential.
14. Chemical structure drawing using software: Origin/ ACD/ChemSketch.
15. Analysis of cement by volumetric method
16. Synthesis of Urea-Formaldehyde polymer.
17. Preparation of a conducting polymer.

Text books:

1. **Arthur I. Vogel -** Quantitative Inorganic Analysis and Elementary Instrumental Analysis: ELBS, Longmann Group, 5th edition, 1989.
2. Chemistry Manual – RIT, 2025-26

Course Outcomes (COs):

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

1. Apply the knowledge of electrochemistry for the construction of batteries, fuel cells and also using the advanced concepts for the preparation. (PO-1, PO-2, PO-6)
2. Analyze the electrochemical theory of corrosion of metals/alloys, corrosion control methods and coating technology. (PO1, PO2)
3. Explain the importance of fuel includes synthetic fuels, bio fuels and green fuels (PO1, PO2, PO6)
4. Apply the knowledge on the preparation of advanced polymers, carbon fiber, and also the extension of polymeric applications to conductivity. (PO1, PO2)
5. Demonstrate the concept of lubricants and coolants to combustion engine, application of sensor technology to the detection of trance concentration and also the conductivity of the solution using conductometric sensor. (PO1, PO2, PO6)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Internal test-I	25	CO1, CO2, CO3
Internal test-II	25	CO3, CO4, CO5
Average of the two internal tests will be taken for 25 marks.		
Other components:		
Quiz	05	CO1, CO2, CO3
Assignment	05	CO3, CO4, CO5
Average of the Quiz and Assignment shall be taken for 05 marks.		
Lab component		
Weekly evaluation of laboratory manuals/records after the Conduction of every experiment.10 Marks x 10 experiments 100 Marks, reduced to 15 Marks	15	CO1, CO2, CO3, CO4, CO5
Practical test conducted for 50 marks, reduced to 05 Marks	05	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE) (Scaled to 50 Marks)	100	CO1, CO2, CO3, CO4, CO5

INTRODUCTION TO C PROGRAMMING

Course Code: PLC14 **Credits: 2:0:1**

Pre-requisites: - **Contact Hours: 30L + 30P**

Course Coordinator: Pallavi N

Course Contents

Unit I

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/106/105/106105171/ MOOC

Unit II

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links ➢ https://nptel.ac.in/courses/106/105/106105171/ MOOC

Unit III

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**.**

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos
- Links: ➢ https://nptel.ac.in/courses/106/105/106105171/ MOOC

Unit IV

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, Videos
- Links: ➢ https://nptel.ac.in/courses/106/105/106105171/ MOOC

Unit V

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.

- Pedagogy / Course delivery tools:
  - Chalk and talk
- Links:
  - https://nptel.ac.in/courses/106/105/106105171/ MOOC

Text books:

1. **E. Balaguruswamy** - Programming in ANSI C, 9th edition, Tata McGraw Hill Education.

Reference books:

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

Course Outcomes (COs):

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

1. Explain the fundamental structure of a C program and primitive constructs (PO-1, PO-2, PO-5)
2. Apply decision-making and iterative control structures to solve simple computational problems (P0-1, PO-2, PO-5)
3. Develop programs using arrays and string operations to solve real-world problems (P0-1, PO-2, PO-5, PO-11)
4. Construct user-defined functions to modularize the solution to the given problems (P0-1, PO-2, PO-5, PO-11)
5. Build programs using structures and pointers for complex data representation and access (P0-1, PO-2, PO-5, PO-11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Internal test-I	30	CO1, CO2, CO3
Internal test-II	30	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks.		
Other components		
Quiz	10	CO1, CO2, CO3
Assignment	10	CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

INTRODUCTION TO AI AND APPLICATIONS

Course Code: ETC15/25 **Credits:** 3:0:0

Pre-requisites: - **Contact Hours:** 45L

Course Coordinator: Dr. Naveen N C

Course Contents

Unit I

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/106105077

Unit II

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links ➢ https://learnprompting.org

Unit III

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).

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos
- Links: ➢ https://nptel.ac.in/courses/106106198

Unit IV

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).

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, Videos
- Links: ➢ https://ai.google/principles/#our-ai-principles-in-action

Unit V

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

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://teachablemachine.withgoogle.com

Text books:

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:

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, 1st edition, Wiley.

Course Outcomes (COs):

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

1. Explain the concepts and types of artificial intelligence. (PO-1, PO-2)
2. Make use of prompt engineering techniques to interact with generative AI tools. (PO-1, PO-2, PO-3, PO-5)
3. Illustrate basic machine learning methods for regression, classification and clustering. (PO-1, PO-2)
4. Identify real-world applications across different disciplines. (PO-1,PO-2,PO-7)

5. Outline recent trends in artificial intelligence and machine learning. (PO-1, PO-2, PO-4, PO-6)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Internal test-I	30	CO1, CO2, CO3
Internal test-II	30	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks.		
Other components		
Practical Assignment on Creating Effective Prompts	20	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE) (Scaled to 50)	100	CO1, CO2, CO3, CO4, CO5

COMMUNICATION SKILLS

Course Code: HSCC16/26 **Credits:** 1:0:0

Pre-requisites: Nil **Contact Hours:** 15L+15P

Course Coordinator: Dr. Diwakar P

Course Contents

Unit I

Communication Skills

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 II

Interpersonal Skills

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 III
English for Employabilty

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 IV
English in Digital World

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 V
Applying for Jobs

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.** - English for Engineers and Technologists, Orient BlackSwan, 2008.
2. **Raman M., Sharma, S.** - Technical Communication: Principles and Practice, 3rd edition, Oxford University Press, 2015.

3. **Floyd K., Cardon P. W.** - Business and Professional Communication, 3rd edition, 2019.
4. **Pratap K. J. Mohapatra, Sanjib Moulick** - Principles of Scientific and Technical Writing, 1st edition, 2025, Published: December 23, 2024.
5. **Ashraf M. Rizvi, Priyadarshi Patnaik** - Effective Technical Communication, 3rd edition, 2024, Published: September 12, 2024
6. **Yadav D. P.** - A course in English pronunciation, 2022, 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
- Learn English – https://learnenglish.britishcouncil.org/
- Take IELTS - https://www.britishcouncil.in/exam/ielts
- British Council Apps:
    - ❖ Bbc Learn English online Grammar
    - ❖ Learn English Podcasts
    - ❖ IELTS Word Power
    - ❖ Bbc learning English grammer online
    - ❖ Sounds Right (Phonemic Chart)

Course Outcomes (COs):

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

1. Build essential verbal, non-verbal, and phonetic communication skills for clarity and effectiveness (PO-8, PO-9, PO-11)
2. Use interpersonal skills in group discussions, presentations, and professional interactions (PO-9, PO-11)
3. Apply formal writing, email etiquette, and creative content development for employability (PO-9, PO-11)
4. Communicate effectively in digital platforms, following netiquette and academic integrity (PO-8, PO-9, PO-11)
5. Prepare job applications, resumes, and perform confidently in interviews (PO-8, PO-9, PO-11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Internal test-I	30 (6 marks objective & 24 marks subjective pattern	CO1, CO2, CO3
Internal test-II	30 (6 marks objective & 24 marks subjective pattern)	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks.		
Other components		
Assignment-I	10	CO1, CO2, CO3
Assignment-II	10	CO3, CO4, CO5
Semester End Examination (SEE)	50 (10 marks objective & 40 marks subjective pattern)	CO1, CO2, CO3, CO4, CO5

INTERDISCIPLINARY PROJECT-BASED LEARNING

Course Code: AECC17/27 **Credits:** 0:0:1

Pre-requisites: Nil **Contact Hours:** 30P

Course Coordinator: -

Course Contents

1. Week 1 & 2: Introduction to project-based learning & interdisciplinary nature. Motivational talk / case studies of successful student projects. Ice-breaking and team-building activities. Formation of groups (4–6 students). Selection of broad theme areas. Brainstorming techniques {mind mapping, (5W1H: what, who, when, where, why, and how) SCAMPER}. Identifying problems. Discuss feasibility & Interdisciplinary nature. Approval of project problem.
2. Week-3: How to search for prior work (journals, patents, research project, case studies).
3. Week-4&5: Refining the problem statement. Identifying constraints and scope. Framing objectives & expected outcomes. Generating multiple solution ideas. Discussing feasibility (technical, economic, social). Team roles assigned (design, research, coding, documentation, testing).
4. Week-6: Criteria-based selection of best idea (decision matrix). Rough sketches, block diagrams, flowcharts. Resource planning (materials, software, tools).

Deliverables - Finalized Problem definition with objectives, List of solution concepts (sketches/flowcharts) and Design document (diagrams, flow) – 10 Marks

5. Week-7: Work breakdown structure (task division). Timeline for development. Safety & ethical considerations.
6. Week-8&9: Development of subsystems/modules, Application of classroom knowledge (electrical circuits, coding, mechanics, CAD, etc.), Peer & mentor review sessions.

Deliverables - Prototype development plan, Subsystem demos (partial working models) – 10 Marks

7. Week-13&14: Refining prototype for efficiency, cost, sustainability. Internal review & peer feedback. Preparing visuals for final presentation (posters, PPT, demo video).
8. Project pitching - Presentation of the project with impact with assessment, prototype, and sustainability plan

Deliverables – Final Results of Experimentation or Testing & Working/ Prototype Model – 30 Marks

9. Week 1 & 2: Introduction to project-based learning & interdisciplinary nature. Motivational talk / case studies of successful student projects. Ice-breaking and team-building activities. Formation of groups (4–6 students). Selection of broad theme areas. Brainstorming techniques {mind mapping, (5W1H: what, who, when, where, why, and how) SCAMPER}. Identifying problems. Discuss feasibility & Interdisciplinary nature. Approval of project problem.
10. Week-3: How to search for prior work (journals, patents, research project, case studies).
11. Week-4&5: Refining the problem statement. Identifying constraints and scope. Framing objectives & expected outcomes. Generating multiple solution ideas. Discussing feasibility (technical, economic, social). Team roles assigned (design, research, coding, documentation, testing).
12. Week-6: Criteria-based selection of best idea (decision matrix). Rough sketches, block diagrams, flowcharts. Resource planning (materials, software, tools).

Deliverables - Finalized Problem definition with objectives, List of solution concepts (sketches/flowcharts) and Design document (diagrams, flow) – 10 Marks

13. Week-7: Work breakdown structure (task division). Timeline for development. Safety & ethical considerations.
14. Week-8&9: Development of subsystems/modules, Application of classroom knowledge (electrical circuits, coding, mechanics, CAD, etc.), Peer & mentor review sessions.

Deliverables - Prototype development plan, Subsystem demos (partial working models) – 10 Marks

15. Week-13&14: Refining prototype for efficiency, cost, sustainability. Internal review & peer feedback. Preparing visuals for final presentation (posters, PPT, demo video).
16. Project pitching - Presentation of the project with impact with assessment, prototype, and sustainability plan

Deliverables – Final Results of Experimentation or Testing & Working/ Prototype Model – 30 Marks

Suggested Learning e-Resources:

- Introduction to the Arduino Microcontroller:
  https://www.arduino.cc/en/Tutorial/HomePage/
- Introduction to the ESP Microcontroller:
  https://docs.espressif.com/projects/esp-idf/en/stable/esp32/get-started/index.html

References

- Michael Margolis, Brian Jepson, Nicholas Robert Weldin. (2020). Arduino Cookbook, 3rd Edition.
- Prince, M. J., & Felder, R. M. (2006). Inductive Teaching and Learning Methods: Definitions, Comparisons, and Research Bases. Journal of Engineering Education.
- Savery, J. R. (2006). Overview of Problem-Based Learning: Definitions and Distinctions. Interdisciplinary Journal of Problem-Based Learning.

Course Outcomes:

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

1. Identify and define problems requiring interdisciplinary knowledge (PO-1, PO-2, PO-3, PO-6, PO-8, PO-9, PO-10)
2. Apply basic concepts of science, engineering, and technology to design simple solutions (PO-1, PO-2, PO-3, PO-4, PO-5, PO-8, PO-9, PO-10)
3. Work effectively in teams with defined roles and responsibilities. (PO-8, PO-9, PO-10)
4. Use project management, documentation, and presentation skills (PO-8, PO-9, PO-10)
5. Develop socially relevant, sustainable, and innovative prototypes/solutions (PO – 6)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Deliverables along with the marks indicated in Course Content	50	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS

Course Code: HSCC18/28 **Credits:** 0:0:0

Pre-requisites: Nil **Contact Hours:** 15L

Course Coordinator: Mrs. Kanya Kumari S

Course Contents

Unit I

Introduction to the Constitution of India

Meaning and Significances of the Constitution, and its salient features, Preamble of the Constitution, Fundamental Rights and relevant cases.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power point presentation

Unit II

Relevance of Directive Principles of State Policy -Part-IV

Fundamental Duties & their significance. Special constitutional provisions for the betterment of Women, Children and backward classes in India.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power point presentation

Unit III

Union Executive and State Executive

The organs of government -Union executive- the President of India, Vice President, Prime Minister, & Council of Ministers. The Union Legislature, Compositions & the functions of Parliament and the Supreme court of India -composition & Jurisdictions

State Executive-Governor, Chief Minister& council of Ministers, State legislature-composition & functions of Legislative assembly& legislative council and State Judiciary.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos

Unit IV

Emergency Provisions, Electoral Process & Major Constitutional Amendments

Emergency provisions and election commission of India & Electoral process, Amendment procedure and Major Constitutional amendments.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation

Unit V

Professional Ethics

Scope and Aim of professional ethics, Responsible attitude, impediments to Responsibility, Trust & Reliability in Engineering

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation

Text Books:

1. A Primer on Constitution of India & Professional ethics, VTU Publication-2007

Reference Books:

1. **Durga Das Basu** - Introduction to Constitution of India - 19th / 20th edition 2001
2. **M.V.Pylee** - An Introduction to Constitution of India, 4th edition, 2008
3. **Dr. K. R. Phaneesh** - Constitution of India & Professional Ethics, Sudha publication, 10th revised edition 2018.

Course Outcomes (COs):

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

1. Identify the fundamental principles of Indian constitution. (PO-11)
2. Examine various provisions of the fundamental duties and directives of government. (PO-7, PO-11)
3. Understand the powers & functions of executive, Legislature and judicial system at the center and state level (PO-11)
4. Identify the role of government. Understand about Amendment procedure (PO-11)
5. Understand about Ethical values in engineering profession (PO-7)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Internal test-I	30	CO1, CO2, CO3
Internal test-II	30	CO3, CO4, CO5
Average of the two internal tests will be taken for 30 marks.		
Other components		
Assignment	10	CO1, CO2
quiz	10	CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

ELECTRICAL & ELECTRONICS ENGINEERING STREAM
I SEMESTER

DIFFERENTIAL CALCULUS & LINEAR ALGEBRA

Course Code: MAE11 **Credits:** 3:1:0
Pre-requisites: - **Contact Hours:** 45L+30T

Course Coordinator: Dr. Monica Anand & Dr. A Sreevallabha Reddy

Course Contents

Unit I

Differential Calculus

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

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power Point Presentation, Videos
- Links: ➢ https://nptel.ac.in/courses/111105121
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/107625/1030

Unit II

Power Series Expansions and Multivariable Calculus

Taylor's and Maclaurin's series expansion for one variable, Solution of algebraic and transcendental equations: Newton-Raphson method for one variable.

Partial differentiation, total derivative, differentiation of composite functions, Jacobian, Taylor's and Maclaurin's series expansion for two variables. Maxima, minima for the function of two variables, solution of a system of nonlinear equations - Newton-Raphson method.

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation
- Links: ➢ https://nptel.ac.in/courses/111106101
  ➢ https://nptel.ac.in/courses/111105121
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/283623/703
  ➢ https://a.impartus.com/ilc/#/course/59742/295

Unit III

Ordinary Differential Equations (ODEs) of First Order & Nonlinear ODEs

Applications of first order ODEs: LR, RC circuits, Newton's law of cooling, population growth equations and orthogonal trajectories.

Non-linear differential equations: Introduction to general and singular solutions, solvable for p only, Clairaut's equations.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos
- Links: ➢ https://nptel.ac.in/courses/111106100
  ➢ https://nptel.ac.in/courses/111106101
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/119640/593
  https://a.impartus.com/ilc/#/course/59742/295
  https://a.impartus.com/ilc/#/course/619570/1030

Unit IV

Ordinary Differential Equations of Higher Order

Homogeneous and non-homogeneous differential equations of higher order with

constant coefficients. Inverse differential operators – e^{ax}, sin(ax+b), cos(ax+b), x^n and $e^{ax}\ V(x)$.

Method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations, LCR circuits.

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation, Videos
- Links: ➢ https://nptel.ac.in/courses/111105121
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/107625/1030 ➢ https://a.impartus.com/ilc/#/course/59742/295

Unit V

Linear Algebra

Elementary row transformation of a matrix, Echelon form, rank of a matrix. Consistency and solution of system of linear equations: Gauss elimination method, Gauss Seidel method, engineering applications.

Eigenvalues and Eigenvectors, Rayleigh power method, diagonalization of a matrix, solution of system of differential equations by matrix method.

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation, Videos
- Links: ➢ https://nptel.ac.in/courses/111108066 ➢ https://nptel.ac.in/courses/111105035
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/619570/1030

Text books:

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

Reference books:

1. **B.V. Ramana** - Higher Engineering Mathematics, McGraw-Hill Education, 11th edition, 2017.
2. **Srimanta Pal & Subodh C.Bhunia -** Engineering Mathematics, Oxford University Press, 3rd edition, 2016.
3. **N. P Bali and Manish Goyal** - A Textbook of Engineering Mathematics, Laxmi Publications, 10th edition, 2022.
4. **David C Lay**, Linear Algebra and its Applications, Pearson Publishers, 4th edition, 2018.

Course Outcomes (COs):

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

1. Solve problems related to Polar curves, Radius of curvature. (PO-1, PO-2)
2. Determine extreme values, Jacobians, roots of algebraic & transcendental equations and solution of non-linear system of equations. (PO-1, PO-2)
3. Solve first order linear and special cases of nonlinear differential equations analytically (PO-1, PO-2)
4. Solve higher order linear differential equations with constant and variable coefficients (PO-1, PO-2)
5. Solve system of linear equations and ordinary differential equations using matrices (PO-1, PO-2)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal Test-I	30	CO1, CO2, CO3
Internal Test-II	30	CO3, CO4, CO5
Average of the two tests shall be taken for 30 marks		
Other Components		
Assignment	10	CO1, CO2, CO3
Quiz	10	CO3, CO4, CO5
Semester End Examination (SEE) (Scaled to 50 Marks)	100	CO1, CO2, CO3, CO4, CO5

APPLIED CHEMISTRY FOR EMERGING ELECTRONICS & FUTURISTIC DEVICES

Course Code: CYE12 **Credits:** 3:0:1
Pre-requisites: - **Contact Hours:** 45L+30P
Course Coordinators: Dr B C Yallur & Dr Sampath C

Course Content

Unit I

Electrode System and Electrochemical Sensors

Electrochemical cells: Classification - galvanic cells and electrolytic cells with examples. Single electrode potential, standard electrode potential and E.M.F of a cell – definition and Nernst equation - derivation and applications. Concentration cells – definition and Nernst equation for concentration cell. Numerical problems on Nernst equation and concentration cell. Electrodes: Reference electrodes – construction, working and applications of Calomel electrode. Ion-selective electrodes – definition, examples (Glass electrode). Application of glass electrode for the determination of pH of a solution.

Sensing Techniques: Optical sensors: Colorimetry - principle, statement of Lambert's law, Beer's law, Beer-Lambert's law, instrumentation and application in the estimation of copper in PCB's. Numerical problems. Electrochemical sensors: Potentiometry- Principle, instrumentation, and application in redox titration (e.g. FAS against K2Cr2O7). Conductometric sensors: Principle, instrumentation and application in titrations of strong acid against a strong base and mixture of acids (strong acid + weak acid) against a strong base.

Self-study: Ion selective electrodes, sodium - ion battery, Nanosensors for NOx and COx gas detection.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos.
- Links: ➢ https://nptel.ac.in/courses/113/104/113104021/
- Impartus recording: ➢ http://msrit.edu/study-material/chemistry.html

Unit II

Corrosion Science and E-Waste Management

Corrosion Science: Introduction, electrochemical theory of corrosion, types of corrosion differential metal corrosion in electronic circuits and differential aeration corrosion, corrosion control-galvanization, tinning and anodization. Cathodic protection and impressed current method. Corrosion penetration rate (CPR)-definition, importance and numerical problems.

Metal Finishing: Introduction, difference between electroplating & electroless plating, electroplating of chromium for hard and decorative coatings, electroless plating of copper on PCBs.

E-waste: Introduction, need of e-waste management, sources & effects of e-waste on environment and human health, extraction of gold from e-waste from bioleaching method.

Self-study: Chrome and non-chrome coatings for aerospace applications, bio

corrosion, soil corrosion, advanced nonmetal coatings for automobiles.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos.
- Links ➢ https://nptel.ac.in/courses/103/102/103102103/
- Impartus recording: ➢ http://msrit.edu/study-material/chemistry.html

Unit III

Materials for Energy Conversion and Storage Technologies

Semiconductors: Introduction, organic semiconductors; types of organic semiconductors used in memory devices, p-type semiconductor-pentacene and n-type semiconductor -perfluoropentacene, difference between organic and inorganic memory devices, construction, working and advantages of pentacene semiconductor chip.

Energy Storage Devices: Introduction, classification of batteries-primary, secondary and reserve battery, characteristics (Voltage, capacity, energy density, cell balancing & cycle life). Construction and working of lithium-ion battery advantages in EV applications, construction and working of ultra-small asymmetric super capacitor and its applications in IoT/wearable devices.

Energy Conversion Devices: Introduction, construction, working principal, advantages and applications of photovoltaic cell of (PV cell), quantum dot sensitized solar cells.

Self-study: advanced semiconductors (eg; Indium-Gallium-Zinc Oxide (IGZO)) for display and memory devices, sodium ion battery (future battery).

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos.
- Links: ➢ https://nptel.ac.in/courses/103/102/103102103/
- Impartus recording: ➢ http://msrit.edu/study-material/chemistry.html

Unit IV

Functional Polymers and Hybrid Composites in Flexible Electronics

Stretchable and Wearable Microelectronics: Introduction synthesis, properties and applications of PDMS (Polydimethylsiloxane) in e-skin (electronic skin) applications.

Polymers: Introduction to polymers. Molecular weight of polymers: number and weight average molecular weight of polymers, numerical problems. Glass transition temperature (Tg), factors influencing Tg. Conducting polymers - Definition, mechanism of conduction in polyacetylene. High performance (Engineering) polymers: Synthesis, properties and applications of Teflon and PMMA.

Polymer Composites: Polymer Composites: Introduction, fiber-reinforced polymers (FRPs); Kevlar – Synthesis, properties and industrial applications. Carbon-fiber - Preparation from Polyacrylonitrile (PAN), properties and industrial applications.

Self-study: advanced composite material for aerospace applications, fiber glass for industrial applications.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos.
- Links: ➢ https://nptel.ac.in/courses/103/102/103102103/
- Impartus recording: ➢ http://msrit.edu/study-material/chemistry.html

Unit V

Nano and Quantum Dot Materials

Nanomaterials: Introduction, size dependent properties of nanomaterials (surface area, catalytic and electrical), types of nano materials – based on materials (carbon based, metal based, composites & dendrimers). Production of nanomaterials – definition of top down and bottom up process. Synthesis of nanometal oxides – semiconducting nano ZnO by solution-combustion method and nano TiO2 by hydrothermal method. Applications of nanomaterials.

Quantum Dot Materials: Introduction to Quantum Dots, Types-inorganic and organic quantum dots. Optical and electronic properties of quantum dots (QDs).

Inorganic Quantum Dot Materials (IQDMs): Introduction, synthesis and properties of silicon based QDs by Sol-Gel method and CdSe Quantum Dots by hot injection method and applications in optoelectronic devices.

Organic Quantum Dot Materials (OQDMs): Introduction, synthesis and properties of chitosan-carbon quantum dots. Synthesis and properties of Graphene Quantum Dots using citric acid method its applications in emerging electronics.

Self-study: advanced nano composite materials for electronic devices, quantum dots for display and memory devices (Ex; Indium-Gallium-Zinc Oxide (IGZO).

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos.
- Links: ➢ https://nptel.ac.in/courses/113/104/113104021/
- Impartus recording: ➢ http://msrit.edu/study-material/chemistry.html

Text Book:

1. **Suba Ramesh, S. Vairam** - Engineering Chemistry, A Text book of Chemistry for Engineers, Wiley India, 2020.
2. **P. C. Jain, Monica Jain** - A Text book of Engineering Chemistry, Dhanapat Rai Publications, New Delhi, 17th edition, 2018.
3. **R.V. Gadag, Nithyananda Shetty** - A Text book of Engineering Chemistry, Med tech Publishers, 1st edition, 2019.

Reference Books:

1. **Sankar P. Dey, Nayim Sepay** - A Text book of Green Chemistry, 1st edition, Techno World Publisher, 2021.
2. **M.G. Fontana** - Corrosion Engineering, McGraw Hill Publications, New York, 1987.
3. **F.W. Billmeyer** - Text book of Polymer Science, Wiley Inter Science Publications, 1994.
4. **Bharath Bhushan** - Hand book of Nanotechnology, Spinger-Verlag Berlin Heidelberg, New York, 2004.
5. **M.N.V. Prasad, Methhika Vithanage, Anwesha Borthakur** - Handbook of Electronic Waste Management, 1st edition, Butterworth-Heinemann, 2019.

PRACTICAL MODULE
Course Contents

PART A: Any Five (choice based) - Instrumental

1. Estimation of copper present in electroplating effluent by optical sensor (Colorimetrically).
2. Estimation of acid mixture (HCl & CH_3COOH) by conductometric method.
3. Analysis of iron content present in E-waste effluent potentiometrically.
4. Determination of pKa of vinegar using pH sensor (Membrane electrode - Glass electrode).
5. Estimation of sodium present in soil/an effluent sample using flame photometer.
6. Determination of Viscosity Coefficient of a lubricant sample (Ostwald's Viscometer).

PART B: Any Five (choice-based)-Volumetric and other Techniques

7. Assessment of suitability of drinking and industrial water by estimation of total hardness by EDTA method.
8. Determination of COD of an industrial effluent sample.
9. Estimation of copper in electroplating effluent sample iodometrically.
10. Estimation of percentage of iron in rust solution.
11. Synthesis of semiconducting metal oxide ($ZnO/Fe_2O_3/CuO/Al_2O_3$) nanomaterial.
12. Determination of rate of corrosion of mild steel by weight loss method.

PART C: Open Ended Experiments: (Any Two)

13. Verification of Nernst's equation and measurement of single electrode potential.
14. Chemical structure drawing using software: Origin/ ACD/ChemSketch.
15. Analysis of cement by volumetric method
16. Synthesis of Urea-Formaldehyde polymer.
17. Preparation of a conducting polymer.

Text Books:

1. **Arthur I. Vogel -** Quantitative Inorganic Analysis and Elementary Instrumental Analysis: ELBS, Longmann Group, 5th edition, 1989.
2. Chemistry Manual – RIT, 2025-26.

Course Outcomes (COs):

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

1. Apply the knowledge of electrochemistry for the construction of batteries, fuel cells and also using the advanced concepts for the preparation. (PO1, PO2, PO6)
2. Analyze the electrochemical theory of corrosion of metals/alloys, corrosion

control methods and coating technology. (PO1, PO2)

3. Explain the importance of fuel includes synthetic fuels, bio fuels and green fuels (PO1, PO2, PO6)
4. Apply the knowledge on the preparation of advanced polymers, carbon fiber, and also the extension of polymeric applications to conductivity. (PO1, PO2)
5. Demonstrate the concept of lubricants and coolants to combustion engine, application of sensor technology to the detection of trance concentration and also the conductivity of the solution using conductometric sensor. (PO1, PO2, PO6)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Internal test-I	25	CO1, CO2, CO3
Internal test-II	25	CO3, CO4, CO5
Average of the two internal tests shall be taken for 25 marks.		
Other components:		
Quiz	05	CO1, CO2, CO3
Assignment	05	CO3, CO4, CO5
Average of the Quiz and Assignment shall be taken for 05 marks.		
Lab component		
Weekly evaluation of laboratory manuals/records after the Conduction of every experiment.10 Marks x 10 experiments 100 Marks, reduced to 15 Marks	15	CO1, CO2, CO3, CO4, CO5
Practical test conducted for 50 marks, reduced to 05 Marks	05	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE) (Scaled to 50 Marks)	100	CO1, CO2, CO3, CO4, CO5

INTRODUCTION TO C PROGRAMMING

Course Code: PLC14 **Credits: 2:0:1**

Pre-requisites: - **Contact Hours: 30L + 30P**

Course Coordinator: Pallavi N

Course Contents

Unit I

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/106/105/106105171/ MOOC

Unit II

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links ➢ https://nptel.ac.in/courses/106/105/106105171/ MOOC

Unit III

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**.**

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos
- Links: ➢ https://nptel.ac.in/courses/106/105/106105171/ MOOC

Unit IV

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, Videos
- Links: ➢ https://nptel.ac.in/courses/106/105/106105171/ MOOC

Unit V

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/106/105/106105171/ MOOC

Text books:

1. **E. Balaguruswamy** - Programming in ANSI C, 9th edition, Tata McGraw Hill Education.

Reference books:

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

Course Outcomes (COs):

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

1. Explain the fundamental structure of a C program and primitive constructs (PO-1, PO-2, PO-5)
2. Apply decision-making and iterative control structures to solve simple computational problems (P0-1, PO-2, PO-5)
3. Develop programs using arrays and string operations to solve real-world problems (P0-1, PO-2, PO-5, PO-11)
4. Construct user-defined functions to modularize the solution to the given problems (P0-1, PO-2, PO-5, PO-11)
5. Build programs using structures and pointers for complex data representation and access (P0-1, PO-2, PO-5, PO-11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Internal test-I	30	CO1, CO2, CO3
Internal test-II	30	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks.		
Other components		
Quiz	10	CO1, CO2, CO3
Assignment	10	CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

INTRODUCTION TO AI AND APPLICATIONS

Course Code: ETC15/25 **Credits:** 3:0:0

Pre-requisites: - **Contact Hours:** 45L

Course Coordinator: Dr. Naveen N C

Course Contents

Unit I

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/106105077

Unit II

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links ➢ https://learnprompting.org

Unit III

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).

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos
- Links: ➢ https://nptel.ac.in/courses/106106198

Unit IV

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).

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, Videos
- Links: ➢ https://ai.google/principles/#our-ai-principles-in-action

Unit V

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

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://teachablemachine.withgoogle.com

Text books:

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:

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, 1st edition, Wiley.

Course Outcomes (COs):

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

1. Explain the concepts and types of artificial intelligence. (PO-1, PO-2)
2. Make use of prompt engineering techniques to interact with generative AI tools. (PO-1, PO-2, PO-3, PO-5)
3. Illustrate basic machine learning methods for regression, classification and clustering. (PO-1, PO-2)
4. Identify real-world applications across different disciplines. (PO-1,PO-2,PO-7)
5. Outline recent trends in artificial intelligence and machine learning. (PO-1, PO-2, PO-4, PO-6)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Internal test-I	30	CO1, CO2, CO3
Internal test-II	30	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks.		
Other components		
Practical Assignment on Creating Effective Prompts	20	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE) (Scaled to 50)	100	CO1, CO2, CO3, CO4, CO5

COMMUNICATION SKILLS

Course Code: HSCC16/26 **Credits:** 1:0:0

Pre-requisites: Nil **Contact Hours:** 15L+15P

Course Coordinator: Dr. Diwakar P

Course Contents

Unit I

Communication Skills

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 II

Interpersonal Skills

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 III
English for Employabilty

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 IV
English in Digital World

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 V
Applying for Jobs

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.** - English for Engineers and Technologists, Orient BlackSwan, 2008.
2. **Raman M., Sharma, S.** - Technical Communication: Principles and Practice, 3rd edition, Oxford University Press, 2015.

3. **Floyd K., Cardon P. W.** - Business and Professional Communication, 3rd edition, 2019.
4. **Pratap K. J. Mohapatra, Sanjib Moulick** - Principles of Scientific and Technical Writing, 1st edition, 2025, Published: December 23, 2024.
5. **Ashraf M. Rizvi, Priyadarshi Patnaik** - Effective Technical Communication, 3rd edition, 2024, Published: September 12, 2024
6. **Yadav D. P.** - A course in English pronunciation, 2022, 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
- Learn English – https://learnenglish.britishcouncil.org/
- Take IELTS - https://www.britishcouncil.in/exam/ielts
- British Council Apps:
    - ❖ Bbc Learn English online Grammar
    - ❖ Learn English Podcasts
    - ❖ IELTS Word Power
    - ❖ Bbc learning English grammer online
    - ❖ Sounds Right (Phonemic Chart)

Course Outcomes (COs):

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

1. Build essential verbal, non-verbal, and phonetic communication skills for clarity and effectiveness (PO-8, PO-9, PO-11)
2. Use interpersonal skills in group discussions, presentations, and professional interactions (PO-9, PO-11)
3. Apply formal writing, email etiquette, and creative content development for employability (PO-9, PO-11)
4. Communicate effectively in digital platforms, following netiquette and academic integrity (PO-8, PO-9, PO-11)
5. Prepare job applications, resumes, and perform confidently in interviews (PO-8, PO-9, PO-11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Internal test-I	30 (6 marks objective & 24 marks subjective pattern	CO1, CO2, CO3
Internal test-II	30 (6 marks objective & 24 marks subjective pattern)	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks.		
Other components		
Assignment-I	10	CO1, CO2, CO3
Assignment-II	10	CO3, CO4, CO5
Semester End Examination (SEE)	50 (10 marks objective & 40 marks subjective pattern)	CO1, CO2, CO3, CO4, CO5

INTERDISCIPLINARY PROJECT-BASED LEARNING

Course Code: AECC17/27 **Credits:** 0:0:1

Pre-requisites: Nil **Contact Hours:** 30P

Course Coordinator: -

Course Contents

1. Week 1 & 2: Introduction to project-based learning & interdisciplinary nature. Motivational talk / case studies of successful student projects. Ice-breaking and team-building activities. Formation of groups (4–6 students). Selection of broad theme areas. Brainstorming techniques {mind mapping, (5W1H: what, who, when, where, why, and how) SCAMPER}. Identifying problems. Discuss feasibility & Interdisciplinary nature. Approval of project problem.
2. Week-3: How to search for prior work (journals, patents, research project, case studies).
3. Week-4&5: Refining the problem statement. Identifying constraints and scope. Framing objectives & expected outcomes. Generating multiple solution ideas. Discussing feasibility (technical, economic, social). Team roles assigned (design, research, coding, documentation, testing).
4. Week-6: Criteria-based selection of best idea (decision matrix). Rough sketches, block diagrams, flowcharts. Resource planning (materials, software, tools).

Deliverables - Finalized Problem definition with objectives, List of solution concepts (sketches/flowcharts) and Design document (diagrams, flow) – 10 Marks

5. Week-7: Work breakdown structure (task division). Timeline for development. Safety & ethical considerations.
6. Week-8&9: Development of subsystems/modules, Application of classroom knowledge (electrical circuits, coding, mechanics, CAD, etc.), Peer & mentor review sessions.

Deliverables - Prototype development plan, Subsystem demos (partial working models) – 10 Marks

7. Week-13&14: Refining prototype for efficiency, cost, sustainability. Internal review & peer feedback. Preparing visuals for final presentation (posters, PPT, demo video).
8. Project pitching - Presentation of the project with impact with assessment, prototype, and sustainability plan

Deliverables – Final Results of Experimentation or Testing & Working/

Prototype Model – 30 Marks

9. Week 1 & 2: Introduction to project-based learning & interdisciplinary nature. Motivational talk / case studies of successful student projects. Ice-breaking and team-building activities. Formation of groups (4–6 students). Selection of broad theme areas. Brainstorming techniques {mind mapping, (5W1H: what, who, when, where, why, and how) SCAMPER}. Identifying problems. Discuss feasibility & Interdisciplinary nature. Approval of project problem.
10. Week-3: How to search for prior work (journals, patents, research project, case studies).
11. Week-4&5: Refining the problem statement. Identifying constraints and scope. Framing objectives & expected outcomes. Generating multiple solution ideas. Discussing feasibility (technical, economic, social). Team roles assigned (design, research, coding, documentation, testing).
12. Week-6: Criteria-based selection of best idea (decision matrix). Rough sketches, block diagrams, flowcharts. Resource planning (materials, software, tools).

Deliverables - Finalized Problem definition with objectives, List of solution concepts (sketches/flowcharts) and Design document (diagrams, flow) – 10 Marks

13. Week-7: Work breakdown structure (task division). Timeline for development. Safety & ethical considerations.
14. Week-8&9: Development of subsystems/modules, Application of classroom knowledge (electrical circuits, coding, mechanics, CAD, etc.), Peer & mentor review sessions.

Deliverables - Prototype development plan, Subsystem demos (partial working models) – 10 Marks

15. Week-13&14: Refining prototype for efficiency, cost, sustainability. Internal review & peer feedback. Preparing visuals for final presentation (posters, PPT, demo video).
16. Project pitching - Presentation of the project with impact with assessment, prototype, and sustainability plan

Deliverables – Final Results of Experimentation or Testing & Working/ Prototype Model – 30 Marks

Suggested Learning e-Resources:

- Introduction to the Arduino Microcontroller: **https://www.arduino.cc/en/Tutorial/HomePage/**
- Introduction to the ESP Microcontroller: **https://docs.espressif.com/projects/esp-idf/en/stable/esp32/get-started/index.html**

References

- Michael Margolis, Brian Jepson, Nicholas Robert Weldin. (2020). Arduino Cookbook, 3rd Edition.
- Prince, M. J., & Felder, R. M. (2006). Inductive Teaching and Learning Methods: Definitions, Comparisons, and Research Bases. Journal of Engineering Education.
- Savery, J. R. (2006). Overview of Problem-Based Learning: Definitions and Distinctions. Interdisciplinary Journal of Problem-Based Learning.

Course Outcomes:

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

1. Identify and define problems requiring interdisciplinary knowledge (PO-1, PO-2, PO-3, PO-6, PO-8, PO-9, PO-10)
2. Apply basic concepts of science, engineering, and technology to design simple solutions (PO-1, PO-2, PO-3, PO-4, PO-5, PO-8, PO-9, PO-10)
3. Work effectively in teams with defined roles and responsibilities. (PO-8, PO-9, PO-10)
4. Use project management, documentation, and presentation skills (PO-8, PO-9, PO-10)
5. Develop socially relevant, sustainable, and innovative prototypes/solutions (PO – 6)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Deliverables along with the marks indicated in Course Content	50	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS

Course Code: HSCC18/28 **Credits:** 0:0:0

Pre-requisites: Nil **Contact Hours:** 15L

Course Coordinator: Mrs. Kanya Kumari S

Course Contents

Unit I

Introduction to the Constitution of India

Meaning and Significances of the Constitution, and its salient features, Preamble of the Constitution, Fundamental Rights and relevant cases.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power point presentation

Unit II

Relevance of Directive Principles of State Policy -Part-IV

Fundamental Duties & their significance. Special constitutional provisions for the betterment of Women, Children and backward classes in India.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power point presentation

Unit III

Union Executive and State Executive

The organs of government -Union executive- the President of India, Vice President, Prime Minister, & Council of Ministers. The Union Legislature, Compositions & the functions of Parliament and the Supreme court of India -composition & Jurisdictions

State Executive-Governor, Chief Minister& council of Ministers, State legislature-composition & functions of Legislative assembly& legislative council and State Judiciary.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos

Unit IV

Emergency Provisions, Electoral Process & Major Constitutional Amendments

Emergency provisions and election commission of India & Electoral process, Amendment procedure and Major Constitutional amendments.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation

Unit V

Professional Ethics

Scope and Aim of professional ethics, Responsible attitude, impediments to Responsibility, Trust & Reliability in Engineering

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation

Text Books:

1. A Primer on Constitution of India & Professional ethics, VTU Publication-2007

Reference Books:

1. **Durga Das Basu** - Introduction to Constitution of India - 19th / 20th edition 2001
2. **M.V.Pylee** - An Introduction to Constitution of India, 4th edition, 2008
3. **Dr. K. R. Phaneesh** - Constitution of India & Professional Ethics, Sudha publication, 10th revised edition 2018.

Course Outcomes (COs):

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

1. Identify the fundamental principles of Indian constitution. (PO-11)
2. Examine various provisions of the fundamental duties and directives of government. (PO-7, PO-11)
3. Understand the powers & functions of executive, Legislature and judicial system at the center and state level (PO-11)
4. Identify the role of government. Understand about Amendment procedure (PO-11)
5. Understand about Ethical values in engineering profession (PO-7)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Internal test-I	30	CO1, CO2, CO3
Internal test-II	30	CO3, CO4, CO5
Average of the two internal tests will be taken for 30 marks.		
Other components		
Assignment	10	CO1, CO2
quiz	10	CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

MECHANICAL ENGINEERING STREAM
I SEMESTER

DIFFERENTIAL CALCULUS & LINEAR ALGEBRA

Course Code: MAM11 **Credits:** 3:1:0
Pre-requisites: Nil **Contact Hours: 45L+15T**

Course Coordinator: Dr. B. Azghar Pasha & Dr. Uma M

Course Content

Unit I

Polar Curves and Curvature

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/111105121
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/107625/1030
  ➢ https://a.impartus.com/ilc/#/course/59742/295

Unit II

Series Expansion and Multivariable Calculus

Taylor's and Maclaurin's series expansion for one variable, Partial differentiation, Total derivative – differentiation of composite functions, Jacobian, Taylor's and Maclaurin's series expansion for two variables, Maxima and minima for the function of two variables.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation
- Links: ➢ https://nptel.ac.in/courses/111105121
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/2583981/1205

Unit III

Ordinary Differential Equations of First Order

Review of Linear and Bernoulli's differential equation, Exact and reducible to exact differential equations with integrating factor: $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ and $\frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$. Orthogonal trajectories**,** Law of natural growth and decay, Newton's law of cooling, Circuit problems**.**

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, Videos
- Links: ➢ https://nptel.ac.in/courses/111105121
  ➢ https://nptel.ac.in/courses/111106100
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/59742/295
  ➢ https://a.impartus.com/ilc/#/course/2583981/1205

Unit IV

Ordinary Differential Equations of Higher Order

Higher-order ordinary differential equations with constant coefficients, homogeneous and non- homogeneous equations- e^{ax}, sin(ax+b), cos(ax+b), x^n and $e^{ax}V(x)$, Method of variation of parameters, Cauchy's and Legendre's differential equations, Engineering Applications.

- Pedagogy / Course delivery tools:
  - Chalk and talk, Power Point Presentation, Videos
- Links:
  - https://nptel.ac.in/courses/111105121
  - https://nptel.ac.in/courses/111106100
- Impartus recording:
  - https://a.impartus.com/ilc/#/course/59742/295
  - https://a.impartus.com/ilc/#/course/2583981/1205

Unit V

Linear Algebra

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, Engineering applications.

- Pedagogy / Course delivery tools:
  - Chalk and talk, Power Point Presentation, Videos
- Links:
  - https://nptel.ac.in/courses/111108066
  - https://nptel.ac.in/courses/111105035
- Impartus recording:
  - https://a.impartus.com/ilc/#/course/2583981/1205
  - https://a.impartus.com/ilc/#/course/619570/1030

Text books:

1. **E. Kreyszig** - Advanced Engineering Mathematics, John Wiley & Sons, 10th edition, 2018.
2. **B.S. Grewal** - Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2021.
3. **Seymour Lipschutz and Marc Lipson** -Linear Algebra, Schaum's outlines series, 4th edition, 2008.
4. **Gilbert Strang** - Linear Algebra and its Applications, Cengage Publications, 4th edition, 2022.

Reference books:

1. **Srimanta Pal & Subodh C. Bhunia** - Engineering Mathematics, Oxford University Press, 3rd edition, 2016.
2. **N. P.Bali and Manish Goyal** - A Text book of Engineering Mathematics, Laxmi Publications, 10th edition, 2022.
3. **H.K. Dass and Er. Rajnish Verma** - Higher Engineering Mathematics, S.Chand Publication, 3rd edition, 2014.
4. **Ray Wylie, Louis C. Barrett** - Advanced Engineering Mathematics, McGraw Hill Book Co., New York, 6th edition, 2017.

5. **David C Lay -** Linear Algebra and its Applications - Pearson Publishers, 4th edition, 2018.
6. **Gareth Williams** - Linear Algebra with Applications, Jones Bartlett Publishers Inc., 6th edition, 2017.

Course Outcomes (COs):

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

1. Analyze polar curves, formulate pedal equations and evaluate radius of curvature (PO-1, PO-2)
2. Apply series expansions, partial differentiation, and Jacobians to analyze multivariable functions (PO-1, PO-2)
3. Formulate and solve first order differential equations and apply them to analyze engineering problems (PO-1, PO-2)
4. Solve linear differential equations with constant and variable coefficients (PO-1, PO-2)
5. Apply direct and iterative methods to obtain solutions of linear systems and determine eigenvalues and eigenvectors (PO-1, PO-2)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Internal test-I	30	CO1, CO2, CO3
Internal test-II	30	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks		
Lab components		
Quiz	10	CO1, CO2, CO3
Assignment	10	CO3, CO4, CO5
Semester End Examination (SEE) (Scaled to 50 Marks)	100	CO1, CO2, CO3, CO4, CO5

APPLIED CHEMISTRY FOR ADVANCED METAL PROTECTION AND SUSTAINABLE ENERGY SYSTEMS

Course Code: CYM12 **Credits:** 3:0:1
Pre-requisites: Nil **Contact Hours:** 45L+30P

Course Coordinators: Dr. P Muralikrishna & Dr. Malathi Challa

Course Content

Unit I
Advanced Energy and Storage Devices

Advanced Energy: Introduction, Nernst equation derivation, Concentration cell - Definition, Nernst equation for concentration cell and numerical problems. Construction, working of secondary reference electrode (calomel electrode). Batteries: Basic concepts, classification of batteries (primary, secondary and reserve batteries). Characteristics of batteries – Voltage, capacity, Energy density, Cycle life and shelf life. Construction, working and applications of Li-ion battery.

Storage Devices: Introduction, Difference between fuel cell and battery. construction and working of solid oxide fuel cells (SOFCs) for Auxiliary Power Units (APUs) applications.

Self-study: Ion selective electrodes, sodium - ion battery.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos.
- Links: ➢ https://nptel.ac.in/courses/113/104/113104021/
- Impartus recording: ➢ http://msrit.edu/study-material/chemistry.html

Unit II
Corrosion Science and Coating Technologies

Corrosion science: Introduction, electrochemical theory of corrosion, types of corrosion-differential metal and differential aeration corrosion, corrosion control-metal coating; galvanization, Tinning. Surface conversion coating - anodization and cathodic protection (sacrificial anode method). Corrosion penetration rate (CPR) - Introduction and numerical problems.

Coating Technologies: Introduction, technological importance, electroplating - electroplating of chromium; hard and decorative, electro-less plating - electroless plating of Nickel, difference between electroplating and electroless plating.

Self-study: Chrome and non-chrome coatings for aerospace applications, bio corrosion, soil corrosion.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos.
- Links ➢ https://nptel.ac.in/courses/103/102/103102103/
- Impartus recording: ➢ http://msrit.edu/study-material/chemistry.html

Unit III

Advanced Chemical and Green Fuels

Fuels: Introduction, calorific value, determination of calorific value using bomb calorimeter, numerical problems on GCV and NCV. Upgradation of gasoline by cracking process. Knocking in internal combustion engines - knocking mechanism and anti-knocking agents - methyl tertiary butyl ether (MTBE) and ethyl tert-butyl ether (ETBE), importance of octane and cetane rating of fuel.

Green and bio Fuels: Introduction, power alcohol – properties, applications and its limitations, Production of green hydrogen by photocatalytic water splitting and its advantages, hydrogen storage – introduction, advantages and limitations of metal hydride and ammonia as chemical hydrogen carriers. **Biofuels:** biodiesel-synthesis by trans-esterification method, advantages and its applications.

Self-study: Hybrid fuel cells, bio-ethanol, aviation fuels, synthetic ammonia.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos.
- Links: ➢ https://nptel.ac.in/courses/103/102/103102103/
- Impartus recording: ➢ http://msrit.edu/study-material/chemistry.html

Unit IV

Advanced Materials for Engineering Applications

Nanomaterials: Introduction, Size-dependent properties of nanomaterial-surface area, catalytical, electrical and thermal conductivity. Nanomaterials for catalytic converter applications in automobiles. Example: ZnO & TiO_2. Synthesis of ZnO by solution combustion method and TiO2 nanoparticles by hydrothermal method. Characterization techniques (Only mention). Applications of nanomaterials.

Engineering Polymers: Introduction, molecular weight of polymers - numerical problems, synthesis, properties and engineering applications of Teflon , and polymethyl methacrylate (PMMA). Glass transition temperature (Tg), factor affecting Tg and its significance.

Polymer Composites: Introduction, fiber-reinforced polymers (FRPs); Kevlar – Synthesis, properties and industrial applications. Carbon-fiber - Preparation from Polyacrylonitrile (PAN), properties and industrial applications.

Self-study: advanced composite material for aerospace applications, fiber glass for industrial applications

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos.
- Links: ➢ https://nptel.ac.in/courses/103/102/103102103/
- Impartus recording: ➢ http://msrit.edu/study-material/chemistry.html

Unit V

Advanced Fluids and Sensor Technologies

Lubricants: Introduction, classification, ideal properties and applications. Lubricant testing; experimental determination of viscosity.

Industrial Coolants: Introduction, types-water and oil-based coolants, properties and industrial applications.

Sensors: Introduction, potentiometric sensor - principle and its application in the estimation of iron in steel industry effluent. Conductometric sensor - principle and its application in the estimation of acids in electrochemical bath effluent. pH sensor

- principle and its application in the estimation of pKa of acid electrolyte.

Self-study: Nano lubricants for automobile applications, Nanosensors for NO_x and CO_x gas detection.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos.
- Links: ➢ https://nptel.ac.in/courses/113/104/113104021/
- Impartus recording: ➢ http://msrit.edu/study-material/chemistry.html

Text books:

1. **Suba Ramesh and S. Vairam** - Engineering Chemistry, A Text book of Chemistry for Engineers, Wiley India, 2020.
2. **P. C. Jain and Monica Jain** - A Text book of Engineering Chemistry, Dhanapat Rai Publications, New Delhi, 17th edition, 2018.
3. **R.V. Gadag and Nithyananda Shetty -** A Text book of Engineering Chemistry, Med tech Publishers, 1st edition, 2019.

Reference books:

1. **Sankar P. Dey, Nayim Sepay** - A Textbook of Green Chemistry, 1st edition, Techno World Publisher, 2021.
2. **M.G. Fontana** - Corrosion Engineering, McGraw Hill Publications, New York, 1987.
3. **F.W. Billmeyer** - Text book of Polymer Science, Wiley Inter Science Publications, 1994.
4. **Bharath Bhushan -** Hand book of Nanotechnology, Spinger-Verlag Berlin Heidelberg, New York, 2004.

PRACTICAL MODULE
Course Contents

PART A: Any Five (choice based) - Instrumental

1. Estimation of copper present in electroplating effluent by optical sensor (Colorimetrically).
2. Estimation of acid mixture (HCl & CH_3COOH) by conductometric method.
3. Analysis of iron content present in E-waste effluent potentiometrically.
4. Determination of pKa of vinegar using pH sensor (Membrane electrode - Glass electrode).
5. Estimation of sodium present in soil/an effluent sample using flame photometer.
6. Determination of Viscosity Coefficient of a lubricant sample (Ostwald's Viscometer).

PART B: Any Five (choice-based)-Volumetric and other Techniques

7. Assessment of suitability of drinking and industrial water by estimation of total hardness by EDTA method.
8. Determination of COD of an industrial effluent sample.
9. Estimation of copper in electroplating effluent sample iodometrically.
10. Estimation of percentage of iron in rust solution.
11. Synthesis of semiconducting metal oxide ($ZnO/Fe_2O_3/CuO/Al_2O_3$) nanomaterial.
12. Determination of rate of corrosion of mild steel by weight loss method.

PART C : Open Ended Experiments: (Any Two)

13. Verification of Nernst's equation and measurement of single electrode potential.
14. Chemical structure drawing using software: Origin/ ACD/ChemSketch.
15. Analysis of cement by volumetric method
16. Synthesis of Urea-Formaldehyde polymer.
17. Preparation of a conducting polymer.

Text books:

1. **Arthur I. Vogel -** Quantitative Inorganic Analysis and Elementary Instrumental Analysis: ELBS, Longmann Group, 5th edition, 1989.
2. Chemistry Manual – RIT, 2025-26

Course Outcomes (COs):

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

1. Apply the knowledge of electrochemistry for the construction of batteries, fuel cells and also using the advanced concepts for the preparation. (PO-1, PO-2, PO-6)
2. Analyze the electrochemical theory of corrosion of metals/alloys, corrosion control methods and coating technology. (PO1, PO2)
3. Explain the importance of fuel includes synthetic fuels, bio fuels and green fuels (PO1, PO2, PO6)
4. Apply the knowledge on the preparation of advanced polymers, carbon fiber, and also the extension of polymeric applications to conductivity. (PO1, PO2)
5. Demonstrate the concept of lubricants and coolants to combustion engine, application of sensor technology to the detection of trance concentration and also the conductivity of the solution using conductometric sensor. (PO1, PO2, PO6)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Internal test-I	25	CO1, CO2, CO3
Internal test-II	25	CO3, CO4, CO5
Average of the two internal tests will be taken for 25 marks.		
Other components:		
Quiz	05	CO1, CO2, CO3
Assignment	05	CO3, CO4, CO5
Average of the Quiz and Assignment shall be taken for 05 marks.		
Lab component		
Weekly evaluation of laboratory manuals/records after the Conduction of every experiment.10 Marks x 10 experiments 100 Marks, reduced to 15 Marks	15	CO1, CO2, CO3, CO4, CO5
Practical test conducted for 50 marks, reduced to 05 Marks	05	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE) (Scaled to 50 Marks)	100	CO1, CO2, CO3, CO4, CO5

INTRODUCTION TO C PROGRAMMING

Course Code: PLC14 **Credits: 2:0:1**

Pre-requisites: - **Contact Hours: 30L + 30P**

Course Coordinator: Pallavi N

Course Contents

Unit I

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/106/105/106105171/ MOOC

Unit II

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links ➢ https://nptel.ac.in/courses/106/105/106105171/ MOOC

Unit III

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**.**

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos
- Links: ➢ https://nptel.ac.in/courses/106/105/106105171/ MOOC

Unit IV

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, Videos
- Links: ➢ https://nptel.ac.in/courses/106/105/106105171/ MOOC

Unit V

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/106/105/106105171/ MOOC

Text books:

1. **E. Balaguruswamy** - Programming in ANSI C, 9th edition, Tata McGraw Hill Education.

Reference books:

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

Course Outcomes (COs):

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

1. Explain the fundamental structure of a C program and primitive constructs (PO-1, PO-2, PO-5)
2. Apply decision-making and iterative control structures to solve simple computational problems (P0-1, PO-2, PO-5)
3. Develop programs using arrays and string operations to solve real-world problems (P0-1, PO-2, PO-5, PO-11)
4. Construct user-defined functions to modularize the solution to the given problems (P0-1, PO-2, PO-5, PO-11)
5. Build programs using structures and pointers for complex data representation and access (P0-1, PO-2, PO-5, PO-11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Internal test-I	30	CO1, CO2, CO3
Internal test-II	30	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks.		
Other components		
Quiz	10	CO1, CO2, CO3
Assignment	10	CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

INTRODUCTION TO AI AND APPLICATIONS

Course Code: ETC15/25 **Credits:** 3:0:0

Pre-requisites: - **Contact Hours:** 45L

Course Coordinator: Dr. Naveen N C

Course Contents

Unit I

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/106105077

Unit II

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links ➢ https://learnprompting.org

Unit III

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).

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos
- Links: ➢ https://nptel.ac.in/courses/106106198

Unit IV

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).

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, Videos
- Links: ➢ https://ai.google/principles/#our-ai-principles-in-action

Unit V

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

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://teachablemachine.withgoogle.com

Text books:

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:

5. **Stuart Russell and Peter Norvig** - Artificial Intelligence: A Modern Approach, 4th edition, Pearson Education, 2023.
6. **Elaine Rich, Kevin Knight, and Shivashankar B. Nair** - Artificial Intelligence, McGraw Hill Education.
7. **Tom Taulli** - Prompt Engineering for Generative AI: ChatGPT, LLMs, and Beyond, Apress, Springer Nature.
8. **Nilakshi Jain** - Artificial Intelligence: Making A System Intelligent, 1st edition, Wiley.

Course Outcomes (COs):

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

1. Explain the concepts and types of artificial intelligence. (PO-1, PO-2)
2. Make use of prompt engineering techniques to interact with generative AI tools. (PO-1, PO-2, PO-3, PO-5)
3. Illustrate basic machine learning methods for regression, classification and clustering. (PO-1, PO-2)
4. Identify real-world applications across different disciplines. (PO-1, PO-2, PO-7)

5. Outline recent trends in artificial intelligence and machine learning. (PO-1, PO-2, PO-4, PO-6)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Internal test-I	30	CO1, CO2, CO3
Internal test-II	30	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks.		
Other components		
Practical Assignment on Creating Effective Prompts	20	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE) (Scaled to 50)	100	CO1, CO2, CO3, CO4, CO5

COMMUNICATION SKILLS

Course Code: HSCC16/26 **Credits:** 1:0:0

Pre-requisites: Nil **Contact Hours:** 15L+15P

Course Coordinator: Dr. Diwakar P

Course Contents

Unit I

Communication Skills

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 II

Interpersonal Skills

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 III
English for Employabilty

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 IV
English in Digital World

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 V
Applying for Jobs

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.** - English for Engineers and Technologists, Orient BlackSwan, 2008.
2. **Raman M., Sharma, S.** - Technical Communication: Principles and Practice, 3rd edition, Oxford University Press, 2015.

3. **Floyd K., Cardon P. W.** - Business and Professional Communication, 3rd edition, 2019.
4. **Pratap K. J. Mohapatra, Sanjib Moulick** - Principles of Scientific and Technical Writing, 1st edition, 2025, Published: December 23, 2024.
5. **Ashraf M. Rizvi, Priyadarshi Patnaik** - Effective Technical Communication, 3rd edition, 2024, Published: September 12, 2024
6. **Yadav D. P.** - A course in English pronunciation, 2022, 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
- Learn English – https://learnenglish.britishcouncil.org/
- Take IELTS - https://www.britishcouncil.in/exam/ielts
- British Council Apps:
    - ❖ Bbc Learn English online Grammar
    - ❖ Learn English Podcasts
    - ❖ IELTS Word Power
    - ❖ Bbc learning English grammer online
    - ❖ Sounds Right (Phonemic Chart)

Course Outcomes (COs):

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

1. Build essential verbal, non-verbal, and phonetic communication skills for clarity and effectiveness (PO-8, PO-9, PO-11)
2. Use interpersonal skills in group discussions, presentations, and professional interactions (PO-9, PO-11)
3. Apply formal writing, email etiquette, and creative content development for employability (PO-9, PO-11)
4. Communicate effectively in digital platforms, following netiquette and academic integrity (PO-8, PO-9, PO-11)
5. Prepare job applications, resumes, and perform confidently in interviews (PO-8, PO-9, PO-11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Internal test-I	30 (6 marks objective & 24 marks subjective pattern	CO1, CO2, CO3
Internal test-II	30 (6 marks objective & 24 marks subjective pattern)	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks.		
Other components		
Assignment-I	10	CO1, CO2, CO3
Assignment-II	10	CO3, CO4, CO5
Semester End Examination (SEE)	50 (10 marks objective & 40 marks subjective pattern)	CO1, CO2, CO3, CO4, CO5

INTERDISCIPLINARY PROJECT-BASED LEARNING

Course Code: AECC17/27 **Credits:** 0:0:1

Pre-requisites: Nil **Contact Hours:** 30P

Course Coordinator: -

Course Contents

1. Week 1 & 2: Introduction to project-based learning & interdisciplinary nature. Motivational talk / case studies of successful student projects. Ice-breaking and team-building activities. Formation of groups (4–6 students). Selection of broad theme areas. Brainstorming techniques {mind mapping, (5W1H: what, who, when, where, why, and how) SCAMPER}. Identifying problems. Discuss feasibility & Interdisciplinary nature. Approval of project problem.
2. Week-3: How to search for prior work (journals, patents, research project, case studies).
3. Week-4&5: Refining the problem statement. Identifying constraints and scope. Framing objectives & expected outcomes. Generating multiple solution ideas. Discussing feasibility (technical, economic, social). Team roles assigned (design, research, coding, documentation, testing).
4. Week-6: Criteria-based selection of best idea (decision matrix). Rough sketches, block diagrams, flowcharts. Resource planning (materials, software, tools).

Deliverables - Finalized Problem definition with objectives, List of solution concepts (sketches/flowcharts) and Design document (diagrams, flow) – 10 Marks

5. Week-7: Work breakdown structure (task division). Timeline for development. Safety & ethical considerations.
6. Week-8&9: Development of subsystems/modules, Application of classroom knowledge (electrical circuits, coding, mechanics, CAD, etc.), Peer & mentor review sessions.

Deliverables - Prototype development plan, Subsystem demos (partial working models) – 10 Marks

7. Week-13&14: Refining prototype for efficiency, cost, sustainability. Internal review & peer feedback. Preparing visuals for final presentation (posters, PPT, demo video).
8. Project pitching - Presentation of the project with impact with assessment, prototype, and sustainability plan

Deliverables – Final Results of Experimentation or Testing & Working/ Prototype Model – 30 Marks

9. Week 1 & 2: Introduction to project-based learning & interdisciplinary nature. Motivational talk / case studies of successful student projects. Ice-breaking and team-building activities. Formation of groups (4–6 students). Selection of broad theme areas. Brainstorming techniques {mind mapping, (5W1H: what, who, when, where, why, and how) SCAMPER}. Identifying problems. Discuss feasibility & Interdisciplinary nature. Approval of project problem.
10. Week-3: How to search for prior work (journals, patents, research project, case studies).
11. Week-4&5: Refining the problem statement. Identifying constraints and scope. Framing objectives & expected outcomes. Generating multiple solution ideas. Discussing feasibility (technical, economic, social). Team roles assigned (design, research, coding, documentation, testing).
12. Week-6: Criteria-based selection of best idea (decision matrix). Rough sketches, block diagrams, flowcharts. Resource planning (materials, software, tools).

Deliverables - Finalized Problem definition with objectives, List of solution concepts (sketches/flowcharts) and Design document (diagrams, flow) – 10 Marks

13. Week-7: Work breakdown structure (task division). Timeline for development. Safety & ethical considerations.
14. Week-8&9: Development of subsystems/modules, Application of classroom knowledge (electrical circuits, coding, mechanics, CAD, etc.), Peer & mentor review sessions.

Deliverables - Prototype development plan, Subsystem demos (partial working models) – 10 Marks

15. Week-13&14: Refining prototype for efficiency, cost, sustainability. Internal review & peer feedback. Preparing visuals for final presentation (posters, PPT, demo video).
16. Project pitching - Presentation of the project with impact with assessment, prototype, and sustainability plan

Deliverables – Final Results of Experimentation or Testing & Working/ Prototype Model – 30 Marks

Suggested Learning e-Resources:

- Introduction to the Arduino Microcontroller: **https://www.arduino.cc/en/Tutorial/HomePage/**
- Introduction to the ESP Microcontroller: **https://docs.espressif.com/projects/esp-idf/en/stable/esp32/get-started/index.html**

References

- Michael Margolis, Brian Jepson, Nicholas Robert Weldin. (2020). Arduino Cookbook, 3rd Edition.
- Prince, M. J., & Felder, R. M. (2006). Inductive Teaching and Learning Methods: Definitions, Comparisons, and Research Bases. Journal of Engineering Education.
- Savery, J. R. (2006). Overview of Problem-Based Learning: Definitions and Distinctions. Interdisciplinary Journal of Problem-Based Learning.

Course Outcomes:

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

1. Identify and define problems requiring interdisciplinary knowledge (PO-1, PO-2, PO-3, PO-6, PO-8, PO-9, PO-10)
2. Apply basic concepts of science, engineering, and technology to design simple solutions (PO-1, PO-2, PO-3, PO-4, PO-5, PO-8, PO-9, PO-10)
3. Work effectively in teams with defined roles and responsibilities. (PO-8, PO-9, PO-10)
4. Use project management, documentation, and presentation skills (PO-8, PO-9, PO-10)
5. Develop socially relevant, sustainable, and innovative prototypes/solutions (PO – 6)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Deliverables along with the marks indicated in Course Content	50	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS

Course Code: HSCC18/28 **Credits:** 0:0:0

Pre-requisites: Nil **Contact Hours:** 15L

Course Coordinator: Mrs. Kanya Kumari S

Course Contents

Unit I

Introduction to the Constitution of India

Meaning and Significances of the Constitution, and its salient features, Preamble of the Constitution, Fundamental Rights and relevant cases.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power point presentation

Unit II

Relevance of Directive Principles of State Policy -Part-IV

Fundamental Duties & their significance. Special constitutional provisions for the betterment of Women, Children and backward classes in India.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power point presentation

Unit III

Union Executive and State Executive

The organs of government -Union executive- the President of India, Vice President, Prime Minister, & Council of Ministers. The Union Legislature, Compositions & the functions of Parliament and the Supreme court of India -composition & Jurisdictions

State Executive-Governor, Chief Minister& council of Ministers, State legislature-composition & functions of Legislative assembly& legislative council and State Judiciary.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos

Unit IV

Emergency Provisions, Electoral Process & Major Constitutional Amendments

Emergency provisions and election commission of India & Electoral process, Amendment procedure and Major Constitutional amendments.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation

Unit V

Professional Ethics

Scope and Aim of professional ethics, Responsible attitude, impediments to Responsibility, Trust & Reliability in Engineering

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation

Text Books:

1. A Primer on Constitution of India & Professional ethics, VTU Publication-2007

Reference Books:

1. **Durga Das Basu** – Introduction to Constitution of India – 19th / 20th edition 2001
2. **M.V.Pylee** – An Introduction to Constitution of India, 4th edition, 2008
3. **Dr. K. R. Phaneesh** – Constitution of India & Professional Ethics, Sudha publication, 10th revised edition 2018.

Course Outcomes (Cos):

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

1. Identify the fundamental principles of Indian constitution. (PO-11)
2. Examine various provisions of the fundamental duties and directives of government. (PO-7, PO-11)
3. Understand the powers & functions of executive, Legislature and judicial system at the center and state level (PO-11)
4. Identify the role of government. Understand about Amendment procedure (PO-11)
5. Understand about Ethical values in engineering profession (PO-7)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Internal test-I	30	CO1, CO2, CO3
Internal test-II	30	CO3, CO4, CO5
Average of the two internal tests will be taken for 30 marks.		
Other components		
Assignment	10	CO1, CO2
quiz	10	CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

COMPUTER SCIENCE & ENGINEERING STREAM

II SEMESTER

NUMERICAL METHODS

Course Code: MAC21 **Credits:** 3:1:0
Pre-requisites: - **Contact Hours:** 45L+30T

Course Coordinators: Dr. S Ramprasad & Dr. Sushma S

Course Content

Unit I
Numerical Methods

Introduction to errors and their computation. Solution of algebraic and transcendental equations: Regula-Falsi and Newton-Raphson method. Solution of a system of nonlinear equations – Newton-Raphson method, solution for system of linear equations: LU-decomposition method, Gauss Seidel method.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/111106101
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/59742/295
  ➢ https://a.impartus.com/ilc/#/course/619570/1030

Unit II
Multiple Integrals

Evaluation of double and triple integrals, change of order of integration, changing into polar coordinates. Area by double integral and volume by triple integral.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links ➢ https://nptel.ac.in/courses/111105121
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/107625/1030

Unit III
Differential Equations of First and Higher Order

Applications of first order ODEs to solve LR, RC circuits, Newton's law of cooling and orthogonal trajectories. Homogeneous and non-homogeneous differential equations of higher order with constant coefficients. Inverse differential operators – e^{ax}, sin(ax+b), cos(ax+b), x^n and $e^{ax}V(x)$

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos
- Links ➢ https://nptel.ac.in/courses/111106100
  ➢ https://nptel.ac.in/courses/111105121
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/59742/295
  ➢ https://a.impartus.com/ilc/#/course/2583981/1205

Unit IV
Interpolation

Finite differences, interpolation using Newton Gregory forward and Newton Gregory backward difference formulae, Newton's divided difference formula, Lagrange interpolation formula, Numerical differentiation using forward and backward interpolation techniques.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, Videos
- Links: ➢ https://onlinecourses.nptel.ac.in/noc25_ma83/preview
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/96127/452
  ➢ https://a.impartus.com/ilc/#/course/132243/636

Unit V

Numerical Integration and Numerical Solution of Differential Equations

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

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/111106101
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/59742/295
  ➢ https://a.impartus.com/ilc/#/course/619570/1030

Text books:

1. **M.K. Jain, S.R.K. Iyengar and R.K. Jain**, Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 8^{th} edition, 2022.
2. **B. S. Grewal**, Higher Engineering Mathematics, Khanna Publishers, 44^{th} edition, 2021.

Reference books:

1. **B.V. Ramana**, Higher Engineering Mathematics, McGraw-Hill Education, 11^{th} Edition, 2017
2. **N. P. Bali and Manish Goyal**, A Textbook of Engineering Mathematics, Laxmi Publications, 10^{th} edition, 2022.
3. **S. S. Sastry**, Introductory Methods of Numerical Analysis, PHI Learning Private Limited, 5^{th} edition, 2012.
4. **Steven V. Chapra and Raymond P. Canale**, Applied Numerical Methods with Matlab for Engineers and Scientists, McGraw-Hill, 3^{rd} edition , 2011.
5. **Richard L. Burden, Douglas J. Faires**, A. M. Burden, Numerical Analysis, 10th edition.,2010, Cengage Publishers

Course Outcomes:

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

1. Analyze and apply numerical techniques to estimate errors, and solve algebraic, transcendental, and linear equations (PO-1, PO-2)
2. Evaluate double and triple integrals and apply them to determine areas and volumes (PO-1, PO-2)
3. Formulate and solve first order ODEs and find the solution of higher order LDEs with constant coefficients (PO-1, PO-2)
4. Estimate unknown values and compute derivatives using interpolation techniques (PO-1, PO-2)
5. Evaluate definite integrals and solve first order ODEs numerically (PO-1, PO-2)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal test – I	30	CO1, CO2, CO3
Internal test – II	30	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks.		
Other components		
Quiz	10	CO1, CO2, CO3
Assignment	10	CO3, CO4, CO5
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5

APPLIED CHEMISTRY FOR SMART SYSTEMS

Course Code: CYC21 **Credits:** 3:0:1
Pre-requisites: - **Contact Hours:** 45L+30P

Course Coordinators: Dr R Hari Krishna & Dr Gurushantha K

Course Content

Unit I
Sustainable Chemistry for Energy Devices

Advanced Battery Chemistry: Introduction, Nernst equation derivation, Concentration cell - Definition, Nernst equation for concentration cell and numerical problems. Construction, working of secondary reference electrode (calomel electrode). Batteries: Basic concepts, classification of batteries (primary, secondary and reserve batteries). Characteristics of batteries – Voltage, capacity, Energy density, Cycle life.

Next – Generation Energy Systems: Introduction, construction and working of commercial batteries like Sodium - ion batteries.

Clean Energy Chemistry: Introduction, fuel cell, difference between fuel cell and battery, construction, working principle, applications and limitations of solid-oxide fuel cell (SOFCs). Production of green hydrogen by photocatalytic water splitting method and its advantages.

Self-study: Ion selective electrodes, Alluminium - air battery, Advanced materials in batteries for EV vehicles.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos.
- Links: ➢ https://nptel.ac.in/courses/113/104/113104021/
- Impartus recording: ➢ http://msrit.edu/study-material/chemistry.html

Unit II
Chemistry of Chemical Sensors and Corrosion Technology

Chemical Sensors: Colorimetry - Principle, statement of Lambert's law, Beer's law and Beer-Lambert's law. Photo electric colorimeter - Instrumentation and application in the estimation of copper, Numerical problems.

Electrochemical Sensors: Potentiometry - Principle, instrumentation and application in redox titration (FAS v/s $K_2Cr_2O_7$).

Conductometric Sensors - Principle and application in titrations of strong acid against a strong base, and mixture of acids (strong acid + weak acid) against a strong base.

Corrosion Technology: Metallic corrosion, electrochemical theory of corrosion, types of corrosion - differential metal and differential aeration corrosion (waterline and pitting corrosion). Corrosion penetration rate (CPR) - numerical problems. Corrosion control: Metal coatings - Galvanization, Inorganic coatings - Anodization of Alumina. Cathodic protection - Impressed voltage method and Sacrificial anode method.

Self-study: Chrome and non-chrome coatings for aerospace applications, bio corrosion, soil corrosion, Nanosensors for NO_x and CO_x gas detection.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos.
- Links ➢ https://nptel.ac.in/courses/103/102/103102103/
- Impartus recording: ➢ http://msrit.edu/study-material/chemistry.html

Unit III

Advanced Chemistry: Quantum Materials and Polymers

Quantum dots: Introduction, size dependent properties (Quantum confinement effect, Surface-to-volume ratio & Band gap). Solar Cells: Definition with principle, construction, working and applications of PV cells and Quantum Dot Sensitized Solar Cells (QDSSC's).

Polymers: Introduction, molecular weight of polymers: number and weight average molecular weight of polymers, numerical problems. Glass transition temperature and factors affecting Tg. Synthesis and properties of PTFE (Teflon) and PMMA (Plexi glass) for device applications.

Conducting polymers: Definition, mechanism of conduction in polyacetylene (oxidative doping).

Self-study: advanced polymeric material for aerospace applications, metal and non-metal quantum dots for sensing and medical devices.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos.
- Links: ➢ https://nptel.ac.in/courses/103/102/103102103/
- Impartus recording: ➢ http://msrit.edu/study-material/chemistry.html

Unit IV

Functional Materials in Memory and Display Systems

Memory Devices: Introduction, organic semiconductors; types of organic semiconductors used in memory devices, p-type semiconductor-pentacene and n-type semiconductor - perfluoropentacene, difference between organic and inorganic memory devices, construction, working and advantages of pentacene semiconductor chip.

Display Systems: Introduction, classification of liquid crystals-thermotropic & lyotropic liquid crystal, different phases of thermotropic & lyotropic liquid crystal. Liquid crystalline behavior in homologous series (PAA). Applications of liquid

crystals in displays,. Light emitting diode (LED): Definition, Types of LED - Organic light emitting diodes (OLED's) and Quantum Light emitting diodes (QLED's). properties and applications of OLED and QLED.

Self-study: advanced semiconductors (eg; Indium-Gallium-Zinc Oxide (IGZO)) for display and memory devices.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos.
- Links: ➢ https://nptel.ac.in/courses/103/102/103102103/
- Impartus recording: ➢ http://msrit.edu/study-material/chemistry.html

Unit V

Green Materials and E-Waste Management

Green materials: Introduction, synthesis of nano ZnO by combustion method and nano TiO_2 by hydrothermal method for Random- access (RAM) applications and solar cells application.

Biomaterials: Introduction, synthesis, properties and applications of polylactic acid (PLA) and polyethylene glycol (PEG) for touch screen and brain computer interfaces.

E-waste: Introduction, sources (E - waste items), toxic materials used in the manufacturing electronic and electrical products, problem of E - waste on environment and human health, solution for E - waste, methods of disposal, advantages of recycling. Extraction of gold from E – waste via hydrometallurgy.

Self-study: Hybrid fuel cells, bio-ethanol, synthetic ammonia, Extraction of Li atom from Li-ion battery.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos.
- Links: ➢ https://nptel.ac.in/courses/113/104/113104021/
- Impartus recording: ➢ http://msrit.edu/study-material/chemistry.html

Text Books:

1. **Suba Ramesh, S. Vairam** - Engineering Chemistry, A text book of Chemistry for Engineers, Wiley India, 2020.
2. **P. C. Jain, Monica Jain** - A text Book of Engineering Chemistry, Dhanapat Rai Publications, New Delhi, 17th edition, 2018.
3. **R. V. Gadag, Nithyananda Shetty** - A text Book of Engineering Chemistry, Med tech Publishers, 1st edition, 2019.

Reference Books:

1. **Sankar P. Dey, Nayim Sepay** - A Textbook of Green Chemistry, 1st edition, Techno World Publisher, 2021.
2. **M. G. Fontana** - Corrosion Engineering, McGraw Hill Publications, New York, 1987.
3. **F. W. Billmeyer** - Text book of Polymer Science, Wiley Inter Science Publications, 1994.
4. **Bharath Bhushan** - Hand book of nanotechnology, Spinger-Verlag Berlin Heidelberg, New York, 2004.
5. **M. N. V. Prasad, Meththika Vithanage, Anwesha Borthakur** - Handbook of Electronic Waste Management, 1st edition, Butterworth-Heinemann, 2019.

PRACTICAL MODULE

Course Contents

PART A: Any Five (choice based) - Instrumental

1. Estimation of copper present in electroplating effluent by optical sensor (Colorimetrically).
2. Estimation of acid mixture (HCl & CH_3COOH) by conductometric method.
3. Analysis of iron content present in E-waste effluent potentiometrically.
4. Determination of pKa of vinegar using pH sensor (Membrane electrode - Glass electrode).
5. Estimation of sodium present in soil/an effluent sample using flame photometer.
6. Determination of Viscosity Coefficient of a lubricant sample (Ostwald's Viscometer).

PART B: Any Five (choice-based)-Volumetric and other Techniques

7. Assessment of suitability of drinking and industrial water by estimation of total hardness by EDTA method.
8. Determination of COD of an industrial effluent sample.
9. Estimation of copper in electroplating effluent sample iodometrically.
10. Estimation of percentage of iron in rust solution.
11. Synthesis of semiconducting metal oxide ($ZnO/Fe_2O_3/CuO/Al_2O_3$) nanomaterial.
12. Determination of rate of corrosion of mild steel by weight loss method.

PART C : Open Ended Experiments: (Any Two)

13. Verification of Nernst's equation and measurement of single electrode potential.
14. Chemical structure drawing using software: Origin / ACD / ChemSketch.
15. Analysis of cement by volumetric method
16. Synthesis of Urea-Formaldehyde polymer.
17. Preparation of a conducting polymer.

Text Books:

1. **Arthur I. Vogel -** Quantitative Inorganic Analysis and Elementary Instrumental Analysis: ELBS, Longmann Group, 5th edition, 1989.
2. Chemistry Manual – RIT, 2025-26

Course Outcomes

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

1. Apply the knowledge of electrochemistry for the construction of batteries, fuel cells and also using the advanced concepts for the preparation. (PO1, PO2, PO6)
2. Analyze the electrochemical theory of corrosion of metals/alloys, corrosion control methods and coating technology. (PO1, PO2)
3. Explain the importance of fuel includes synthetic fuels, bio fuels and green fuels(PO1, PO2, PO6)
4. Apply the knowledge on the preparation of advanced polymers, carbon fiber, and also the extension of polymeric applications to conductivity. (PO1, PO2)
5. Demonstrate the concept of lubricants and coolants to combustion engine, application of sensor technology to the detection of trance concentration and also the conductivity of the solution using conductometric sensor. (PO1, PO2, PO6)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal test – I	25	CO1, CO2, CO3
Internal test – II	25	CO3, CO4, CO5
Average of the two internal tests will be taken for 25 marks.		
Other components		
Quiz	05	CO1, CO2, CO3
Assignment	05	CO3, CO4, CO5
Average of the Quiz and Assignment shall be taken for 05 marks.		
Lab component	Marks	
Weekly evaluation of laboratory manuals/records after the Conduction of every experiment.10 Marks x 10 experiments 100 Marks, reduced to 15 Marks	15	CO1, CO2, CO3, CO4, CO5
Practical test conducted for 50 marks, reduced to 05 Marks	05	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE)	100	CO1, CO2, CO3,CO4, CO5

PYTHON PROGRAMMING

Course Code: PLC24 **Credits:** 3:0:1
Pre-requisites: - **Contact Hours:** 45L+30P
Course Coordinators:

Course Content

Unit I

The way of the program: The Python programming language, what is a program? What is debugging? Syntax errors, Runtime errors, Semantic errors, Experimental debugging.

Variables, Expressions and Statements: Values and data types, Variables, Variable names and keywords, Statements, evaluating expressions, Operators and operands, Type converter functions, Order of operations, Operations on strings, Input, Composition, The modulus operator.

Iteration: Assignment, Updating variables, the for loop, the while statement, The Collatz 3n + 1 sequence, tables, two-dimensional tables, break statement, continue statement, paired data, Nested Loops for Nested Data.

Functions: Functions with arguments and return values.

- Pedagogy / Course delivery tools:
  - Chalk and talk, Power point presentation, Problem-Based Learning (PBL), Case-Based Teaching
- Links:
  - https://onlinecourses.nptel.ac.in/noc25_cs104/preview
  - https://www.coursera.org/learn/python-programming-intro
  - https://www.programiz.com/python-programming
  - https://www.learnbyexample.org/python/

Unit II

Strings: Working with strings as single things, working with the parts of a string, Length, Traversal and the for loop, Slices, String comparison, Strings are immutable, the in and not in operators, A find function, Looping and counting, Optional parameters, The built-in find method, The split method, Cleaning up your strings, The string format method.

Tuples: Tuples are used for grouping data, Tuple assignment, Tuples as return values, Composability of Data Structures.

Lists: List values, accessing elements, List length, List membership, List operations, List slices, Lists are mutable, List deletion, Objects and references, Aliasing, cloning lists, Lists and for loops, List parameters, List methods, Pure functions and modifiers, Functions that produce lists, Strings and lists, list and range, Nested lists, Matrices.

- Pedagogy / Course delivery tools:
  - Chalk and talk, Power point presentation, Problem-Based Learning (PBL), Case-Based Teaching
- Links
  - https://onlinecourses.nptel.ac.in/noc25_cs104/preview
  - https://www.coursera.org/learn/python-programming-intro
  - https://www.programiz.com/python-programming
  - https://www.learnbyexample.org/python/

Unit III

Dictionaries: Dictionary operations, dictionary methods, aliasing and copying.
Numpy: About, Shape, Slicing, masking, Broadcasting, dtype.
Files: About files, writing our first file, reading a file line-at-a-time, turning a file into a list of lines, Reading the whole file at once, working with binary files, Directories, fetching something from the Web.

- Pedagogy / Course delivery tools:
  - Chalk and talk, Power point presentation, Problem-Based Learning (PBL), Case-Based Teaching
- Links:
  - https://onlinecourses.nptel.ac.in/noc25_ch97/preview
  - https://www.coursera.org/learn/python-programming-intro
  - https://www.programiz.com/python-programming
  - https://www.learnbyexample.org/python/

Unit IV

Modules: Random numbers, the time module, the math module, creating your own modules, Namespaces, Scope and lookup rules, Attributes and the dot Operator, Three import statement variants.
Mutable versus immutable and aliasing
Object oriented programming: Classes and Objects — The Basics, Attributes, adding methods to our class, Instances as arguments and parameters, converting an instance to a string, Instances as return values.

- Pedagogy / Course delivery tools:
  - Chalk and talk, Power point presentation, Problem-Based Learning (PBL), Case-Based Teaching
- Links:
  - https://www.coursera.org/learn/object-oriented-python?specialization=hands-on-python
  - https://www.programiz.com/python-programming

Unit V

Object oriented programming: Objects are mutable, Sameness, Copying.
Inheritance: Pure functions, Modifiers, Generalization, Operator Overloading, Polymorphism.
Exceptions: Catching Exceptions, Raising your own exceptions.

- Pedagogy / Course delivery tools:
  - Chalk and talk, Power point presentation, Problem-Based Learning (PBL), Case-Based Teaching
- Links:
  - https://www.coursera.org/learn/object-oriented-python?specialization=hands-on-python
  - https://www.programiz.com/python-programming

Lab Component:

1. a. Develop a python program to read 2 numbers from the keyboard and perform the basic arithmetic operations based on the choice. (1-Add, 2-Subtract, 3-Multiply, 4-Divide).
   b. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.
2. a. Develop a program to generate Fibonacci sequence of length (N). Read N from the console.
   b. Write a python program to create a list and perform the following operations
      - Inserting an element
      - Removing an element
      - Appending an element
      - Displaying the length of the list
      - Popping an element
      - Clearing the list
3. a. Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages.
   b. Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with a suitable message.
4. Develop a program to print 10 most frequently appearing words in a text file. [Hint: Use a dictionary with distinct words and their frequency of occurrences. Sort the dictionary in the reverse order of frequency and display the dictionary slice of the first 10 items.
5. Develop a program to read 6 subject marks from the keyboard for a student. Generate a report that displays the marks from the highest to the lowest score attained by the student. [Read the marks into a 1-Dimesional array and sort using the Bubble Sort technique].
6. Develop a program to sort the contents of a text file and write the sorted contents into a separate text file. [Hint: Use string methods strip(), len(), list methods sort(), append(), and file methods open(), readlines(), and write()].
7. Develop a function named DivExp which takes TWO parameters a, b, and returns a value c (c=a/b). Write a suitable assertion for a>0 in the function DivExp and raise an exception for when b=0. Develop a suitable program that reads two console values and calls the function DivExp.
8. Define a function that takes TWO objects representing complex numbers and returns a new complex number with the sum of two complex numbers. Define a suitable class ‘Complex’ to represent the complex number. Develop a program to read N (N >=2) complex numbers and to compute the addition of N complex numbers.
9. Text Analysis Tool: Build a tool that analyses a paragraph: frequency of each word, longest word, number of sentences, etc.

10. Develop Data Summary Generator: Read a CSV file (like COVID data or weather stats), convert to dictionary form, and allow the user to run summary queries: max, min, average by column.
11. Develop Student Grade Tracker: Accept multiple students' names and marks. Store them in a list of tuples or dictionaries. Display summary reports (average, topper, etc.).
12. Develop a program to display contents of a folder recursively (Directory) having sub-folders and files (name and type).

Text books:

1. **Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers** - How to think like a computer scientist: learning with python 3. Green Tea Press, Wellesley, Massachusetts, 2020 https://media.readthedocs.org/pdf/howtothink/latest/howtothink.pdf

Reference books:

1. **Al Sweigart** - Automate the Boring Stuff with Python, 2nd edition: Practical Programming for Total Beginners",2nd edition, No Starch Press, 2022. (Available under CC-BY-NC-SA license at https://automatetheboringstuff.com/)
2. **Kyla McMullen, Elizabeth Matthews and June Jamrich Parsons -** Programming with Python, Cengage, 2023.

Course Outcomes

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

1. Develop scripts using primitive language constructs of python (PO1, PO2, PO5, PSO1, PSO2).
2. Identify the methods to manipulate primitive python data structures (PO1, PO2, PO4, PSO1, PSO2).
3. Make use of Python standard libraries for programming (PO1, PO2, PO5, PSO1, PSO3).
4. Build scripts for performing file operations (PO2, PO3, PO5, PSO1, PSO2).
5. Illustrate the concepts of Object-Oriented Programming as used in Python (PO1, PO3, PO9, PO10, PSO1, PSO2, PSO3).

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal test – I	30	CO1, CO2, CO3
Internal test – II	30	CO3, CO4, CO5
Average of the two internal tests will be taken for 30 marks.		
Other components	**Marks**	**Course outcomes addressed**
Lab Component Evaluation	20	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5

INTRODUCTION TO AI AND APPLICATIONS

Course Code: ETC15/25 **Credits:** 3:0:0

Pre-requisites: - **Contact Hours:** 45L

Course Coordinator: Dr. Naveen N C

Course Contents

Unit I

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/106105077

Unit II

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links ➢ https://learnprompting.org

Unit III

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).

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos
- Links: ➢ https://nptel.ac.in/courses/106106198

Unit IV

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).

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, Videos
- Links: ➢ https://ai.google/principles/#our-ai-principles-in-action

Unit V

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

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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://teachablemachine.withgoogle.com

Text books:

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:

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, 1st edition, Wiley.

Course Outcomes (COs):

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

1. Explain the concepts and types of artificial intelligence. (PO-1, PO-2)
2. Make use of prompt engineering techniques to interact with generative AI tools. (PO-1, PO-2, PO-3, PO-5)
3. Illustrate basic machine learning methods for regression, classification and clustering. (PO-1, PO-2)
4. Identify real-world applications across different disciplines. (PO-1, PO-2, PO-7)
5. Outline recent trends in artificial intelligence and machine learning. (PO-1, PO-2, PO-4, PO-6)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Internal test-I	30	CO1, CO2, CO3
Internal test-II	30	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks.		
Other components		
Practical Assignment on Creating Effective Prompts	20	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE) (Scaled to 50)	100	CO1, CO2, CO3, CO4, CO5

COMMUNICATION SKILLS

Course Code: HSCC16/26 **Credits:** 1:0:0

Pre-requisites: Nil **Contact Hours:** 15L+15P

Course Coordinator: Dr. Diwakar P

Course Contents

Unit I

Communication Skills

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 II

Interpersonal Skills

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 III
English for Employabilty

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 IV
English in Digital World

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 V
Applying for Jobs

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.** - English for Engineers and Technologists, Orient BlackSwan, 2008.
2. **Raman M., Sharma, S.** - Technical Communication: Principles and Practice, 3rd edition, Oxford University Press, 2015.

3. **Floyd K., Cardon P. W.** - Business and Professional Communication, 3rd edition, 2019.
4. **Pratap K. J. Mohapatra, Sanjib Moulick** - Principles of Scientific and Technical Writing, 1st edition, 2025, Published: December 23, 2024.
5. **Ashraf M. Rizvi, Priyadarshi Patnaik** - Effective Technical Communication, 3rd edition, 2024, Published: September 12, 2024
6. **Yadav D. P.** - A course in English pronunciation, 2022, 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
- Learn English – https://learnenglish.britishcouncil.org/
- Take IELTS - https://www.britishcouncil.in/exam/ielts
- British Council Apps:
    - ❖ Bbc Learn English online Grammar
    - ❖ Learn English Podcasts
    - ❖ IELTS Word Power
    - ❖ Bbc learning English grammer online
    - ❖ Sounds Right (Phonemic Chart)

Course Outcomes (COs):

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

1. Build essential verbal, non-verbal, and phonetic communication skills for clarity and effectiveness (PO-8, PO-9, PO-11)
2. Use interpersonal skills in group discussions, presentations, and professional interactions (PO-9, PO-11)
3. Apply formal writing, email etiquette, and creative content development for employability (PO-9, PO-11)
4. Communicate effectively in digital platforms, following netiquette and academic integrity (PO-8, PO-9, PO-11)
5. Prepare job applications, resumes, and perform confidently in interviews (PO-8, PO-9, PO-11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Internal test-I	30 (6 marks objective & 24 marks subjective pattern	CO1, CO2, CO3
Internal test-II	30 (6 marks objective & 24 marks subjective pattern)	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks.		
Other components		
Assignment-I	10	CO1, CO2, CO3
Assignment-II	10	CO3, CO4, CO5
Semester End Examination (SEE)	50 (10 marks objective & 40 marks subjective pattern)	CO1, CO2, CO3, CO4, CO5

INTERDISCIPLINARY PROJECT-BASED LEARNING

Course Code: AECC17/27 **Credits:** 0:0:1

Pre-requisites: Nil **Contact Hours:** 30P

Course Coordinator: -

Course Contents

1. Week 1 & 2: Introduction to project-based learning & interdisciplinary nature. Motivational talk / case studies of successful student projects. Ice-breaking and team-building activities. Formation of groups (4–6 students). Selection of broad theme areas. Brainstorming techniques {mind mapping, (5W1H: what, who, when, where, why, and how) SCAMPER}. Identifying problems. Discuss feasibility & Interdisciplinary nature. Approval of project problem.
2. Week-3: How to search for prior work (journals, patents, research project, case studies).
3. Week-4&5: Refining the problem statement. Identifying constraints and scope. Framing objectives & expected outcomes. Generating multiple solution ideas. Discussing feasibility (technical, economic, social). Team roles assigned (design, research, coding, documentation, testing).
4. Week-6: Criteria-based selection of best idea (decision matrix). Rough sketches, block diagrams, flowcharts. Resource planning (materials, software, tools).

Deliverables - Finalized Problem definition with objectives, List of solution concepts (sketches/flowcharts) and Design document (diagrams, flow) – 10 Marks

5. Week-7: Work breakdown structure (task division). Timeline for development. Safety & ethical considerations.
6. Week-8&9: Development of subsystems/modules, Application of classroom knowledge (electrical circuits, coding, mechanics, CAD, etc.), Peer & mentor review sessions.

Deliverables - Prototype development plan, Subsystem demos (partial working models) – 10 Marks

7. Week-13&14: Refining prototype for efficiency, cost, sustainability. Internal review & peer feedback. Preparing visuals for final presentation (posters, PPT, demo video).
8. Project pitching - Presentation of the project with impact with assessment, prototype, and sustainability plan

Deliverables – Final Results of Experimentation or Testing & Working/ Prototype Model – 30 Marks

9. Week 1 & 2: Introduction to project-based learning & interdisciplinary nature. Motivational talk / case studies of successful student projects. Ice-breaking and team-building activities. Formation of groups (4–6 students). Selection of broad theme areas. Brainstorming techniques {mind mapping, (5W1H: what, who, when, where, why, and how) SCAMPER}. Identifying problems. Discuss feasibility & Interdisciplinary nature. Approval of project problem.
10. Week-3: How to search for prior work (journals, patents, research project, case studies).
11. Week-4&5: Refining the problem statement. Identifying constraints and scope. Framing objectives & expected outcomes. Generating multiple solution ideas. Discussing feasibility (technical, economic, social). Team roles assigned (design, research, coding, documentation, testing).
12. Week-6: Criteria-based selection of best idea (decision matrix). Rough sketches, block diagrams, flowcharts. Resource planning (materials, software, tools).

Deliverables - Finalized Problem definition with objectives, List of solution concepts (sketches/flowcharts) and Design document (diagrams, flow) – 10 Marks

13. Week-7: Work breakdown structure (task division). Timeline for development. Safety & ethical considerations.
14. Week-8&9: Development of subsystems/modules, Application of classroom knowledge (electrical circuits, coding, mechanics, CAD, etc.), Peer & mentor review sessions.

Deliverables - Prototype development plan, Subsystem demos (partial working models) – 10 Marks

15. Week-13&14: Refining prototype for efficiency, cost, sustainability. Internal review & peer feedback. Preparing visuals for final presentation (posters, PPT, demo video).
16. Project pitching - Presentation of the project with impact with assessment, prototype, and sustainability plan

Deliverables – Final Results of Experimentation or Testing & Working/ Prototype Model – 30 Marks

Suggested Learning e-Resources:

- Introduction to the Arduino Microcontroller:
  https://www.arduino.cc/en/Tutorial/HomePage/
- Introduction to the ESP Microcontroller:
  https://docs.espressif.com/projects/esp-idf/en/stable/esp32/get-started/index.html

References

- Michael Margolis, Brian Jepson, Nicholas Robert Weldin. (2020). Arduino Cookbook, 3rd Edition.
- Prince, M. J., & Felder, R. M. (2006). Inductive Teaching and Learning Methods: Definitions, Comparisons, and Research Bases. Journal of Engineering Education.
- Savery, J. R. (2006). Overview of Problem-Based Learning: Definitions and Distinctions. Interdisciplinary Journal of Problem-Based Learning.

Course Outcomes:

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

1. Identify and define problems requiring interdisciplinary knowledge (PO-1, PO-2, PO-3, PO-6, PO-8, PO-9, PO-10)
2. Apply basic concepts of science, engineering, and technology to design simple solutions (PO-1, PO-2, PO-3, PO-4, PO-5, PO-8, PO-9, PO-10)
3. Work effectively in teams with defined roles and responsibilities. (PO-8, PO-9, PO-10)
4. Use project management, documentation, and presentation skills (PO-8, PO-9, PO-10)
5. Develop socially relevant, sustainable, and innovative prototypes/solutions (PO – 6)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Deliverables along with the marks indicated in Course Content	50	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS

Course Code: HSCC18/28 **Credits:** 0:0:0

Pre-requisites: Nil **Contact Hours:** 15L

Course Coordinator: Mrs. Kanya Kumari S

Course Contents

Unit I

Introduction to the Constitution of India

Meaning and Significances of the Constitution, and its salient features, Preamble of the Constitution, Fundamental Rights and relevant cases.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power point presentation

Unit II

Relevance of Directive Principles of State Policy -Part-IV

Fundamental Duties & their significance. Special constitutional provisions for the betterment of Women, Children and backward classes in India.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power point presentation

Unit III

Union Executive and State Executive

The organs of government -Union executive- the President of India, Vice President, Prime Minister, & Council of Ministers. The Union Legislature, Compositions & the functions of Parliament and the Supreme court of India -composition & Jurisdictions

State Executive-Governor, Chief Minister& council of Ministers, State legislature-composition & functions of Legislative assembly& legislative council and State Judiciary.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos

Unit IV

Emergency Provisions, Electoral Process & Major Constitutional Amendments

Emergency provisions and election commission of India & Electoral process, Amendment procedure and Major Constitutional amendments.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation

Unit V

Professional Ethics

Scope and Aim of professional ethics, Responsible attitude, impediments to Responsibility, Trust & Reliability in Engineering

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation

Text Books:

1. A Primer on Constitution of India & Professional ethics, VTU Publication-2007

Reference Books:

1. **Durga Das Basu** - Introduction to Constitution of India - 19th / 20th edition 2001
2. **M.V.Pylee** - An Introduction to Constitution of India, 4th edition, 2008
3. **Dr. K. R. Phaneesh** - Constitution of India & Professional Ethics, Sudha publication, 10th revised edition 2018.

Course Outcomes (COs):

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

1. Identify the fundamental principles of Indian constitution. (PO-11)
2. Examine various provisions of the fundamental duties and directives of government. (PO-7, PO-11)
3. Understand the powers & functions of executive, Legislature and judicial system at the center and state level (PO-11)
4. Identify the role of government. Understand about Amendment procedure (PO-11)
5. Understand about Ethical values in engineering profession (PO-7)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Internal test-I	30	CO1, CO2, CO3
Internal test-II	30	CO3, CO4, CO5
Average of the two internal tests will be taken for 30 marks.		
Other components		
Assignment	10	CO1, CO2
quiz	10	CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

CIVIL ENGINEERING STREAM
II SEMESTER

MULTIVARIABLE CALCULUS & NUMERICAL METHODS

Course Code: MAV21 **Credits:** 3:1:0
Pre-requisites: - **Contact Hours:** 45L+30T

Course Coordinators: Dr. B Azghar Pasha & Dr. Uma M

Course Contents

Unit I
Integral Calculus

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

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/111105121
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/107625/1030

Unit II
Partial Differential Equations (PDE)

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. Classification of second order PDE and solution of one-dimensional heat equation and wave equation by separation of variables.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/111101153
  ➢ https://nptel.ac.in/courses/111108152
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/2583981/1205
  ➢ https://a.impartus.com/ilc/#/course/290290/703

Unit III
Vector Calculus

Vector Differentiation: 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, Green's theorem.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/111105134
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/107625/1030

Unit IV

Numerical Methods- 1

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

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

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/111105121
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/619570/1030
  ➢ https://a.impartus.com/ilc/#/course/96127/452
  ➢ https://a.impartus.com/ilc/#/course/132243/636

Unit V

Numerical Methods– 2

Numerical integration: Trapezoidal, Simpson's1/3rd and 3/8th rules.

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

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/111105121
- Impartus recording: https://a.impartus.com/ilc/#/course/96127/452
  https://a.impartus.com/ilc/#/course/619570/1030
  https://a.impartus.com/ilc/#/course/621524/1030

Text books:

1. **E. Kreyszig** - Advanced Engineering Mathematics, John Wiley & Sons, 10th edition, 2018.
2. **B. S. Grewal** - Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2021.
3. **B. V. Ramana** - Higher Engineering Mathematics, McGraw-Hill Education, 11th edition, 2017
4. **M.K. Jain, S.R.K. Iyengar and R.K. Jain** - Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 8th edition, 2022**.**

Reference books:

1. **Srimanta Pal & Subodh C. Bhunia** - Engineering Mathematics, Oxford University Press, 3rd edition, 2016.
2. **N. P.Bali and Manish Goyal** - A Text book of Engineering Mathematics, Laxmi Publications, 10th edition, 2022.
3. **H.K. Dass and Er. Rajnish Verma** - Higher Engineering Mathematics, S.Chand Publication, 3rd edition, 2014.
4. **Ray Wylie, Louis C. Barrett** - Advanced Engineering Mathematics, McGraw Hill Book Co., New York, 6th edition, 2017.

5. **Steven C. Chapra and Raymond P. Canale** - Applied Numerical Methods with Matlab for Engineers and Scientists, Mc Graw-Hill, 3rd edition, 2011.
6. **Richard L. Burden, Douglas J. Faires and A. M. Burden** - Numerical Analysis, Cengage Publishers, 10th edition, 2010.
7. **S.S. Sastry** - Introductory Methods of Numerical Analysis, PHI Learning Private Limited, 5th edition, 2012.

Course Outcomes

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

1. Evaluate multiple integrals and use them to find areas and volumes. (PO-1, 2)
2. Find the solution of PDE's analytically and numerically (PO-1, 2)
3. Apply the concepts of vector differentiation and vector integration to solve engineering problems (PO-1, 2)
4. Apply numerical methods to solve algebraic/transcendental equations and interpolate functions over an interval (PO-1, 2)
5. Evaluate definite integrals and solve first order ODE's numerically (PO-1, 2)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal test – I	30	CO1,CO2,CO3
Internal test – II	30	CO3,CO4,CO5
Average of the two internal tests will be taken for 30 marks.		
Other components	**Marks**	**Course outcomes addressed**
Quiz	10	CO1,CO2,CO3
Assignment	10	CO3,CO4,CO5
Semester End Examination (SEE)	100	CO1,CO2,CO3,CO4,CO5

PHYSICS FOR SUSTAINABLE STRUCTURAL SYSTEMS

Course Code: PYV22 **Credits:** 3:0:1
Pre-requisites: **Contact Hours:** 45L+30P

Course Coordinator: Dr. Siddlingeshwar B.

Course Contents

Unit I
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.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://www.youtube.com/watch?v=gnD8Se92hfk
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/107626/533

Unit II
Elasticity

Review of stress- strain curve, Strain hardening and softening, Elastic moduli, Poisson's ratio and its limiting values. Derivations for Y, K, n in terms of linear and lateral strains, Relationship between Y, k, n and σ. Beams, bending moment of a beam (derivation), Expression for Cantilever loaded at free end (derivation), Torsion of a cylinder and determination of couple per unit twist. Torsion pendulum—Determination of rigidity modulus using torsion pendulum, Elastic materials (qualitative). Failures of engineering materials Ductile fracture, Brittle fracture, Stress concentration, Fatigue and factors affecting fatigue (only qualitative explanation), S-N Curve (Wohler curve), Numerical problems

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://web.mit.edu/course/3/3.11/www/modules/ss.pdf
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/107626/533

Unit III
Waves And Their Role In Structural Behaviour

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, engineering structures to withstand tsunami), Seismometer and Seismograph, Accelerometer

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links ➢ https://www.youtube.com/watch?v=G9NgoxHMPwk
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/107626/533

Unit IV
Acoustics And Ultrasonics

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, Noise and its Measurements, Sound Insulation and its measurements. Impact of Noise in Multi-storied buildings, Numerical Problems

Ultrasonics: Production of Ultrasonic waves: Magnetostriction method, Piezo-electric method. Detection of Ultrasonics, Properties of Ultrasonics, Applications of ultrasonics: NDT - Detection of flaws in metals, SONAR, mention of other applications.

Pedagogy / Course delivery tools: Chalk and talk, Power Point Presentation, videos
Links: https://www.youtube.com/watch?v=aMelwOsGpIs
Impartus recording: https://a.impartus.com/ilc/#/course/107626/533

Unit V
Materials Characterization And Instrumentation Techniques

Crystal structure: Crystal systems, Crystal planes, Determination of Miller indices of crystal planes, Interplanar spacing in terms of Miller indices, Bragg's law.

Material Characterization and Instrumentation Techniques: Principle, construction and working of X-ray Diffractometer, crystallite size determination by Scherrer equation, Phase identification of materials by PXRD pattern, Principle, construction, working and applications of Atomic Force Microscopy (AFM) and Scanning electron Microscopy (SEM), Numerical problems.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, Videos
- Links: ➢ https://youtu.be/SXIYzrFGmkU
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/107626/533

Text Books:

1. **H M Agarwal and R M Agarwal, Physics** - Oscillations and Waves, Optics and Quantum Mechanics , Pearson, 2025
2. **Shatendra Sharma and Jyotsna Sharma** - Engineering Physics, Pearson, 2018.
3. **Gaur and Gupta -** Engineering Physics, Dhanpat Rai Publishers, New Delhi, 8th revised edition 2017.
4. **Sam Zhang, Lin Li, Ashok Kumar** - Materials Characterization Techniques, CRC Press, First Edition, 2008.

Reference Books:

1. **Resnick, Halliday and Jearl Walker** - Fundamentals of Physics, John Wiley & Sons, Inc., 11th edition, 2018.
2. **Stein, Seth, and Michael Wysession** - Introduction to Seismology, Earthquakes, and Earth Structure Blackwell Publishing, 2003.
3. **S L Kakani, Shubra Kakani** - Engineering Physics, 3rd Edition, 2020, CBS Publishers and Distributers Pvt. Ltd.

Practical Component (Lab experiments)

1. Plotting of forward and reverse bias characteristics of a Zener Diode and determination of breakdown voltage
2. Determination of numerical aperture, Acceptance angle and bending loss in Optical Fibre Cable
3. Measurement of capacitance and dielectric constant of a capacitor by charging and discharging it through a resistor
4. Determination of Planck's constant using LEDs
5. Verification of Stefan's law
6. Identification of different components (L,C or R) of a Black Box and calculation of their values through frequency response curves
7. Determination of Moment of inertia of an irregular body and calculation of rigidity modulus
8. Measurement of Young's Modulus of the material of the single cantilever beam
9. Determination of Energy gap of semiconductor
10. Determination of Fermi energy of a metal
11. Measurement of operating wavelength of semiconductor laser using Laser diffraction.
12. Calculation of thickness of given paper strip by the method of interference fringes (Air wedge)
13. Frequency response of series and parallel LCR circuits and calculation of Q-factor and band width
14. Determination of Hall coefficient and concentration of charge carriers of the semiconductor
15. Simulation of electrical experiments using PSPICE open source software
16. Predicting the outputs of various combinations of single and two-qubit gates using QUISKIT.

****Students are required to perform 12 prescribed experiments in the Physics lab from the above list**.**

Course Outcomes

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

1. Interpret the difference between free, damped and forced vibrations and their importance in structural systems. (PO-1, 2)
2. Analyze different elastic modulii in materials and learn the concepts of beams and cantilever in civil structures. (PO-1, 2)
3. Evaluate the effect of wave propagation in beams, rods, and slabs and physics of earthquakes and other natural hazards. (PO-1, 2)
4. Demonstrate knowledge of non-destructive testing (NDT) techniques and apply the principles of acoustics to design better systems. (PO-1, 2)
5. Apply the concepts of X-ray diffraction and other characterization techniques to assess the properties and sustainability of engineering systems. (PO-1, 2)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal test – I	30	CO1,CO2,CO3
Internal test – II	30	CO3,CO4,CO5
Average of the two internal tests will be taken for 30 marks.		
CIE practical component assessment	Marks	Course outcomes addressed
Regular performance of experiments in the lab	15	CO1,CO2,CO3,CO4,CO5
Lab Test	05	CO1,CO2,CO3,CO4,CO5
Semester End Examination (SEE)	100	CO1,CO2,CO3,CO4,CO5

ENGINEERING MECHANICS

Course Code: PSCCV24 **Credits:** 3:0:0
Pre-requisites: **Contact Hours:** 45L

Course Coordinator: Dr. Santhosh D

Course Contents

Unit I

Introduction to Civil Engineering: Surveying, Structural Engineering, Geotechnical Engineering, Water Resources Engineering, Transportation Engineering, Environmental Engineering, Construction Planning and Project Management.

Construction Materials: Types and Uses of Bricks, Stones, Cement, Fine and Coarse aggregates, Structural Steel, Wood and Concrete.

Building Components: Concept of Foundation, Plinth, Lintel, Chejja, Masonry wall, Column, Beam, Slab, Flooring and Staircase.

Pedagogy / Course delivery tools:	➢ Chalk and talk
Links:	➢ Introduction: https://a.impartus.com/ilc/#/video/id/534326
Impartus recording:	➢ https://a.impartus.com/ilc/#/video/id/536441

Unit II

Coplanar force system: Basic dimensions and units, Idealisation, Force, Classification of force system, principle of transmissibility of a force, Composition and resolution of forces, Free body diagrams, Resultant of coplanar concurrent and non-concurrent force system, Moment, Couple and Characteristics of couple, Varignon's theorem: Numerical Examples.

Pedagogy / Course delivery tools:	➢ Chalk and talk
Links	➢ Introduction to Engg. Mechanics https://a.impartus.com/ilc/#/video/id/532408
Impartus recording:	➢ Resultants - https://a.impartus.com/ilc/#/video/id/537603

Unit III

Equilibrium: Conditions of static equilibrium, Equilibrium of coplanar concurrent force systems, Equilibrium of coplanar non-concurrent force system, Numerical examples. Types of supports, loadings and beams, Concept of statically determinate and indeterminate beams. Support reactions for statically determinate beams subjected to various loadings: Numerical examples.

Pedagogy / Course delivery tools:	➢ Chalk and talk, Power Point Presentation, videos
Links:	➢ https: //a.impartus.com/ilc/#/video/id/550330
Impartus recording:	➢ https://a.impartus.com/ilc/#/video/id/550330

Unit IV

Friction: Introduction, Types of friction, Concept of static friction, Kinetic (Dynamic) friction, Laws of friction, Angle of repose, Cone of friction, Equilibrium of blocks on horizontal and inclined plane, Ladder friction: Numerical examples.

Pedagogy / Course delivery tools:	➢	Chalk and talk, Power Point Presentation, Videos
Links:	➢	https://www.youtube.com/watch?v=AlenFWwK3Ek
Impartus recording:	➢	https://www.youtube.com/watch?v=AlenFWwK3Ek

Unit V

Centroid: Introduction, definitions of centroid and Centre of Gravity. Axes of symmetry, Locating the centroid of square, rectangle, triangle, circle, semicircle, quadrant and sector of a circle using method of integration, Centroid of composite areas and simple built- up sections: Numerical examples.

Moment of Inertia of plane Areas: Introduction, Moment of inertia about an axis, Parallel axes theorem, Perpendicular axes theorem, Polar moment of inertia, Radius of gyration.Moment of inertia of square, rectangular, triangular and circular areas from the method of Integration, Moment of inertia of composite areas and simple built-up sections: Numerical Examples.

Pedagogy / Course delivery tools:	➢	Chalk and talk
Links:	➢	Centroid: https://www.youtube.com/watch?v=QK_TuE2lfSc
	➢	Moment of Inertia: https://www.youtube.com/watch?v=Bls5KnQOWkY
Impartus recording:	➢	https://www.youtube.com/watch?v=Bls5KnQOWkY

Text books:

1 **Bansal R. K., Rakesh Ranjan Beohar, Ahmad Ali Khan** - Basic Civil Engineering and Engineering Mechanics, 3rd edition, 2015, Laxmi Publications, ISBN: 9789380856674.

2 **Kolhapure B. K.** - Elements of Civil Engineering and Engineering Mechanics, 11th edition, 2018, Eastern Book Promoters Belgaum [EBPB], ISBN: 5551234003896.

Reference Books:

1 **Beer F.P., Johnston E. R.** - Mechanics for Engineers: Statics and Dynamics, 4th edition, 1987, McGraw Hill, ISBN: 9780070045842.

2 **Meriam J. L., Kraige L. G.** - Engineering Mechanics-Statics, Vol I– 6th edition, 2008, Wiley publication.

3 **Irving H. Shames** - Engineering Mechanics-Statics and Dynamics, 4th edition, 2002, Prentice-Hall of India(PHI).

4 **Hibbler R. C.** - Engineering Mechanics: Principles of Statics and Dynamics, 14th edition, 2017, Pearson Press, New Delhi.ISBN:9789332584747.

5 **Timoshenko S, Young D. H., Rao J. V., Sukumar Patil** - Engineering Mechanics, 5th edition, 2017, McGraw Hill Publisher, ISBN: 9781259062667.
6 **Bhavikatti S. S.** - Engineering Mechanics, 4th edition, 2018, New Age International Publications.
7 **Reddy Vijaykumar K., Suresh Kumar K.** - Engineering Mechanics, 3rd edition 2013, BS Publications.
8 **J. K. Gupta, S. K. Gupta** - Engineering Mechanics and Applied Mechanics, 1st edition, 2021, Cengage learning. ISBN: 9789353505851.

Course Outcomes

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

1. Explain the various disciplines of civil engineering, construction materials, and building components.(PO-1,PO-6)
2. Apply the principles of equilibrium for force systems. (PO-1, PO-2, PO-3)
3. Compute the reactions using Conditions of Equilibrium. (PO-1, PO-2, PO-3)
4. Apply the principles of friction for various Civil Engineering problems. (PO-1, PO-2 ,PO-3)
5. Determine the centroid and Moment of Inertia of simple and composite plane areas using first principles (PO-1, PO-2, PO-3)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal test – I	30	CO1,CO2,CO3
Internal test – II	30	CO3,CO4,CO5
Average of the two internal tests will be taken for 30 marks.		
Other components	**Marks**	**Course outcomes addressed**
Quiz	10	CO1,CO2,CO3
Assignment	10	CO3,CO4,CO5
Semester End Examination (SEE)	100	CO1,CO2,CO3,CO4,CO5

SOFT SKILLS

Course Code: HSCP15/25 **Credits:** 1:0:0
Pre-requisites: Nil **Contact Hours:** 15L+15P

Course Coordinator: Dr. Diwakar P

Course Content

Unit I

Social Skills

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.

- Pedagogy / Course delivery tools:
  - TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
- Language Lab
  - Quicklrn.com

Unit II

Emotional Skills I

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.

- Pedagogy / Course delivery tools:
  - TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
- Language Lab
  - Quicklrn.com

Unit III

Emotional Skills II

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).

- Pedagogy / Course delivery tools:
  - TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach

- Language Lab
  - Quicklrn.com

Unit IV
Professional Skills I

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.

- Pedagogy / Course delivery tools:
  - TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
- Language Lab
  - Quicklrn.com

Unit V
Professional Skills II

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.

- Pedagogy / Course delivery tools:
  - TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
- Language Lab
  - Quicklrn.com

Text books:

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

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:
  - ❖ bbc Learn English online Grammar
  - ❖ Learn English Podcasts
  - ❖ IELTS Word Power
  - ❖ Bbc learning English grammer online
  - ❖ Sounds Right (Phonemic Chart)

Course Outcomes (COs):

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

1. Apply social skills for clear communication, persuasion, self-awareness, and active listening (PO-8, PO-9, PO-11)
2. Use emotional skills to build confidence, manage stress, and adapt to change (PO-9, PO-11)
3. Set ambitious goals, practice empathy, and apply creativity for problem-solving (PO- 9, PO-11)
4. Demonstrate discipline, time management, and structured problem-solving (PO-8, PO-9, PO-11)
5. Work in teams, negotiate, resolve conflicts, and think critically (PO-8, 9, 11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes attained**
Internal Test-I	30 (6 marks objective & 24 marks subjective pattern)	CO1, CO2, CO3
Internal Test-II	30 (6 marks objective & 24 marks subjective pattern)	CO4, CO5
Average of the two internal tests shall be taken for 30 marks.		
Other components		
Assignment-I	10	CO1, CO2, CO3
Assignment-II	10	CO3, CO4, CO5
Semester End Examination (SEE)	50 (10 marks objective & 40 marks subjective pattern)	CO1, CO2, CO3, CO4, CO5

KANNADA KALI

Course Code: HSCP16/26K **Credits:** 1:0:0

Pre-requisites: - **Contact Hours:** 15L

Course Coordinator: Mrs. Kanya Kumari S

Course Content

Unit I

(Parichaya) - Introduction

Kannada Bhashe - About Kannada Language, Eight Kannada Authors – JnanpiTh Awardies. Introduction to Kannada Language, Karnataka State and Literature.

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

Unit II

Kannada PadagaLu mattu Vaakyagalu. Kannada Words and Sentences

naamapadagaLu – Sarva naamapadagaLu – (Nouns-Pronouns) and it's usage in Kannada.

Kannada naamavisheshanagaLu - (Adjectives-Interrogatives) kriyapadagaLu, kriya visheshaNagaLu- (verb-adverb)

Sambhashaneyalli Prashnarthaka padagalu – vaakyagaLu mattu kriyapadagaLu-visheshaNagaLu (Kannada- Interrogative words & Sentences and verb-adverb in Conversation)

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

Unit III

Kannada Bhasheyalli Sambhashanegalu- Conversations in Kannada:

Samanya Sambhashaneyalli Kannadada Padagalu mattu Vaakyagalu.

(Kannada Words and Sentences in General Conversation with activities)

Vicharaneya / Bedikeya vakyagalu (Enquiry /Request sentences in Conversation)

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

Unit IV

Kannada padagaLu (eakavachana, bahuvachanagaLu, virudda padagaLu, dina nityadalli baLasuva padagaLu mattu sankya vyavaste

Sambhashaneyalli Eakavachana mattu Bhahuvachana- (Singular and Plural nouns) Conversation- Sambhashaneyalli Linga rupagaLu- Genders in Conversation

Viruddha padagalu /Virodarthaka padagalu (Antonyms) Asamanjasa Uchcharane (Inappropriate Pronunciation)

Sankhya Vyavasthe (Numbers system) -Samaya /Kalakke Sambhandhisida padhagalu (Words Relating to time) – Dikkugalige sambhadisida padhagalu (Words Relating to Directions)

Aaharakke sambandisida padagaLu (Names connected with food)
Manavana shareerada bhagagalu / Angagalu (Parts of the Human body) Manava Sambhandhada da padhagalu (Terms Relating to Human Relationship)
Manavana Bhavanegalige sambandisida Padagalu (Words Relating to Human's feelings and Emotions)
Vaasada staLakke sambhandisidanthaha padhagalu (Words Relating to place of leaving)

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

Unit V

Kannada akshara maale (Kannada alphabets and their practices with pronunciations)

swara aksharagaLu –vyanjanaksharagaLu.
Shabdakosha (Vocabulary) - Exercises to test their knowledge of understanding the Language.
tantragnana mattu AaDalita padagaLu-Technical and administrative worlds in Kannada

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

Text Book:

1. **Dr. L.Thimmesh, Prof. Keshava muurthy -** BaLake kannada Prasarangaa, VTU, 2020

Reference Books:

1. **Smt. Kanya Kumari S** – Kannada Kali, Kinnari publications, 1st edition, Bengaluru, 2022
2. **Lingadevaru Halemane** – Kannada Kali, Prasaranga Kannada University Hampi, 6th edition, 2019

Course Outcomes (COs):

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

1. Develop vocabulary (PO-9)
2. Identify the basic Kannada language skill (PO-9)
3. Develop listing & speaking skill in Kannada language (PO-9, PO-11)
4. Enrich language skill (PO-11)
5. Apply Kannada language skill for various purpose (PO-11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes attained**
Internal Test-I	30	CO1, CO2, CO3
Internal Test-II	30	CO4, CO5
Average of the two internal tests shall be taken for 30 marks		
Other components		
Assignment	10	CO1, CO2
Quiz	10	CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

ಕನ್ನಡ ಮನಸು

Course Code: HSCP16/26M **Credits:** 1:0:0

Pre-requisites: - **Contact Hours:** 15L

Course Coordinator: Mrs. Kanya Kumari S

ಘಟಕ -೧ (Unit I)

ಲೇಖನಗಳು (Articles)

ಕನ್ನಡ ಭಾಷೆ ನಾಡು -ನುಡಿ
ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ
ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ
ವಚನಗಳು - ಅಕ್ಕಮಹಾದೇವಿ -ಬಸವಣ್ಣ -ಅಲ್ಲಮಪ್ರಭು

- Pedagogy / Course delivery tools: ➢ Chalk & talk

ಘಟಕ-೨ (Unit II)

ಕಾವ್ಯಭಾಗ (Poetry)

ವಚನಗಳು ಮತ್ತು ಕೀರ್ತನೆ : ಪುರಂದರ ದಾಸರು
ತತ್ವ ಪದಗಳು : ಶಿಶುನಾಳ ಶರೀಫರು

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

ಘಟಕ-೩ (Unit III)

ಆಧುನಿಕ ಕಾವ್ಯಗಳು

ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗ -ಡಿ.ವಿ.ಜಿ
ಕುರುಡು ಕಾಂಚಾಣ - ದ.ರಾ .ಬೇಂದ್ರೆ

- Pedagogy / Course delivery tools: ➢ Chalk & talk

ಘಟಕ-೪ (Unit IV)

ತಾಂತ್ರಿಕ ಧುರೀಣರು (ವ್ಯಕ್ತಿ ಪರಿಚಯ) ಕಥೆ -ಪ್ರವಾಸ ಕಥನ

ಡಾ.ಸರ್.ಎಂ.ವಿಶ್ವೇಶ್ವರಯ್ಯ - ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ - ಎ. ಎನ್. ಮೂರ್ತಿರಾಯರು
ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ
ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಡಾ. ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ

- Pedagogy / Course delivery tools: ➢ Chalk & talk

ಘಟಕ-೫ (Unit V)

ಕಂಪ್ಯೂಟರ್ ಹಾಗು ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ

"ಕ" ಮತ್ತು "ಬ" ಬರಹ ತಂತ್ರಾಂಶಗಳು
ತಾಂತ್ರಿಕ ಪದಕೋಶ: ತಾಂತ್ರಿಕ ಹಾಗು ಪಾರಿಭಾಷಿಕ ಕನ್ನಡ ಪದಗಳು

- Pedagogy / Course delivery tools: ➢ Chalk & talk

ಪಠ್ಯ ಪುಸ್ತಕ (Text book):

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ - ಡಾ. ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ - ವಿಶ್ರಾಂತ ಕುಲಪತಿಗಳು, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ, ಪ್ರಸಾರಾಂಗ - ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಪ್ರಥಮ ಮುದ್ರಣ, ೨೦೨೦

ಪೂರಕ ಪಠ್ಯ (Reference book):

೧. ಕನ್ನಡ ಮನಸು - ಪ್ರಸಾರಾಂಗ, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ, ಆರನೇ ಮುದ್ರಣ, ೨೦೧೯
೨. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಕೋಶ - ಡಾ. ರಾಜಪ್ಪ ದಳವಾಯಿ, ೨೦೧೮

Course Outcomes (COs):

ಕನ್ನಡ ಮನಸು ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು

೧. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡದ ಜೊತೆಗೆ ಕ್ರಿಯಾತ್ಮಕ, ಸಾಹಿತ್ಯ, ಸಂಸ್ಕೃತಿ ಮತ್ತು ನಾಡು ನುಡಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು (P0-11)
೨. ಕನ್ನಡ ಭಾಷೆಯ ವ್ಯಾಕರಣ, ಭಾಷಾ ರಚನೆಯ ನಿಯಮಗಳನ್ನು ಪರಿಚಯಿಸುವುದು (P0-9)
೩. ಕನ್ನಡ ಭಾಷಾ ಬರಹದಲ್ಲಿ ಕಂಡು ಬರುವ ದೋಷಗಳು, ಅವುಗಳ ನಿವಾರಣೆ (P0-9)
೪. ಸಾಮಾನ್ಯ ಅರ್ಜಿಗಳು, ಸರ್ಕಾರಿ ಹಾಗು ಅರೆ ಸರ್ಕಾರಿ ಪತ್ರ ವ್ಯವಹಾರದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡಿಸುವುದು (P0-11)
೫. ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆ ಬಗ್ಗೆ ಆಸಕ್ತಿ ಮೂಡಿಸುವುದು ಮತ್ತು ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ, ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗು ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು (P0-11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes attained**
Internal Test-I	30	CO1, CO2, CO3
Internal Test-II	30	CO4, CO5
Avarege of the two internal test two will be taken for 30 marks		
Other components		
Assignment	10	CO1, CO2
Quiz	10	CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

INNOVATION & DESIGN THINKING LAB

Course Code: AECP17/27 **Credits: 0:0:1**

Pre-requisites: Nil **Contact Hours: 30P**

Course Coordinator: Dr. Anita Kanavalli

Course Content

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

Course Outcomes (COs):

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

1. Empathize with community problems and define meaningful challenges. (PO1, PO2, PO8, PO9)
2. Apply design thinking principles and multidisciplinary skills to develop user-centric solutions. (PO1, PO2, PO3, PO4, PO8, PO9)
3. Build and test basic prototypes using tools available in the Atal Idea/Tinkering Lab or Makers Space. (PO1, PO2, PO3, PO4, PO6, PO8, PO9)
4. Pitch socially relevant ideas with scalable models. (PO1, PO2, PO3, PO4, PO6, PO8, PO9)
5. Collaborate effectively in diverse teams. (PO1, PO2, PO3, PO4, PO6, PO8, PO-9)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes attained**
Weekly evaluation of laboratory reports after the conduction of every experiment.	30	CO1, CO2, CO3
Other components		
Practical test 20	20	CO1, CO2, CO3
Semester End Examination (SEE)	50	CO1, CO2, CO3

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)

MECHANICS AND MATERIALS LAB

Course Code: PSCLCV28 **Credits:** 0:0:1

Pre-requisites: Nil **Contact Hours:** 30P

Course Coordinator: Dr Lakshmikanth S M

Course Content

Part-A

1. Verification of Lami's Theorem.
2. Equilibrium of concurrent forces.
3. Parallel force system- Simply supported beam.
4. Verification of Varignon's theorem.
5. Specific Gravity, Bulk Density & Water Absorption of
   a) Fine aggregates.
   b) Coarse aggregates.
   c) Cement.
6. Sieve analysis of sand

Part-B

1. Reactions.
2. Field tests on cement.
3. Field tests on soil
4. Field tests on Brick.
5. Particle size distribution of soil - Gap graded, uniformly graded, well graded
6. Visual identification of building materials: Bricks, Stones, Tiles, M-Sand, Bitumen, Fly-Ash, GGBS, Steel Bars of Various Sizes.

Text books:

1. Laboratory manual prepared by the Civil Engineering Department, RIT, Bangalore.
2. M. L. Gambhir : Concrete Manual : Dhanpat Rai & sons New – Delhi, ISBN-135551234001965.
3. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, third edition, 2015, Laxmi Publications, ISBN: 9789380856674
4. Ramamrutham.S, Engineering Mechanics, Dhanpat Rai Books, 2013,ISBN: 9789352164271.
5. Soil Mechanics and foundation Engineering by B C Punmia, Ashok kumar jain, Arun Kumar Jain, 18th edition, 2023, Laxmi Publications New Delhi.

Reference books / Manuals:

1. Meriam J. L. and Kraige L. G, Engineering Mechanics-Statics, Vol I–sixth Edition,2008, Wiley publication.
2. Rattan S.S., Strength of Materials, Third edition, 2017, McGraw Hill Education; New Delhi. ISBN- 13978-9385965517.
3. Bansal R K, Strength of Materials, Laxmi Publications. 2023, 4th Edition, ISBN:978-8131808146.
4. IS 4031 (Part 11):1988 – Specific gravity test for hydraulic cement.
5. IS 383:1970 – Specification for coarse and fine aggregates from natural sources for concrete.
6. IS 2386(Part 3):1963 Methods of test for aggregates for concrete: Part 3 Specific gravity, density, voids, absorption and bulking.
7. IS 2720 (Part 3/Sec 1):1980 – Determination of specific gravity of soil.
8. Relevant IS Codes.

Course Outcomes

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

1. Analyze coplanar force systems by analytical and graphical methods and verifying Lami's theorem.(PO-1, PO-7, PO-8)
2. Compute support reactions in simply supported beams experimentally and analytically. (PO-1, PO-7, PO-8)
3. Identify and understand the properties of various construction materials. .(PO-1, PO-7, PO-8)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50		
Assessment Tool	**Marks**	**Course outcomes addressed**
Weekly evaluation of laboratory reports after the conduction of every experiment.	30	CO1,CO2,CO3
Average of the two internal tests will be taken for 30 marks.		
Other components	**Marks**	**Course outcomes addressed**
Practical test 20	20	CO1, CO2, CO3
Semester End Examination (SEE)	50	CO1, CO2, CO3

COMPUTER AIDED ENGINEERING DRAWING - CV

Course Code: MELV29 **Credits:** 0:0:1
Pre-requisites: Nil **Contact Hours:** 30P
Course Coordinator: Dr. Mohandas K N

Course Contents

Unit I

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 and RPP & LPP of 2D environment. 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:
Orthographic projections: Definitions - Planes of projection, reference line and conventions employed, Projections of points in First and Third quadrants (**No problems**), Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (**No problems**).

Orthographic Projections of Planes viz triangle, square, rectangle, pentagon, hexagon, and circular laminae (**Placed in First quadrant only using change of position method**).

- Pedagogy/Course delivery tools: ➢ Chalk and talk, Power point presentation
- Links: Orthographic Projections ➢ https://www.youtube.com/watch?v=uePTMVQlIA4
- Links: Orthographic projections of plane ➢ https://www.youtube.com/watch?v=GguSUmNxc8Q

Unit II

Development of Lateral Surfaces of Solids:
Development of sectioned (**Section plane perpendicular to VP and inclined to HP bisecting the axis only**) lateral surfaces of right regular prism, cylinder, pyramid and cone resting **with base on HP only.**

- Pedagogy/Course delivery tools: ➢ Chalk and talk, Power point presentation
- Links: Development of lateral surfaces ➢ https://www.youtube.com/watch?v=U5mz9_W-xdI

Unit III

Orthographic Projection of Solids:
Orthographic projection of right regular solids (**Solids Resting on HP only**): Prism

& Pyramid (triangle, square, rectangle, pentagon, hexagon), Cylinder, Cone and Cube **(No freely suspended problems)**.

- Pedagogy/Course delivery tools: ➢ Chalk and talk, Power point presentation
- Links: Orthographic projection of Solids ➢ https://www.youtube.com/watch?v=vu06T5caWpc&list=PLzDhXNnURXs8bfbPmddiS_ACDRW1WoWb

Unit IV

Isometric Projections:

Isometric scale, Isometric projection of hexahedron (cube), right regular prism, pyramid, cylinder, cone, sphere and frustum of solid. Isometric projection of combination of two simple solids **(Co-axial only)**.

- Pedagogy/Course delivery tools: ➢ Chalk and talk, Power point presentation
- Links: Isometric Projection ➢ https://www.youtube.com/watch?v=Vo9LC9d7FQA&t=3374s

Unit V

Multidisciplinary Applications & Practice: (For CIE only)

Free hand Sketching: True free hand, Guided Free hand, Roads**.**

Drawing Simple Mechanisms: Bicycles, Tricycles, Gear trains.

Electric Wiring and lighting diagrams: Like, Automatic fire alarm.

Basic Building Drawing: Architectural floor plan, basic foundation drawing.

Electronics Engineering Drawings: Simple Electronics Circuit Drawings, practice on layers concept.

- Pedagogy/Course delivery tools: ➢ Chalk and talk, Power point presentation
- Links: Free hand sketching ➢ https://www.youtube.com/watch?v=Ess0dmJB2lo
- Links: Electric wiring and lighting diagram ➢ https://www.youtube.com/watch?v=c67wlH2lJL8
- Links: Electronics Engineering Drawings ➢ https://www.youtube.com/watch?v=RpF7oFC-LPY

Text books:

1. **Sudhir Gopalakrishna & K. R. Gopalakrishna** - A Textbook of Engineering Graphics, Techno Series, 2024.
2. **N. D. Bhatt** - Engineering Drawing, Charotar Publishing house Pvt. Ltd, 2024.

Reference books:

1. **M H Annaiah** - Computer Aided Engineering Drawing, New Age International Private Limited, 7th edition, 2022.

Course Outcomes (COs):

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

1. Demonstrate the usage of suitable software for creating basic and applied engineering drawings. (PO-1, PO-5, PO-8, PO-9, PO-11)
2. Conceptually sketch and draw developments for typical lateral surfaces. (PO-1, PO-5, PO-8, PO-9)
3. Exhibit the knowledge of orthographic and isometric projections of typical solids. (PO-1, PO-5, PO-8, PO-9)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Class work and Print out	30	CO1,CO2,CO3
Assignments	10	CO1,CO2,CO3
Tests	10	CO1,CO2,CO3
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

ELECTRICAL & ELECTRONICS ENGINEERING STREAM
II SEMESTER

CALCULUS, NUMERICAL TECHNIQUES AND LAPLACE TRANSFORM

Course Code: MAE21 **Credits:** 3:1:0
Pre-requisites: - **Contact Hours: 45L+30T**

Course Coordinator: Dr. Monica Anand and Dr. A Sreevallabha Reddy

Course Contents

Unit I
Integral Calculus and its Applications

Multiple Integrals: Evaluation of double and triple integrals, change of order of integration, changing into polar coordinates. Area by double integral and volume by triple integral.

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

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, Video
- Links: ➢ https://a.impartus.com/ilc/#/course/107625/1030
- Impartus recording: ➢ https://nptel.ac.in/courses/111105121

Unit II
Vector Calculus and its Applications

Vector Differentiation: Scalar and vector fields, gradient, directional derivatives, divergence and curl- physical interpretation, solenoidal vector fields, irrotational vector fields and scalar potential.

Vector Integration**:** Line integrals, Statement of Green's theorem and problems.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, Videos
- Links ➢ https://nptel.ac.in/courses/111105134
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/283623/703
  ➢ https://a.impartus.com/ilc/#/course/107625/1030

Unit III
Numerical Methods-1

Finite differences, interpolation using Newton Gregory forward and backward difference formulae, Newton's divided difference formula, Lagrange's interpolation formula, numerical differentiation for forward and backward interpolation.

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

- Pedagogy / Course delivery tools:
  - Chalk and talk, Power Point Presentation, videos
- Links:
  - https://nptel.ac.in/courses/111105134
- Impartus recording:
  - https://a.impartus.com/ilc/#/course/96127/452

Unit IV

Numerical Methods-2 and LaplaceTransform-1

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.

Laplace transform (LT): Definition and formulae of Laplace transform, LT of elementary functions. Properties– linearity, scaling, shifting property.

- Pedagogy / Course delivery tools:
  - Chalk and talk, Power Point Presentation, Videos
- Links:
  - https://nptel.ac.in/courses/111105121
  - https://nptel.ac.in/courses/111105134
- Impartus recording:
  - https://a.impartus.com/ilc/#/course/59742/295

Unit V

Laplace Transform -2

Multiplication by t, division by t, LT of periodic functions, square wave, saw-tooth wave, triangular wave, full and half wave rectifier, Heaviside Unit step function.

Inverse Laplace Transforms: Definition, properties, evaluation using different methods: Convolution theorem and applications to solve ordinary differential equations.

- Pedagogy / Course delivery tools:
  - Chalk and talk, Power Point Presentation, Videos
- Links:
  - https://nptel.ac.in/courses/111105134
- Impartus recording:
  - https://a.impartus.com/ilc/#/course/59742/295

Text Books:

1. **B.S. Grewal** - Higher Engineering Mathematics, Khanna Publishers, 45th Ed., 2021.
2. **E. Kreyszig** - Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2018.
3. **M.K. Jain, S.R.K. Iyengar and R.K. Jain** - Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 8th 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. **Richard L. Burden, Douglas J. Faires and A. M. Burden** - Numerical Analysis, 10th Ed.,2010, Cengage Publishers.

Course Outcomes

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

1. Evaluate multiple integrals and use them to find areas and volumes (PO-1, PO-2)
2. Apply vector differentiation to identify solenoidal and irrotational vectors (PO-1, PO-2)
3. Interpolate, differentiate and integrate a given set of tabulated data (PO-1, PO-2)
4. Solve first order differential equations numerically and determine Laplace transforms of standard functions (PO-1, PO-2)
5. Solve initial and boundary value problems using Laplace transforms (PO-1, PO-2)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal test – I	30	CO1, CO2, CO3
Internal test – II	30	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks.		
Other components	**Marks**	**Course outcomes addressed**
Quiz	10	CO1, CO2, CO3
Assignment	10	CO3, CO4, CO5
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5

PHYSICS OF ELECTRONIC AND ELECTRICAL MATERIALS

Course Code: PYEE22 **Credits:** 3 :0:1
Pre-requisites: Nil **Contact Hours:** 45L+30P

Course Coordinator: Dr. Sandhya K. L.

Course Content

Unit I
DIELECTRICS AND MAGNETIC MATERIALS

Dielectrics : Introduction, Electrical Polarization Mechanisms, Internal fields in solids (qualitative), Clausius-Mossotti relation (derivation) and its implications, Properties and Frequency dependence of Dielectric constant, Dielectric loss, Solid, Liquid and Gaseous dielectrics. Application of dielectrics in Capacitors, Transformers (Oils), SF6 in High Voltage application, Ceramics - types and applications, Numerical Problems.

Magnetic materials : Classification of magnetic materials, Weiss Molecular field theory of ferromagnetism(Qualitative), Importance of Curie Temperature, Ferromagnetic Hysteresis and Explanation using Domain theory, Energy loss, Hard and soft ferromagnetic materials and Applications, Transformer Cores, Armature, Inductors and chokes, Permanent magnets, Numerical problems.

Pedagogy / Course delivery tools:	Chalk and talk
Links:	https://nptel.ac.in/courses/115106127
Impartus recording:	http://a.impartus.com/ilc/#/course/59743/295

Unit II
THERMOELECTRIC MATERIALS AND DEVICES

Thermo emf and thermo current, Seebeck effect, Peltier effect, Seebeck and Peltier coefficients, figure of merit(Mention Expression), laws of thermoelectricity. Expression for thermo emf in terms of T1 and T2, Thermo couples, thermopile, Construction and Working of Thermoelectric generators (TEG) and Thermoelectric coolers (TEC), low, mid and high temperature thermoelectric materials, Applications: Exhaust of Automobiles, Refrigerator, Numerical Problems.

Pedagogy / Course delivery tools:	Chalk and talk
Links:	https://www.youtube.com/watch?v=G9NgoxHMPwk
Impartus recording:	http://a.impartus.com/ilc/#/course/59743/295

Unit III
QUANTUM MECHANICS

Wave-Particle dualism: de- Broglie Hypothesis and Matter Waves, de Broglie wavelength and derivation of expression by analogy, Phase Velocity and Group Velocity (Derivation for V_g, relation between Vp & Vg, relation between particle velocity and group velocity), Heisenberg's Uncertainty Principle and its application

(Nonexistence of electron inside the nucleus -Relativistic), Wave Function, Physical Significance of a wave function and Born Interpretation, Time independent Schrodinger wave equation, Eigen functions and Eigen Values, Motion of a particle in a one dimensional potential well of infinite depth, Waveforms and Probabilities, Particle in a finite potential well and quantum mechanical tunnelling, Numerical Problems.

Pedagogy / Course delivery tools:	Chalk and talk
Links	https://nptel.ac.in/courses/115106066
Impartus recording:	http://a.impartus.com/ilc/#/course/59743/295

Unit IV
ELECTRICAL PROPERTIES OF METALS AND SEMICONDUCTORS

Electrical Conductivity in metals: Resistivity and Mobility, Concept of Phonon, Matheissen's rule. Quantum free electron theory, Fermi energy, Fermi factor, Variation of Fermi factor with Temperature and Energy, F-D statistics, Density of states (derivation), Expression for E_F (Derivation).

Semiconductors: Expression for concentration of electrons in conduction band (derivation), holes concentration in valance band (only mention the expression), Law of mass action, Conductivity in semiconductors (derivation), Fermi level for intrinsic semiconductor (derivation), Hall effect, Expression for Hall coefficient (derivation) and its application. Numerical problems.

Pedagogy / Course delivery tools:	Chalk and talk, Power Point Presentation, videos
Links:	https://nptel.ac.in/courses/108108174/05
Impartus recording:	http://a.impartus.com/ilc/#/course/59743/295

Unit V
SUPERCONDUCTIVITY

Zero resistance state, Persistent current, Meissner effect, Critical temperature, Critical current (Silsbee Effect) – Derivation of expression of critical current for a cylindrical wire using ampere's law, Critical field, Formation of Cooper pairs - Mediation of phonons, Two-fluid model, BCS Theory - Phase coherent state, Limitations of BCS theory, examples of systems with low and high electron-phonon coupling, Type-I and Type-II superconductors, Formation of Vortices, Explanation for upper critical field, Cooper pair tunnelling (Andreev reflection), Josephson junction, Flux quantization, DC and AC SQUID (Qualitative), MAGLEV, Numerical problems.

Pedagogy / Course delivery tools:	Chalk and talk, Power Point Presentation, Videos
Links:	https://digimat.in/nptel/courses/video/115105131/L01.html
Impartus recording:	http://a.impartus.com/ilc/#/course/59743/295

Text Books:

1. Shatendra Sharma and Jyotsna Sharma, Engineering Physics, Pearson, 2018.
2. S O Pillai: Solid State Physics, 11th Ed- New Age International Publishers-2025.
3. M. N. Avadhanulu and P. G. Kshirsagar: A Textbook of Engineering Physics, S. Chand Publishing – 2014 Edition
4. M. V. Gandhi and B. S.Thompson: Smart Materials and Structures, Chapman & Hall, 1992

Reference Books:

1. Resnick, Halliday and Jearl Walker - Fundamentals of Physics, John Wiley & Sons, Inc., 11th edition, 2018.
2. Kenneth S.Krane- Modern Physics, Wiley-India- 3rd Edition, 2019.
3. R. K. Shukla : Electrical Engineering Materials, Tata McGraw-Hill Education, India , 2017 reprint edition

Practical Component (Lab experiments)

1. Plotting of forward and reverse bias characteristics of a Zener Diode and determination of breakdown voltage
2. Determination of numerical aperture, Acceptance angle and bending loss in Optical Fibre Cable
3. Measurement of capacitance and dielectric constant of a capacitor by charging and discharging it through a resistor
4. Determination of Planck's constant using LEDs
5. Verification of Stefan's law
6. Identification of different components (L,C or R) of a Black Box and calculation of their values through frequency response curves
7. Determination of Moment of inertia of an irregular body and calculation of rigidity modulus
8. Measurement of Young's Modulus of the material of the single cantilever beam
9. Determination of Energy gap of semiconductor
10. Determination of Fermi energy of a metal
11. Measurement of operating wavelength of semiconductor laser using Laser diffraction.
12. Calculation of thickness of given paper strip by the method of interference fringes (Air wedge)
13. Frequency response of series and parallel LCR circuits and calculation of Q-factor and band width
14. Determination of Hall coefficient and concentration of charge carriers of the semiconductor
15. Simulation of electrical experiments using PSPICE open source software
16. Predicting the outputs of various combinations of single and two-qubit gates using QUISKIT.

Students are required to perform 12 prescribed experiments in the Physics lab from the above list.

Course Outcomes

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

1. Illustrate the dielectric and magnetic properties of materials and their applications in electrical components such as transformers and capacitors. (PO-1, PO-2)
2. Outline the thermoelectric phenomena and device construction with applications. (PO-1, PO-2)
3. Distinguish between phase and group velocities; solve Schrödinger's time-independent wave equation for the case of an infinite potential well. (PO-1, 2)
4. Apply the quantum theory to understand the electrical conductivity of metals and semiconductors. (PO-1, PO-2)
5. Describe the fundamental principles of superconductivity and their relevance in quantum systems and devices.(PO-1, PO-2)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal test – I	30	CO1,CO2,CO3
Internal test – II	30	CO3,CO4,CO5
Average of the two internal tests will be taken for 30 marks.		
CIE practical component assessment	Marks	Course outcomes addressed
Regular performance of experiments in the lab	15	CO1,CO2,CO3,CO4,CO5
Lab Test	05	CO1,CO2,CO3,CO4,CO5
Semester End Examination (SEE)	100	CO1,CO2,CO3,CO4,CO5

QUANTUM PHYSICS AND ELECTRONICS SENSORS

Course Code: PYEC22 **Credits: 3 :0:1**
Pre-requisites: Nil **Contact Hours: 45L+30P**

Course Coordinator: Dr. B. V. Nagesh

Course Content

Unit I

Photonics

Lasers: Characteristics of LASER, Interaction of radiation with matter, Expression for energy density equation and its significance, Requisites of a Laser system, Conditions for Laser action, Principle, Construction and working of He-Ne laser, Semiconductor Laser, Application of Laser – Holography, LIDAR, Use of attenuators for single photon sources (Mach-Zehnder Interferometer)

Optical Fibers: Review of the principle and Propagation mechanism in Fibers, Angle of acceptance, Numerical aperture, fractional index change, Modes of propagation, Number of modes and V parameter, Types of optical fibers, Attenuation, and Mention of expression for attenuation coefficient, Applications: Point to point communication discussion with block diagram, Merits and demerits, Numerical problems.

Pedagogy / Course delivery tools:	Chalk and talk
Links:	https://nptel.ac.in/courses/108106135/03
Impartus recording:	http://a.impartus.com/ilc/#/course/59743/295

Unit II

Quantum Mechanics

Wave-Particle dualism: de- Broglie Hypothesis and Matter Waves, de Broglie wavelength and derivation of expression by analogy, Phase Velocity and Group Velocity (Derivation for $V_{g,}$ relation between Vp & Vg, relation between particle velocity and group velocity), Heisenberg's Uncertainty Principle and its application (Nonexistence of electron inside the nucleus -Relativistic), Wave Function, Physical Significance of a wave function and Born Interpretation, Time independent Schrodinger wave equation, Eigen functions and Eigen Values, Motion of a particle in a one dimensional potential well of infinite depth, Waveforms and Probabilities, Particle in a finite potential well and quantum mechanical tunnelling, Numerical Problems.

Pedagogy / Course delivery tools:	Chalk and talk
Links	https://nptel.ac.in/courses/115106066
Impartus recording:	http://a.impartus.com/ilc/#/course/59743/295

Unit III
Electrical Properties of Metals and Semiconductors

Electrical Conductivity in metals: Resistivity and Mobility, Concept of Phonon, Matheissen's rule. Quantum free electron theory, Fermi energy, Fermi factor, Variation of Fermi factor with Temperature and Energy, F-D statistics, Density of states (derivation), Expression for E_F (Derivation).
Semiconductors: Expression for concentration of electrons in conduction band (derivation), holes concentration in valance band (only mention the expression), Law of mass action, Conductivity in semiconductors (derivation), Fermi level for intrinsic semiconductor (derivation), Hall effect, Expression for Hall coefficient (derivation) and its application. Numerical problems.

Pedagogy / Course delivery tools:	Chalk and talk, Power Point Presentation, videos
Links:	https://nptel.ac.in/courses/108108174/05
Impartus recording:	http://a.impartus.com/ilc/#/course/59743/295

Unit IV
Superconductivity

Zero resistance state, Persistent current, Meissner effect, Critical temperature, Critical current (Silsbee Effect) – Derivation of expression of critical current for a cylindrical wire using ampere's law, Critical field, Formation of Cooper pairs - Mediation of phonons, Two-fluid model, BCS Theory - Phase coherent state, Limitations of BCS theory, examples of systems with low and high electron-phonon coupling, Type-I and Type-II superconductors, Formation of Vortices, Explanation for upper critical field, Cooper pair tunnelling (Andreev reflection), Josephson junction, Flux quantization, DC and AC SQUID (Qualitative), MAGLEV, Numerical problems.

Pedagogy / Course delivery tools:	Chalk and talk, Power Point Presentation, Videos
Links:	https://digimat.in/nptel/courses/video/115105131/L01.html
Impartus recording:	http://a.impartus.com/ilc/#/course/59743/295

Unit V
Semiconductor Devices And Sensors

Direct and indirect band gap, Band gap engineering, Zener Diode, LED, PhotoDiode, Photo Transistor, Light dependent resistor, Resistance temperature detectors (high, medium, low), Sensing mechanisms, Piezo electric Sensors, Metal Oxide Semiconductor (MOS) gas sensors, Hall sensor, Superconducting Nanowire Single Photon Detector,
Numerical Problems.

Pedagogy / Course delivery tools:	Chalk and talk
Links:	https://digimat.in/nptel/courses/video/108108147/L01.html
Impartus recording:	http://a.impartus.com/ilc/#/course/59743/295

Text Books:

1. **Shatendra Sharma and Jyotsna Sharma,** Engineering Physics, Pearson, 2018**.**
2. **S O Pillai**: Solid State Physics, 11th Ed- New Age International Publishers-2025.
3. **B L Theraja** : Basic Electronics : Solid State, Multicolour Edition, S Chand, 2006

Reference Books:

1. **Resnick, Halliday and Jearl Walker -** Fundamentals of Physics, John Wiley & Sons, Inc., 11th edition, 2018.
2. **Kenneth S.Krane**- Modern Physics, Wiley-India- 3rd Edition, 2019.
3. **Ghatak, A. and Thyagarajan, K**.: Optical Electronics. Oxford University Press, 2005

Practical Component (Lab experiments)

1. Plotting of forward and reverse bias characteristics of a Zener Diode and determination of breakdown voltage
2. Determination of numerical aperture, Acceptance angle and bending loss in Optical Fibre Cable
3. Measurement of capacitance and dielectric constant of a capacitor by charging and discharging it through a resistor
4. Determination of Planck's constant using LEDs
5. Verification of Stefan's law
6. Identification of different components (L,C or R) of a Black Box and calculation of their values through frequency response curves
7. Determination of Moment of inertia of an irregular body and calculation of rigidity modulus
8. Measurement of Young's Modulus of the material of the single cantilever beam
9. Determination of Energy gap of semiconductor
10. Determination of Fermi energy of a metal
11. Measurement of operating wavelength of semiconductor laser using Laser diffraction.
12. Calculation of thickness of given paper strip by the method of interference fringes (Air wedge)
13. Frequency response of series and parallel LCR circuits and calculation of Q-factor and band width
14. Determination of Hall coefficient and concentration of charge carriers of the semiconductor
15. Simulation of electrical experiments using PSPICE open source software
16. Predicting the outputs of various combinations of single and two-qubit gates using QUISKIT.

****Students are required to perform 12 prescribed experiments in the Physics lab from the above list**.**

Course Outcomes

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

1. Interpret the interaction of radiation with matter and the operational principles of Photonic devices and their applications.(PO-1, 2)
2. Distinguish between phase and group velocities; solve Schrödinger's time-independent wave equation for the case of an infinite potential well. (PO-1, 2)
3. Apply the quantum theory to understand the electrical conductivity of metals and semiconductors. (PO-1, 2)
4. Describe the fundamental principles of superconductivity and their relevance in quantum systems and devices.(PO-1, 2)
5. Illustrate the applications of semiconductor, optical devices, sensors, and transducers in electronic and photonic systems.(PO-1, 2)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal test – I	30	CO1,CO2,CO3
Internal test – II	30	CO3,CO4,CO5
Average of the two internal tests will be taken for 30 marks.		
CIE practical component assessment	**Marks**	**Course outcomes addressed**
Regular performance of experiments in the lab	15	CO1,CO2,CO3,CO4,CO5
Lab Test	05	CO1,CO2,CO3,CO4,CO5
Semester End Examination (SEE)	100	CO1,CO2,CO3,CO4,CO5

BASICS OF ELECTRICAL ENGINEERING

Course Code: PSCEE24 **Credits: 2 :1:0**
Pre-requisites: Nil **Contact Hours: 30L+30T**

Course Coordinator: Dr. Sridhar. S

Course Content

Unit I

Introduction to Electrical Power: Generation, transmission and distribution of electrical power. Comparison of AC and DC systems. Concept of grid and need for interconnection of grids. Conditions for grid connection. Integration of renewable energy sources to grid- conditions and benefits. Types of loads. Concept of power and energy. Definition of Power Factor. Tariff structures and calculations.

- Pedagogy/Course delivery tools:
- Link for power generation, transmission, distribution and Tariff:

➢ Chalk and Talk, Power Point Presentation
➢ https://www.nptelvideos.in/2012/11/power-sys-generation-transmission.html

Unit II

Analysis of DC and AC Circuits: Fundamentals of AC and DC waveforms, representation of AC and DC quantities, average and rms values, form factor, peak factor. Electric circuit analysis using Ohms law and Kirchhoff's laws. Current and Voltage division rule. Analysis of DC circuits. Analysis of single phase AC circuits with R, L, C, RL, RC and RLC series and parallel configuration, Numericals.

- Pedagogy/Course delivery tools:
- Link for AC and DC waveform:
- Link for Generation of sine wave:

➢ Chalk and Talk, Power Point Presentation
➢ https://www.youtube.com/watch?v=vN9aR2wKv0U
➢ https://www.youtube.com/watch?v=gQyamjPrw-U

Unit III

Introduction to Electrical Machines-I: Faraday's laws. Static and dynamically induced EMF. Construction and working principle of DC Machine. DC Generator EMF equation. DC Motor Characteristics and applications. Necessity of starter, Numericals. Construction and working principle of single phase transformer. EMF equation and losses in transformer, Numericals.

- Pedagogy/Course delivery tools:
- Link for DC generator:
- Link for Transformer:

➢ Chalk and Talk, Power Point Presentation
➢ https://www.youtube.com/watch?v=d_LOXUEFA-o
➢ https://www.youtube.com/watch?v=vh_aCAHThTQ

Unit IV

Introduction to Electrical Machines-II: Advantages of three phase circuits. Relation between line and phase quantities in STAR and DELTA connected systems. Construction and working principle of synchronous generator, EMF equation, Numericals. Types of Induction motors and applications. Construction and working principle of three phase Induction Motor (Rotating magnetic field), slip, speed and frequency of rotor EMF, Numericals.

• Pedagogy/Course delivery tools:	➢ Chalk and Talk, Power Point Presentation
• Link for Alternator:	➢ https://www.youtube.com/watch?v=tiKH48EMgKE
• Link for 3-Phase Induction Motor:	➢ https://www.youtube.com/watch?v=AQqyGNOP_3o ➢ https://www.youtube.com/watch?v=Mle-ZvYi8HA

Unit V

Introduction to Special Electrical Machines: BLDC Motor and Stepper Motor advantages, disadvantages and applications.
Introduction to Wiring and Lighting: Types of domestic wiring, types of lamps and its applications.
Protection and Safety of Electrical Systems: Fuse, MCB, ELCB, surge protective devices and Relay. Necessity of earthing, difference between earthing and grounding and types of grounding. Electric shocks, hazards and safety precautions.

• Pedagogy/Course delivery tools:	➢ Chalk and Talk, Power Point Presentation
• Link for BLDC motor:	➢ https://www.youtube.com/watch?v=bCEiOnuODac
• Link for MCB:	➢ https://www.youtube.com/watch?v=9Xgn40eGcqY
• Link for Stepper Motor:	➢ https://www.youtube.com/watch?v=eyqwLiowZi

Text books:

1. **D. C. Kulshreshtha** - Basic Electrical Engineering, McGraw Hill, 2009.
2. **K. Venkataratnam** – Special Electrical Machines, Universities Press, 2014.

Reference books:

1. **D. P. Khotari, I. J. Nagarth -** Basic Electrical Engineering, Tata McGraw Hill Education, 2001.
2. **V. K. Mehta -** Principals of Power Systems, 2006.

Web links for video lectures (e-Resources):

1. https://nptel.ac.in/courses/108/108/108108076/
2. https://a.impartus.com/ilc/#/course/59745/295

Course Outcomes:

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

1. Interpret the concepts of Electrical Power. (PO-1,2)
2. Solve problems in DC and AC circuits. (PO-1,2)
3. Exemplify the concepts of Electrical Machines. (PO-1,2)
4. Explain the types of wiring and lighting systems. (PO-1,6)
5. Identify types of protective systems and safety precautions. (PO-1,6)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes attained**
Internal Test-I	30	CO1, CO2
Internal Test-II	30	CO2, CO3
Average of the two internal tests shall be taken for 30 marks.		
Other Components		
Assignment	10	CO4, CO5
Quiz	10	CO2
Semester End Examination (SEE)		
Course end examination (Answer one question from each unit- internal choice)	100	CO1, CO2, CO3, CO4, CO5

FUNDAMENTALS OF ELECTRONICS & COMMUNICATION ENGINEERING

Course Code: PCEEC24 **Credits:** 3:0:0
Pre-requisites: Nil **Contact Hours:** 45L

Course Coordinator: Manjunath C Lakkannavar

Course Content

Unit – I

Diodes and Their Application: Introduction, Characteristics and Parameters, Diode Approximation, DC Load Line Analysis, Half Wave Rectifier, Full Wave Bridge Rectifier, Capacitor Filter Circuit (Only Qualitative Approach), Zener Diode and Its Use in Voltage Regulation, Diode Logic Circuit.

- Pedagogy/Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/117103063
- Links: https://a.impartus.com/ilc/#/course/80947/295

Unit – II

Bipolar Junction Transistors: Introduction, BJT Voltages & Currents, BJT Amplification, BJT Switching, Common Base Characteristics, Common Emitter Characteristics, BJT Biasing, Fixed Biasing and Voltage Divider, DC Load Line and Bias Point.

Field Effect Transistor: Junction Field Effect Transistor (N-Channel), JFET Characteristics, MOSFETS: Enhancement MOSFETs.

- Pedagogy/Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/117103063
- Links: https://a.impartus.com/ilc/#/course/80947/295

Unit – III

Operational Amplifiers: Introduction, The Operational Amplifier, Block Diagram Representation of Typical Op Amp, Schematic Symbol,

Op-Amp Parameters: Gain, Input Resistance, Output Resistance, CMRR, Slew Rate, Bandwidth, Input Offset Voltage, Input Bias Current and Input Offset Current, The Ideal Op-Amp, Equivalent Circuit of Op-Amp, Open Loop Op-Amp Configurations, Differential Amplifier, Inverting & Non Inverting Amplifier

Op-Amp Applications: Inverting Configuration, Non-Inverting Configuration, Differential Configuration, Voltage Follower, Integrator, Differentiator.

- Pedagogy/Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/117103063
- Links: https://a.impartus.com/ilc/#/course/80947/295

Unit – IV

Fundamentals Of Communication: Elements of a Communication System, Communication Channels and Their Characteristics: Wireline, Fiber Optic, Wireless Electromagnetic Channels **Introduction to Analog Modulation Types:** Amplitude

Modulation, Frequency and Phase Modulation, Waveforms. (Excluding Derivation and Spectral Diagrams)

Applications: AM Radio Broadcasting, Superheterodyne FM Receiver, Mobile Wireless Telephone Systems. Case Study of Converting Analog Signal to Digital Signal Using PCM

- Pedagogy/Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/117103063
- Links: https://a.impartus.com/ilc/#/course/80947/295

Unit – V

Digital Systems and Binary Numbers: Digital Systems, Numbering System (Binary, Octal, Decimal and Hexadecimal), Number Base Conversion – (Binary to Decimal, Hexadecimal And Vice Versa), 1's and 2's Complement Operation, Signed Binary Numbers-Arithmetic Addition and Subtraction, Binary Logic.

Boolean Algebra: Basic Definitions, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Digital Logic Gates (Excluding Extension to Multiple Inputs, Positive and Negative Edge) NAND

- Pedagogy/Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/117103063
- Links: https://a.impartus.com/ilc/#/course/80947/295

Text books:

1. **David A Bell** - Electronic Devices and Circuits, 5th Edition, Oxford University Press, 30th impression, 2025.
2. **Ramakanth A Gayakwad** - Op-amps and Linear Integrated Circuits, 4th edition, Pearson Education, 2015.
3. **John G. Proakis, Masoud Saleh** - Fundamentals of Communication Systems, 2nd edition, Pearson Educations, Inc., 2014.
4. **D. P Kothari, I. J. Nagrath** - Basic electronics, 2nd edition, McGraw Hill Education Pvt ltd, 2018.
5. **M. Morris Mano, Michael D. Ciletti, Digital Design** - With an Introduction to the Verilog HDL, VHDL and System Verilog 6th edition, Pearson Education Inc, 2024.

Course outcomes

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

1. Apply the working principles, fundamental characteristics of various semiconductor devices including diodes, transistors and operational amplifiers in basic electronic circuits. (PO1, PO2, PO3)
2. Analyze basic rectifier and amplifier circuits using the principles of diodes, BJTs, and operational amplifiers. (PO1, PO2, PO3)

3. Illustrate the fundamental concepts of communication systems and their applications. (PO1, PO2, PO3)
4. Design basic combinational circuits using the fundamental principles of digital systems. (PO1, PO2, PO3)
5. Analyze the fundamental concepts of electronic circuits, communication systems, and digital systems for their role in building basic electronic applications. (PO1, PO2, PO3)

Course Assessment and Evaluation:

Continuous Internal Assessment (50 Marks)		
Assessment Tool	Marks	Course Outcomes Attained
Internal Test – I	30	CO1, CO2
Internal Test – II	30	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks.		
Other Components		
Quiz	10	CO1, CO2
Troubleshooting/ Assignment	10	CO1, CO2, CO3, CO4, CO5
Semester End Exam (SEE) (Scaled to 50 Marks)	100	CO1, CO2, CO3, CO4, CO5

SOFT SKILLS

Course Code: HSCP15/25 **Credits:** 1:0:0
Pre-requisites: Nil **Contact Hours:** 15L+15P

Course Coordinator: Dr. Diwakar P

Course Content

Unit I

Social Skills

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.

- Pedagogy / Course delivery tools:
  - TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
- Language Lab
  - Quicklrn.com

Unit II

Emotional Skills I

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.

- Pedagogy / Course delivery tools:
  - TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
- Language Lab
  - Quicklrn.com

Unit III

Emotional Skills II

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).

- Pedagogy / Course delivery tools:
  - TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach

- Language Lab ➢ Quicklrn.com

Unit IV
Professional Skills I

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.

- Pedagogy / Course delivery tools: ➢ TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
- Language Lab ➢ Quicklrn.com

Unit V
Professional Skills II

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.

- Pedagogy / Course delivery tools: ➢ TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
- Language Lab ➢ Quicklrn.com

Text books:

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

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:
  - ❖ bbc Learn English online Grammar
  - ❖ Learn English Podcasts
  - ❖ IELTS Word Power
  - ❖ Bbc learning English grammer online
  - ❖ Sounds Right (Phonemic Chart)

Course Outcomes (COs):

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

1. Apply social skills for clear communication, persuasion, self-awareness, and active listening (PO-8, PO-9, PO-11)
2. Use emotional skills to build confidence, manage stress, and adapt to change (PO-9, PO-11)
3. Set ambitious goals, practice empathy, and apply creativity for problem-solving (PO- 9, PO-11)
4. Demonstrate discipline, time management, and structured problem-solving (PO-8, PO-9, PO-11)
5. Work in teams, negotiate, resolve conflicts, and think critically (PO-8, 9, 11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes attained**
Internal Test-I	30 (6 marks objective & 24 marks subjective pattern)	CO1, CO2, CO3
Internal Test-II	30 (6 marks objective & 24 marks subjective pattern)	CO4, CO5
Average of the two internal tests shall be taken for 30 marks.		
Other components		
Assignment-I	10	CO1, CO2, CO3
Assignment-II	10	CO3, CO4, CO5
Semester End Examination (SEE)	50 (10 marks objective & 40 marks subjective pattern)	CO1, CO2, CO3, CO4, CO5

KANNADA KALI

Course Code: HSCP16/26K **Credits:** 1:0:0

Pre-requisites: - **Contact Hours:** 15L

Course Coordinator: Mrs. Kanya Kumari S

Course Content

Unit I

(Parichaya) - Introduction

Kannada Bhashe - About Kannada Language, Eight Kannada Authors – JnanpiTh Awardies. Introduction to Kannada Language, Karnataka State and Literature.

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

Unit II

Kannada PadagaLu mattu Vaakyagalu. Kannada Words and Sentences

naamapadagaLu – Sarva naamapadagaLu – (Nouns-Pronouns) and it's usage in Kannada.

Kannada naamavisheshanagaLu - (Adjectives-Interrogatives) kriyapadagaLu, kriya visheshaNagaLu- (verb-adverb)

Sambhashaneyalli Prashnarthaka padagalu – vaakyagaLu mattu kriyapadagaLu-visheshaNagaLu (Kannada- Interrogative words & Sentences and verb-adverb in Conversation)

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

Unit III

Kannada Bhasheyalli Sambhashanegalu- Conversations in Kannada:

Samanya Sambhashaneyalli Kannadada Padagalu mattu Vaakyagalu.

(Kannada Words and Sentences in General Conversation with activities)

Vicharaneya / Bedikeya vakyagalu (Enquiry /Request sentences in Conversation)

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

Unit IV

Kannada padagaLu (eakavachana, bahuvachanagaLu, virudda padagaLu, dina nityadalli baLasuva padagaLu mattu sankya vyavaste

Sambhashaneyalli Eakavachana mattu Bhahuvachana- (Singular and Plural nouns) Conversation- Sambhashaneyalli Linga rupagaLu- Genders in Conversation

Viruddha padagalu /Virodarthaka padagalu (Antonyms) Asamanjasa Uchcharane (Inappropriate Pronunciation)

Sankhya Vyavasthe (Numbers system) -Samaya /Kalakke Sambhandhisida padhagalu (Words Relating to time) – Dikkugalige sambhadisida padhagalu (Words Relating to Directions)

Aaharakke sambandisida padagaLu (Names connected with food)
Manavana shareerada bhagagalu / Angagalu (Parts of the Human body) Manava Sambhandhada da padhagalu (Terms Relating to Human Relationship)
Manavana Bhavanegalige sambandisida Padagalu (Words Relating to Human's feelings and Emotions)
Vaasada staLakke sambhandisidanthaha padhagalu (Words Relating to place of leaving)

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

Unit V

Kannada akshara maale (Kannada alphabets and their practices with pronunciations)

swara aksharagaLu –vyanjanaksharagaLu.
Shabdakosha (Vocabulary) - Exercises to test their knowledge of understanding the Language.
tantragnana mattu AaDalita padagaLu-Technical and administrative worlds in Kannada

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

Text Book:

1. **Dr. L.Thimmesh, Prof. Keshava muurthy -** BaLake kannada Prasarangaa, VTU, 2020

Reference Books:

1. **Smt. Kanya Kumari S** – Kannada Kali, Kinnari publications, 1st edition, Bengaluru, 2022
2. **Lingadevaru Halemane** – Kannada Kali, Prasaranga Kannada University Hampi, 6th edition, 2019

Course Outcomes (COs):

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

1. Develop vocabulary (PO-9)
2. Identify the basic Kannada language skill (PO-9)
3. Develop listing & speaking skill in Kannada language (PO-9, PO-11)
4. Enrich language skill (PO-11)
5. Apply Kannada language skill for various purpose (PO-11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes attained**
Internal Test-I	30	CO1, CO2, CO3
Internal Test-II	30	CO4, CO5
Average of the two internal tests shall be taken for 30 marks		
Other components		
Assignment	10	CO1, CO2
Quiz	10	CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

ಕನ್ನಡ ಮನಸು

Course Code: HSCP16/26M **Credits:** 1:0:0

Pre-requisites: - **Contact Hours:** 15L

Course Coordinator: Mrs. Kanya Kumari S

ಘಟಕ -೧ (Unit I)

ಲೇಖನಗಳು (Articles)

ಕನ್ನಡ ಭಾಷೆ ನಾಡು -ನುಡಿ
ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ
ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ
ವಚನಗಳು - ಅಕ್ಕಮಹಾದೇವಿ -ಬಸವಣ್ಣ -ಅಲ್ಲಮಪ್ರಭು

- Pedagogy / Course delivery tools: ➢ Chalk & talk

ಘಟಕ-೨ (Unit II)

ಕಾವ್ಯಭಾಗ (Poetry)

ವಚನಗಳು ಮತ್ತು ಕೀರ್ತನೆ : ಪುರಂದರ ದಾಸರು
ತತ್ವ ಪದಗಳು : ಶಿಶುನಾಳ ಶರೀಫರು

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

ಘಟಕ-೩ (Unit III)

ಆಧುನಿಕ ಕಾವ್ಯಗಳು

ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗ -ಡಿ.ವಿ.ಜಿ
ಕುರುಡು ಕಾಂಚಾಣ - ದ.ರಾ .ಬೇಂದ್ರೆ

- Pedagogy / Course delivery tools: ➢ Chalk & talk

ಘಟಕ-೪ (Unit IV)

ತಾಂತ್ರಿಕ ಧುರೀಣರು (ವ್ಯಕ್ತಿ ಪರಿಚಯ) ಕಥೆ -ಪ್ರವಾಸ ಕಥನ

ಡಾ.ಸರ್.ಎಂ.ವಿಶ್ವೇಶ್ವರಯ್ಯ - ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ - ಎ. ಎನ್. ಮೂರ್ತಿರಾಯರು
ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ
ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಡಾ. ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ

- Pedagogy / Course delivery tools: ➢ Chalk & talk

ಘಟಕ-೫ (Unit V)

ಕಂಪ್ಯೂಟರ್ ಹಾಗು ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ

"ಕ" ಮತ್ತು "ಬ" ಬರಹ ತಂತ್ರಾಂಶಗಳು
ತಾಂತ್ರಿಕ ಪದಕೋಶ: ತಾಂತ್ರಿಕ ಹಾಗು ಪಾರಿಭಾಷಿಕ ಕನ್ನಡ ಪದಗಳು

- Pedagogy / Course delivery tools: ➢ Chalk & talk

ಪಠ್ಯ ಪುಸ್ತಕ (Text book):

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ - ಡಾ. ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ - ವಿಶ್ರಾಂತ ಕುಲಪತಿಗಳು, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ, ಪ್ರಸಾರಾಂಗ - ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಪ್ರಥಮ ಮುದ್ರಣ, ೨೦೨೦

ಪೂರಕ ಪಠ್ಯ (Reference book):

೧. ಕನ್ನಡ ಮನಸು - ಪ್ರಸಾರಾಂಗ, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ, ಆರನೇ ಮುದ್ರಣ, ೨೦೧೯
೨. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಕೋಶ - ಡಾ. ರಾಜಪ್ಪ ದಳವಾಯಿ, ೨೦೧೮

Course Outcomes (COs):

ಕನ್ನಡ ಮನಸು ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು

೧. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡದ ಜೊತೆಗೆ ಕ್ರಿಯಾತ್ಮಕ, ಸಾಹಿತ್ಯ, ಸಂಸ್ಕೃತಿ ಮತ್ತು ನಾಡು ನುಡಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು (P0-11)
೨. ಕನ್ನಡ ಭಾಷೆಯ ವ್ಯಾಕರಣ, ಭಾಷಾ ರಚನೆಯ ನಿಯಮಗಳನ್ನು ಪರಿಚಯಿಸುವುದು (P0-9)
೩. ಕನ್ನಡ ಭಾಷಾ ಬರಹದಲ್ಲಿ ಕಂಡು ಬರುವ ದೋಷಗಳು, ಅವುಗಳ ನಿವಾರಣೆ (P0-9)
೪. ಸಾಮಾನ್ಯ ಅರ್ಜಿಗಳು, ಸರ್ಕಾರಿ ಹಾಗು ಅರೆ ಸರ್ಕಾರಿ ಪತ್ರ ವ್ಯವಹಾರದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡಿಸುವುದು (P0-11)
೫. ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆ ಬಗ್ಗೆ ಆಸಕ್ತಿ ಮೂಡಿಸುವುದು ಮತ್ತು ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ, ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗು ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು (P0-11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes attained**
Internal Test-I	30	CO1, CO2, CO3
Internal Test-II	30	CO4, CO5
Avarege of the two internal test two will be taken for 30 marks		
Other components		
Assignment	10	CO1, CO2
Quiz	10	CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

INNOVATION & DESIGN THINKING LAB

Course Code: AECP17/27 **Credits: 0:0:1**

Pre-requisites: Nil **Contact Hours: 30P**

Course Coordinator: Dr. Anita Kanavalli

Course Content

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

Course Outcomes (COs):

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

1. Empathize with community problems and define meaningful challenges. (PO1, PO2, PO8, PO9)
2. Apply design thinking principles and multidisciplinary skills to develop user-centric solutions. (PO1, PO2, PO3, PO4, PO8, PO9)
3. Build and test basic prototypes using tools available in the Atal Idea/Tinkering Lab or Makers Space. (PO1, PO2, PO3, PO4, PO6, PO8, PO9)
4. Pitch socially relevant ideas with scalable models. (PO1, PO2, PO3, PO4, PO6, PO8, PO9)
5. Collaborate effectively in diverse teams. (PO1, PO2, PO3, PO4, PO6, PO8, PO-9)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes attained**
Weekly evaluation of laboratory reports after the conduction of every experiment.	30	CO1, CO2, CO3
Other components		
Practical test 20	20	CO1, CO2, CO3
Semester End Examination (SEE)	50	CO1, CO2, CO3

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)

BASIC ELECTRICAL ENGINEERING LAB

Course Code: PSCLEE28 **Credits: 0:0:1**

Pre-requisites: Nil **Contact Hours: 30P**

Course Coordinator: Dr. S. Poornima/ Dr. Nagaraj C

Course Content

List of experiments:

1. Verification of Ohm's law.
2. Verification of Kirchhoff's laws.
3. Trouble shooting of DC circuits.
4. Measurement of low range resistance using voltmeter-ammeter method
5. Design of a voltage divider circuit
6. Measurement of earth's resistance.
7. Determination of operating time of fuses
8. Measurement of resistance, inductance, impedance and power factor in single-phase AC circuits.
9. Measurement of phase angle of a series RL and RC circuit.
10. Two way and three - way control of lamp load.

List of Virtual Experiments:

1. Measurement of single phase power using three ammeters
   Link: https://www.falstad.com/circuit/index.html
   Reference: https://www.youtube.com/watch?v=-b_qo0ADlEY
2. Measurement of single phase power using three voltmeters
   Link: https://www.falstad.com/circuit/index.html
   Reference : https://www.youtube.com/watch?v=hsEM0MIus9w
3. Measurement of three-phase power of star connected load and delta connected load by 2-wattmeter method
   Link: https://bes-iitr.vlabs.ac.in/exp/two-wattmeter-method/index.html

Textbooks

1. **D. C. Kulshreshtha** - Basic Electrical Engineering, McGraw Hill, 2009.
2. **B. L. Theraja, A.K. Theraja** - A Textbook of Electrical Technology - Volume I (Basic Electrical Engineering) , S. Chand, New Delhi, 24th edition, 2014.

Reference Books:

1. **D. P. Kothari, I. J. Nagrath** - Basic Electrical Engineering, Tata McGraw Hill, 2010.

Course Outcomes (COs):

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

1. Conduct standard electrical experiments to verify theoretical principles. (PO3, PO8) (PSO -1)
2. Measure key electrical parameters such as resistance, inductance, impedance, power, and power factor with standard methods. (PO2, PO3), (PSO -1)
3. Design and perform experiments to solve practical open-ended electrical problems. (PO2, PO3), (PSO -1)
4. Analyse experimental data from non-routine method to arrive at a solution. (PO4), (PSO -1)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes attained**
Internal test	25	CO1, CO2, CO3, CO4
Other components		
Observation	15	CO1, CO2, CO3, CO4
Simulation/Quiz/ Assignment	10	CO1, CO2, CO3, CO4
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4

FUNDAMENTALS OF ELECTRONICS & COMMUNICATION ENGINEERING LAB

Course Code: PSCLEC28 **Credits: 0:0:1**

Pre-requisites: Nil **Contact Hours: 30P**

Course Coordinator: Manjunath C Lakkannavar

Course Content

1. Design and Testing of Half-Wave and Full-Wave Rectifiers With and Without Filter for Determining Ripple Factor, Voltage Regulation, and Efficiency
2. Design and Testing of Bridge Rectifier With and Without Filter for Determining Ripple Factor, Voltage Regulation, and Efficiency
3. Analysis of Input and Output Characteristics of a Bipolar Junction Transistor in Common Emitter Configuration
4. Study of Transfer and Drain Characteristics of a MOSFET in Common Source Configuration
5. Investigation of Op-Amp in Inverting and Non-Inverting Modes with Gain Measurement
6. Study of Truth Tables for OR, AND, NOT, NAND, and NOR Gates Using Basic and Universal Gate
7. Design and Testing of Clipping and Clamping Circuits to obtain desired Transfer Characteristics
8. Design and test a single stage bipolar junction transistor amplifier to obtain desired gain and bandwidth requirements.
9. Testing of Op-Amp as voltage follower and a weighted summer with waveform analysis.
10. Design and Testing of Integrator and Differentiator Circuits using Op-Amp with Waveform Analysis
11. Amplitude Modulation using Discrete Components for Given Specifications.
12. Realization of Half/ Full Adder and Subtractor using Logic Gates

Reference books:

1. **David A Bell** - Electronic Devices and Circuits, 5th edition, Oxford University Press, 30th impression, 2025.
2. **Ramakanth A Gayakwad** - Op-amps and Linear Integrated Circuits, 4th edition, Pearson Education, 2015.
3. **John G. Proakis, Masoud Saleh** - Fundamentals of Communication Systems, 2nd edition, Pearson Educations, Inc., 2014.

4. **D. P. Kothari, I. J. Nagrath** - Basic electronics, 2nd edition, McGraw Hill Education Pvt. Ltd. , 2018.
5. M.Morris Mano and Michael D.Ciletti, Digital Design - With an Introduction to the Verilog HDL, VHDL and System Verilog 6th edition, Pearson Education Inc, 2024.
6. **Robert L. Boylestad, Louis Nashelsky** - Electronic Devices and Circuit Theory, 11th edition, PHI, 2016.

Suggested Learning e-Resources:

- Introduction to Basic Electronics: https://nptel.ac.in/courses/122106025
- Digital Electronic Circuits: https://nptel.ac.in/courses/108105132

Course outcomes

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

1. Apply the operating principles of diodes, transistors, and MOSFETs to construct and test basic analog circuits. (PO1, PO2, PO3)
2. Implement operational amplifier configurations such as inverting, non-inverting, integrator, and differentiator for analog signal processing applications. (PO1, PO2, PO3)
3. Analyze the functionality of logic gates and combinational circuits including adders, subtractors, and code converters using digital ICs. (PO1, PO2, PO3)
4. Investigate amplitude modulation to explore fundamental analog communication techniques. (PO1, PO2, PO3)
5. Develop solutions to open-ended electronic design problems by selecting appropriate components, constructing circuits, and interpreting results to meet defined objectives. (PO1, PO2, PO3)

Course Assessment and Evaluation:

Continuous Internal Assessment (50 Marks)		
Assessment Tool	**Marks**	**Course Outcomes Attained**
Weekly evaluation of laboratory journals/ reports after the conduction of every experiment.	30	CO1, CO2, CO3, CO4, CO5
Practical Test	20	CO1, CO2, CO3, CO4, CO5
Semester End Exam (SEE) (Scaled to 50 Marks)	50	CO1, CO2, CO3, CO4, CO5

COMPUTER AIDED ENGINEERING DRAWING - EE

Course Code: MELEE29 **Credits:** 0:0:1
Pre-requisites: Nil **Contact Hours:** 30P
Course Coordinator: Dr. Mohandas K N

Course Contents

Unit I

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 and RPP & LPP of 2D environment. 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:

Orthographic projections: Definitions - Planes of projection, reference line and conventions employed, Projections of points in First and Third quadrants (**No problems**), Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (**No problems**).

Orthographic Projections of Planes viz triangle, square, rectangle, pentagon, hexagon, and circular laminae (**Placed in First quadrant only using change of position method**).

- Pedagogy/Course delivery tools: ➢ Chalk and talk, Power point presentation
- Links: Orthographic Projections ➢ https://www.youtube.com/watch?v=uePTMVQlIA4
- Links: Orthographic projections of plane ➢ https://www.youtube.com/watch?v=GguSUmNxc8Q

Unit II

Development of Lateral Surfaces of Solids:

Development of sectioned (**Section plane perpendicular to VP and inclined to HP bisecting the axis only**) lateral surfaces of right regular prism, cylinder, pyramid and cone resting **with base on HP only.**

- Pedagogy/Course delivery tools: ➢ Chalk and talk, Power point presentation
- Links: Development of lateral surfaces ➢ https://www.youtube.com/watch?v=U5mz9_W-xdI

Unit III

Orthographic Projection of Solids:

Orthographic projection of right regular solids (**Solids Resting on HP only**): Prism & Pyramid (triangle, square, rectangle, pentagon, hexagon), Cylinder, Cone and Cube **(No freely suspended problems)**.

- Pedagogy/Course delivery tools: ➢ Chalk and talk, Power point presentation

- Links: Orthographic projection of Solids
  - https://www.youtube.com/watch?v=vu06T5caWpc&list=PLzDhXNnURXs8bfbPmddiS_ACDRW1WoWb

Unit IV

Isometric Projections:

Isometric scale, Isometric projection of hexahedron (cube), right regular prism, pyramid, cylinder, cone, sphere and frustum of solid. Isometric projection of combination of two simple solids **(Co-axial only)**.

- Pedagogy/Course delivery tools:
  - Chalk and talk, Power point presentation
- Links: Isometric Projection
  - https://www.youtube.com/watch?v=Vo9LC9d7FQA&t=3374s

Unit V

Multidisciplinary Applications & Practice: (For CIE only)

Free hand Sketching: True free hand, Guided Free hand, Roads**.**

Drawing Simple Mechanisms: Bicycles, Tricycles, Gear trains.

Electric Wiring and lighting diagrams: Like, Automatic fire alarm.

Basic Building Drawing: Architectural floor plan, basic foundation drawing.

Electronics Engineering Drawings: Simple Electronics Circuit Drawings, practice on layers concept.

- Pedagogy/Course delivery tools:
  - Chalk and talk, Power point presentation
- Links: Free hand sketching
  - https://www.youtube.com/watch?v=Ess0dmJB2lo
- Links: Electric wiring and lighting diagram
  - https://www.youtube.com/watch?v=c67wlH2lJL8
- Links: Electronics Engineering Drawings
  - https://www.youtube.com/watch?v=RpF7oFC-LPY

Text books:

1. **Sudhir Gopalakrishna & K. R. Gopalakrishna** - A Textbook of Engineering Graphics, Techno Series, 2024.
2. **N. D. Bhatt** - Engineering Drawing, Charotar Publishing house Pvt. Ltd, 2024.

Reference books:

1. **M H Annaiah** - Computer Aided Engineering Drawing, New Age International Private Limited, 7th edition, 2022.

Course Outcomes (COs):

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

1. Demonstrate the usage of suitable software for creating basic and applied engineering drawings. (PO-1, PO-5, PO-8, PO-9, PO-11)
2. Conceptually sketch and draw developments for typical lateral surfaces. (PO-1, PO-5, PO-8, PO-9)
3. Exhibit the knowledge of orthographic and isometric projections of typical solids. (PO-1, PO-5, PO-8, PO-9)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Class work and Print out	30	CO1,CO2,CO3
Assignments	10	CO1,CO2,CO3
Tests	10	CO1,CO2,CO3
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

COMPUTER AIDED ENGINEERING DRAWING - EC

Course Code: MELEC19 **Credits:** 0:0:1
Pre-requisites: Nil **Contact Hours:** 30P
Course Coordinator: Dr. Mohandas K N

Course Contents

Unit I

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 and RPP & LPP of 2D environment. 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:

Orthographic projections: Definitions - Planes of projection, reference line and conventions employed, Projections of points in First and Third quadrants (**No problems**), Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (**No problems**).

Orthographic Projections of Planes viz triangle, square, rectangle, pentagon, hexagon, and circular laminae (**Placed in First quadrant only using change of position method**).

- Pedagogy/Course delivery tools: ➢ Chalk and talk, Power point presentation
- Links: Orthographic Projections ➢ https://www.youtube.com/watch?v=uePTMVQlIA4
- Links: Orthographic projections of plane ➢ https://www.youtube.com/watch?v=GguSUmNxc8Q

Unit II

Development of Lateral Surfaces of Solids:

Development of sectioned (**Section plane perpendicular to VP and inclined to HP bisecting the axis only**) lateral surfaces of right regular prism, cylinder, pyramid and cone resting **with base on HP only.**

- Pedagogy/Course delivery tools: ➢ Chalk and talk, Power point presentation
- Links: Development of lateral surfaces ➢ https://www.youtube.com/watch?v=U5mz9_W-xdI

Unit III

Orthographic Projection of Solids:

Orthographic projection of right regular solids (**Solids Resting on HP only**): Prism & Pyramid (triangle, square, rectangle, pentagon, hexagon), Cylinder, Cone and Cube **(No freely suspended problems)**.

- Pedagogy/Course delivery tools: ➢ Chalk and talk, Power point presentation

- Links: Orthographic projection of Solids
  - https://www.youtube.com/watch?v=vu06T5caWpc&list=PLzDhXNnURXs8bfbPmddiS_ACDRW1WoWb

Unit IV

Isometric Projections:

Isometric scale, Isometric projection of hexahedron (cube), right regular prism, pyramid, cylinder, cone, sphere and frustum of solid. Isometric projection of combination of two simple solids **(Co-axial only)**.

- Pedagogy/Course delivery tools:
  - Chalk and talk, Power point presentation
- Links: Isometric Projection
  - https://www.youtube.com/watch?v=Vo9LC9d7FQA&t=3374s

Unit V

Multidisciplinary Applications & Practice: (For CIE only)

Free hand Sketching: True free hand, Guided Free hand, Roads**.**

Drawing Simple Mechanisms: Bicycles, Tricycles, Gear trains.

Electric Wiring and lighting diagrams: Like, Automatic fire alarm.

Basic Building Drawing: Architectural floor plan, basic foundation drawing.

Electronics Engineering Drawings: Simple Electronics Circuit Drawings, practice on layers concept.

- Pedagogy/Course delivery tools:
  - Chalk and talk, Power point presentation
- Links: Free hand sketching
  - https://www.youtube.com/watch?v=Ess0dmJB2lo
- Links: Electric wiring and lighting diagram
  - https://www.youtube.com/watch?v=c67wlH2lJL8
- Links: Electronics Engineering Drawings
  - https://www.youtube.com/watch?v=RpF7oFC-LPY

Text books:

1. **Sudhir Gopalakrishna & K. R. Gopalakrishna** - A Textbook of Engineering Graphics, Techno Series, 2024.
2. **N. D. Bhatt** - Engineering Drawing, Charotar Publishing house Pvt. Ltd, 2024.

Reference books:

1. **M H Annaiah** - Computer Aided Engineering Drawing, New Age International Private Limited, 7th edition, 2022.

Course Outcomes (COs):

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

1. Demonstrate the usage of suitable software for creating basic and applied engineering drawings. (PO-1, PO-5, PO-8, PO-9, PO-11)
2. Conceptually sketch and draw developments for typical lateral surfaces. (PO-1, PO-5, PO-8, PO-9)
3. Exhibit the knowledge of orthographic and isometric projections of typical solids. (PO-1, PO-5, PO-8, PO-9)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Class work and Print out	30	CO1,CO2,CO3
Assignments	10	CO1,CO2,CO3
Tests	10	CO1,CO2,CO3
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

MECHANICAL ENGINEERING STREAM
II SEMESTER

MULTIVARIABLE CALCULUS & NUMERICAL METHODS

Course Code: MAV21 **Credits:** 3:1:0
Pre-requisites: Nil **Contact Hours:** 45L + 30T
Course Coordinator: Dr. B Azghar Pasha & Dr. Uma M

Course Contents

Unit I
Integral Calculus

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

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/111105121
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/107625/1030

Unit II
Partial Differential Equations (PDE)

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. Classification of second order PDE and solution of one-dimensional heat equation and wave equation by separation of variables.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/111101153
  ➢ https://nptel.ac.in/courses/111108152
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/2583981/1205
  ➢ https://a.impartus.com/ilc/#/course/290290/703

Unit III
Vector Calculus

Vector Differentiation: 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, Green's theorem.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/111105134
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/107625/1030

Unit IV

Numerical Methods- 1

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

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

- Pedagogy / Course delivery tools:
  - Chalk and talk
- Links:
  - https://nptel.ac.in/courses/111105121
- Impartus recording:
  - https://a.impartus.com/ilc/#/course/619570/1030
  - https://a.impartus.com/ilc/#/course/96127/452
  - https://a.impartus.com/ilc/#/course/132243/636

Unit V

Numerical Methods– 2

Numerical integration: Trapezoidal, Simpson's1/3rd and 3/8th rules.

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

- Pedagogy / Course delivery tools:
  - Chalk and talk
- Links:
  - https://nptel.ac.in/courses/111105121
- Impartus recording:
  - https://a.impartus.com/ilc/#/course/96127/452
  - https://a.impartus.com/ilc/#/course/619570/1030
  - https://a.impartus.com/ilc/#/course/621524/1030

Text books:

1. **E. Kreyszig** - Advanced Engineering Mathematics, John Wiley & Sons, 10th edition, 2018.
2. **B. S. Grewal** - Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2021.
3. **B. V. Ramana** - Higher Engineering Mathematics, McGraw-Hill Education, 11th edition, 2017
4. **M.K. Jain, S.R.K. Iyengar and R.K. Jain** - Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 8th edition, 2022**.**

Reference books:

1. **Srimanta Pal & Subodh C. Bhunia** - Engineering Mathematics, Oxford University Press, 3rd edition, 2016.
2. **N. P.Bali and Manish Goyal** - A Text book of Engineering Mathematics, Laxmi Publications, 10th edition, 2022.
3. **H.K. Dass and Er. Rajnish Verma** - Higher Engineering Mathematics, S.Chand Publication, 3rd edition, 2014.
4. **Ray Wylie, Louis C. Barrett** - Advanced Engineering Mathematics, McGraw Hill Book Co., New York, 6th edition, 2017.

5. **Steven C. Chapra and Raymond P. Canale** - Applied Numerical Methods with Matlab for Engineers and Scientists, Mc Graw-Hill, 3rd edition, 2011.
6. **Richard L. Burden, Douglas J. Faires and A. M. Burden** - Numerical Analysis, Cengage Publishers, 10th edition, 2010.
7. **S.S. Sastry** - Introductory Methods of Numerical Analysis, PHI Learning Private Limited, 5th edition, 2012.

Course Outcomes

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

1. Evaluate multiple integrals and use them to find areas and volumes. (PO-1, PO-2)
2. Find the solution of PDE's analytically and numerically (PO-1, PO-2)
3. Apply the concepts of vector differentiation and vector integration to solve engineering problems (PO-1, PO-2)
4. Apply numerical methods to solve algebraic/transcendental equations and interpolate functions over an interval (PO-1, PO-2)
5. Evaluate definite integrals and solve first order ODE's numerically (PO-1, PO-2)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal test – I	30	CO1,CO2,CO3
Internal test – II	30	CO3,CO4,CO5
Average of the two internal tests will be taken for 30 marks.		
Other components	**Marks**	**Course outcomes addressed**
Quiz	10	CO1,CO2,CO3
Assignment	10	CO3,CO4,CO5
Semester End Examination (SEE)	100	CO1,CO2,CO3,CO4,CO5

PHYSICS OF MATERIALS

Course Code: PYM22 **Credits: 3:0:1**
Pre-requisites: - **Contact Hours: 45L+30P**

Course Coordinator: Dr. G. N. Anil Kumar

Course Content

Unit I
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.

Pedagogy / Course delivery tools:	Chalk and talk
Links:	https://www.youtube.com/watch?v=gnD8Se92hfk
Impartus recording:	https://a.impartus.com/ilc/#/course/107626/533

Unit II
Elasticity

Review of stress- strain curve, Strain hardening and softening, Elastic moduli, Poisson's ratio and its limiting values. Derivations for Y, K, n in terms of linear and lateral strains, Relationship between Y, k, n and σ. Beams, bending moment of a beam (derivation), Expression for Cantilever loaded at free end (derivation), Torsion of a cylinder and determination of couple per unit twist. Torsion pendulum—Determination of rigidity modulus using torsion pendulum, Elastic materials (qualitative). Failures of engineering materials Ductile fracture, Brittle fracture, Stress concentration, Fatigue and factors affecting fatigue (only qualitative explanation), S-N Curve (Wohler curve), Numerical problems

Pedagogy / Course delivery tools:	Chalk and talk
Links:	https://web.mit.edu/course/3/3.11/www/modules/ss.pdf
Impartus recording:	https://a.impartus.com/ilc/#/course/107626/533

Unit III
Thermoelectric Materials And DeviceS

Thermo emf and thermo current, Seebeck effect, Peltier effect, Seebeck and Peltier coefficients, figure of merit(Mention Expression), laws of thermoelectricity. Expression for thermo emf in terms of T1 and T2, Thermo couples, thermopile, Construction and Working of Thermoelectric generators (TEG) and Thermoelectric coolers (TEC), low, mid and high temperature thermoelectric materials, Applications: Exhaust of Automobiles, Refrigerator, Numerical problems

Pedagogy / Course delivery tools:	Chalk and talk
Links	https://www.youtube.com/watch?v=G9NgoxHMPwk
Impartus recording:	https://a.impartus.com/ilc/#/course/107626/533

Unit IV

Cryogenics

Introduction to Thermodynamics, Carnot's principle, Efficiency, Production of low temperature - Joule Thomson effect (Derivation with 3 cases), Porous plug experiment with theory, Thermodynamical analysis of Joule Thomson effect, Liquefaction of Oxygen by cascade process, Lindey's air liquefier, Liquefaction of Helium and its properties (superfluidity), Platinum Resistance Thermometer, Applications of Cryogenics: Aerospace, Dewar Flask, Numerical problems

Pedagogy / Course delivery tools:	Chalk and talk, Power Point Presentation, videos
Links:	https://www.youtube.com/watch?v=aMelwOsGpIs
Impartus recording:	https://a.impartus.com/ilc/#/course/107626/533

Unit V

Materials Characterization And Instrumentation Techniques

Crystal structure: Crystal systems, Crystal planes, Determination of Miller indices of crystal planes, Interplanar spacing in terms of Miller indices, Bragg's law.

Material Characterization and Instrumentation Techniques: Principle, construction and working of X-ray Diffractometer, crystallite size determination by Scherrer equation, Phase identification of materials by PXRD pattern, Principle, construction, working and applications of Atomic Force Microscopy (AFM) and Scanning electron Microscopy (SEM), Numerical problems.

Pedagogy / Course delivery tools:	Chalk and talk, Power Point Presentation, Videos
Links:	https://youtu.be/SXIYzrFGmkU
Impartus recording:	https://a.impartus.com/ilc/#/course/107626/533

Text Books:

1. **H M Agarwal and R M Agarwal, Physics**, Oscillations and Waves, Optics and Quantum Mechanics , Pearson, 2025
2. **Shatendra Sharma and Jyotsna Sharma,** Engineering Physics, Pearson, 2018**.**
3. **Gaur and Gupta**: Engineering Physics, Dhanpat Rai Publishers, New Delhi, 8th revised edition 2017.
4. **Sam Zhang, Lin Li, Ashok Kumar,** Materials Characterization Techniques, CRC Press, First Edition, 2008.

Reference Books:

1. **Resnick, Halliday and Jearl Walker -** Fundamentals of Physics, John Wiley & Sons, Inc., 11th edition, 2018.
2. **S.S. Thipse,** Cryogenics: A Text Book , Alpha Science International Limited.
3. **S L Kakani, Shubra Kakani,** Engineering Physics, 3rd Edition, 2020, CBS Publishers and Distributers Pvt. Ltd.

Practical Component (Lab experiments)

1. Plotting of forward and reverse bias characteristics of a Zener Diode and determination of breakdown voltage
2. Determination of numerical aperture, Acceptance angle and bending loss in Optical Fibre Cable
3. Measurement of capacitance and dielectric constant of a capacitor by charging and discharging it through a resistor
4. Determination of Planck's constant using LEDs
5. Verification of Stefan's law
6. Identification of different components (L,C or R) of a Black Box and calculation of their values through frequency response curves
7. Determination of Moment of inertia of an irregular body and calculation of rigidity modulus
8. Measurement of Young's Modulus of the material of the single cantilever beam
9. Determination of Energy gap of semiconductor
10. Determination of Fermi energy of a metal
11. Measurement of operating wavelength of semiconductor laser using Laser diffraction.
12. Calculation of thickness of given paper strip by the method of interference fringes (Air wedge)
13. Frequency response of series and parallel LCR circuits and calculation of Q-factor and band width
14. Determination of Hall coefficient and concentration of charge carriers of the semiconductor
15. Simulation of electrical experiments using PSPICE open source software
16. Predicting the outputs of various combinations of single and two-qubit gates using QUISKIT.

****Students are required to perform 12 prescribed experiments in the Physics lab from the above list**.**

Course Outcomes

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

1. Interpret the difference between free, damped and forced vibrations and their importance in structural systems. (PO-1, 2)
2. Analyze different elastic modulii in materials and learn the concepts of beams and cantilever in civil structures. (PO-1, 2)
3. Evaluate the principles of thermoelectric effects and assess the performance of thermoelectric devices for energy conversion.(PO-1, 2)
4. Demonstrate an understanding of low-temperature physics and analyze the applications of cryogenics in scientific and engineering context. (PO-1, 2)
5. Apply the concepts of X-ray diffraction and other characterization techniques to assess the properties and sustainability of engineering systems. (PO-1, 2)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal test – I	30	CO1,CO2,CO3
Internal test – II	30	CO3,CO4,CO5
Average of the two internal tests will be taken for 30 marks.		
CIE practical component assessment	**Marks**	**Course outcomes addressed**
Regular performance of experiments in the lab	15	CO1,CO2,CO3,CO4,CO5
Lab Test	05	CO1,CO2,CO3,CO4,CO5
Semester End Examination (SEE)	100	CO1,CO2,CO3,CO4,CO5

ELEMENTS OF MECHANICAL ENGINEERING

Course Code: PSCME24 **Credits: 3:0:0**
Pre-requisites: - **Contact Hours: 45L**

Course Coordinator: Dr ANILKUMAR. T

Course Content

Unit I

Engineering Materials and Metal Joining Processes

Engineering Materials: Mechanical Properties of Engineering materials, classification, examples and broad applications.

Composite materials: Introduction, Constituents of a composite, classification, types of matrix and reinforcement materials, advantages, disadvantages and applications of composite materials in aerospace and automobile industries.

Metal Joining Processes: Welding, Classification of welding, Oxyacetylene welding, Arc welding, Electrodes, Soldering and Brazing, Resistance Welding-Spot, Seam, electron beam welding.

Pedagogy/Course delivery tools:	·	Chalk and talk, Power point presentation, animated videos
Lab component/Practical topics:	·	Arc Welding and soldering
Links: Composite Materials	·	https://nptel.ac.in/courses/112104229
Links: Oxyacetylene welding	·	https://www.youtube.com/watch?v=-SA4D098u-Q

Unit II

Internal Combustion Engines and Electric Vehicles

Internal combustion Engines: Classification, Parts of an I C engine, 2 stroke, 4 stroke, petrol and diesel engines, Simple numerical problems on indicated power, indicated thermal efficiency, Brake power, Brake thermal efficiency, Mechanical efficiency, Specific fuel consumption, Demonstration of I.C. engine

Electric Vehicles and Hybrid Vehicles: Working principles, EV and HEV components, Advantages and Dis advantages.

Pedagogy / Course delivery tools:	·	Chalk and talk, Power point presentation, animated videos, Demonstration using IC engine models
Lab component/Practical topics:	·	Internal Combustion Engine (Demonstration)
Links: Internal Combustion Engine	·	https://nptel.ac.in/courses/108106182
Links: Electric Vehicle	·	https://www.youtube.com/watch?v=xE0d0JtXVLw

Unit III

Refrigeration and Air Conditioning, Non-Conventional Machining Methods, and Robotics

Refrigeration and Air Conditioning: Classification of Refrigeration, Working Principle of Vapor Compression Refrigeration system, Properties of Refrigerant, Working principle of Window Air Conditioner.

Non-Conventional Machining Methods: Abrasive Jet Machining, Water Jet Machining, Ultrasonic Machining, Electron Beam Machining.
Robotics: Introduction to Robotics, Robot anatomy-links and joints, types of robots, configurations of robots, Sensors, Industrial and Collaborative Robots

Pedagogy/ Course delivery tools:	·	Chalk and talk, Power point presentation, animated videos
Lab component/Practical topics:	·	Vapour Compression Refrigeration (Demonstration)
Links: Non-Conventional Machining	·	https://nptel.ac.in/courses/112105212
Links: Electron Beam Machining	·	https://youtu.be/dP2m7-WAdos

UNIT IV
Mechanical Power Transmission

Power Transmission: Belt drives; Types, Velocity ratio, Slip, Length of belts for Open belt and Cross belt drive, Angle of lap, ratio of belt tensions, Power transmitted, Creep in belt drive, Simple numerical problems on flat belt drives.
Gear Drives: Classification of gears, Spur gear nomenclature, Velocity ratio, Rack and Pinion, Helical gears, Bevel gears and Worm gears.
Gear Trains: Train values, Classification of gear trains and their uses, Simple numerical problems on simple, Compound gear trains.

Pedagogy/Course delivery tools:	·	Chalk and talk, Power point presentation, animated videos
Lab component/Practical topics:	·	Gear trains in lathe machine
Links: Belt drives	·	https://nptel.ac.in/courses/116102012
Links: Gear trains	·	https://www.youtube.com/watch?v=tjNsUzxRjfw

UNIT V
Computer Numerical Control Machines, Additive Manufacturing and AI in Mechanical Engineering

Computer Numerical Control Machines: Numerical control, Computer numerical control, and Direct numerical control
Additive Manufacturing: Basic Definition and Applications; Direct and Indirect Application levels, Types of Additive manufacturing process, SLA Process, SLS process, FDM process, Applications of Additive manufacturing
Applications of AI in Mechanical Engineering: Automobile Industry, manufacturing, predictive maintenance.

Pedagogy/Course delivery tools:	·	Chalk and talk, Power point presentation, animated videos
Lab component/Practical topics:	·	Robot technology
Links: Additive Manufacturing	·	https://nptel.ac.in/courses/112103306
Links: SLS Process	·	https://www.youtube.com/watch?v=9E5MfBAV_tA

Text books:

1. **K. R. Gopalakrishna, Sudhir Gopalakrishna, S. C. Sharma** – Elements of Mechanical Engineering, Sudha Publications, Jan 2016.
2. **Pravin Kumar -** Basic Mechanical Engineering, Dorling Kindersley (India) Pvt. Ltd., 2013.
3. **Ali Emadi** - Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design, CRC Press, 2nd edition.
4. **Mikell P Groover, Mitchell Weiss, Roger N.Nagel, Nicholas G Odrey -** Industrial Robotics Technology, Programming and Applications, McGraw-Hill International Edition 1986.
5. **Andreas Gebhardt**-Understanding Additive Manufacturing-Hanser Publications, Cincinnati.

REFERENCE BOOKS

1. **K. P. Roy, S. K. Hajra Choudhury, A. K. Hajra Chaudhury & Nirjhar Roy**-Elements of Mechanical Engineering –, Media Promoters & Publishers Pvt Ltd, 7th edition, 2012.
2. **John Lowry**-Electrical Vehicle Technology Explained –, John Wiley & Sons Ltd, 2nd edition, 2012.
3. **P C Pandey and H C Shan**-Modern Machining Processes, P McGraw Hill Education Private Limited, 2008
4. **Appu Kuttan K. K –** Robotics, I. K. International Publishing House, Pvt. Ltd., 2013.
5. **Manu Srivastava, Sandeep Rathee, Sachin Maheshwari, T. K. Kundra** - Additive Manufacturing Fundamentals and Advancements CRC Press, 2019.

Course Outcomes:

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

1. Memorize the list of materials used in aerospace, human implants, defense, jet engines, automobiles, etc and on basics of metal joining processes (PO-1, 2)
2. Record the basics of IC Engines and the fundamentals of Electric Vehicle Technology (PO-1, 2, 5)
3. Recognize broadly and understand the basics of Conventional Machining methods as well learn basics of Refrigeration and Air-Conditioning (PO-1, 2)
4. Understand the fundamental power transmission systems that are used in the industrial world (PO-1, 2)
5. Explain the importance of 3D manufacturing techniques and also fundamentals of Robotics (PO-1, 2, 5)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal test – I	30	CO1,CO2,CO3
Internal test – II	30	CO3,CO4,CO5
Average of the two internal tests will be taken for 30 marks.		
Other components	**Marks**	**Course outcomes addressed**
Assignment/Quiz	10	CO1,CO2,CO3
Assignment/Quiz	10	CO3,CO4,CO5
Semester End Examination (SEE)	100	CO1,CO2,CO3,CO4,CO5

ELEMENTS OF CHEMICAL ENGINEERING

Course Code: PSCCH24 **Credits: 3:0:0**
Pre-requisites: - **Contact Hours: 45L**

Course Coordinator: Dr. Alex Koshy

Course Content

Unit I

Introduction to Chemical Engineering and Process Calculations: Scope and role of chemical engineering, Introduction to units, dimensions, and unit conversions (SI and English systems), Dimensional homogeneity.
Overview of chemical industries and types of processes (batch, semi-batch, continuous)

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links: ➢ https://nptel.ac.in/courses/103103165, https://nptel.ac.in/courses/103106116
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/2975902/1331

Unit II

Material Balances (Non-reactive Systems): Mass fraction, mole fraction, average molecular weight, Mass balance concepts, Steady-state and unsteady-state systems (Qualitative), Material balances on single units (mixers, splitters, tanks), First order kinetics in batch system.

- Pedagogy / Course delivery tools: ➢ Chalk and talk
- Links ➢ https://nptel.ac.in/courses/103103165, https://nptel.ac.in/courses/103106116
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/2975902/1331

Unit III

Properties of Gases and Liquids: Ideal gas law and its applications, Gas mixtures, partial pressure (Dalton's law), Amagat's law, Vapor pressure, saturation, humidity, and basic psychometric, Density, specific volume, and viscosity of fluids

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, videos
- Links: ➢ https://nptel.ac.in/courses/103101004,
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/2975902/1331

Unit IV

Energy Balances (Without Reactions): Forms of energy (sensible heat, latent heat, kinetic and potential energy), Heat capacity and enthalpy change calculations, Basic heat balance for non-reactive systems, Heating/cooling of fluids and mixtures. Heat of Formation, Heat of Reaction, Heat of Combustion, Heat of Solution. Determination of ΔH_R at standard and elevated temperature.

- Pedagogy / Course delivery tools: ➢ Chalk and talk, Power Point Presentation, Videos
- Links: ➢ https://nptel.ac.in/courses/103105140, https://nptel.ac.in/courses/103101004
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/2975902/1331

Unit V

Introduction to Industrial Measurements and Data Handling: Basics of process measurement: temperature, pressure, flow, level; Introduction to experimental error, accuracy, and precision, Units and calibration of measuring instruments; Data recording and representation: tables, graphs (log-log, semi log).

- Pedagogy / Course delivery tools:
  - Chalk and talk
- Links:
  - https://nptel.ac.in/courses/103104043,
  - https://www.youtube.com/watch?v=eHtZrIb0oWY

Text books:

1. **Hougen, O.A., Waston, K.M., Ragatz, R.A.** - Chemical Process Principles Part –I, Material and Energy Balances, 2nd edition, CBS publishers and distributors, New Delhi, 1995.
2. **Himmelblau, D.M.** - Basic Principles and Calculations in Chemical Engineering, 6th edition, Prentice Hall of India, New Delhi, 1997.
3. **Ghoshal, S.K., Sanyal, S.K., Datta, S. -** Introduction to Chemical Engineering, McGraw Hill Education, Noida, 2017.

Reference books:

1. **Bhatt, B. L., Vora, S. M.** - Stoichiometry (SI Units), 3rd edition, 1996, Tata McGraw Hill Publishing Ltd., New Delhi, 1996.
2. **Richard M. Felder, Ronald W. Rousseau** - Elementary Principles of Chemical Processes, John Wiley & amp; Sons, 3rd edition, 2005.

Course Outcomes

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

1. Develop a basic idea on the scope and role of chemical engineering along with the types of processes and operations involved in chemical industries. (PO1, PO6, PO12, PSO1)
2. Perform material and energy balances involved in a process. (PO1, PO2, PO3, PSO1)
3. Remember the properties of gases and liquids and apply the knowledge when needed. (PO1, PO3, PSO1)
4. Identify the order of a reaction and develop a basic idea on its kinetics. (PO1, PO3, PSO1)
5. Develop an idea on industrial measurement and data handling. (PO2, PO4, PSO1)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal test – I	30	CO1, CO2, CO3
Internal test – II	30	CO2, CO4, CO5
Average of the two internal tests will be taken for 30 marks.		
Other components	**Marks**	**Course outcomes addressed**
Quiz	10	CO1,CO2,CO3
Assignment	10	CO2, CO4, CO5
Semester End Examination (SEE)	100	CO1,CO2,CO3,CO4,CO5

ELEMENTS OF CHEMICAL ENGINEERING

Course Code: PSCCH24 **Credits: 3:0:0**
Pre-requisites: - **Contact Hours: 45L**

Course Coordinator: Dr. Alex Koshy

Course Content

Unit I

Introduction to Aircrafts:
History of aviation; Atmosphere and its properties; Classification of aircrafts; Basic components of an aircraft; aircraft axis system; aircraft motions; control surfaces and high lift devices; conventional design configurations; principle of operation of each major part; Helicopters, their parts and functions.

Aircraft Structures and Materials:
Introduction; structural members; general types of construction; monocoque, semi-monocoque and geodesic structures; typical wing and fuselage structure; metallic and non-metallic materials for aircraft application.

- Pedagogy / Course delivery tools:
  - Chalk and talk, Power Point Presentation, Videos
- Links:
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod01lec01.mp4
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod02lec05.mp4
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod02lec06.mp4
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod02lec07.mp4
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod02lec08.mp4
- Impartus recording:
  - **https://nptel.ac.in/courses/101101079**

Unit II

Concepts of Aerodynamics:
Significance of speed of sound; airspeed and groundspeed; standard atmosphere; Bernoulli's theorem and its application for generation of lift and measurement of airspeed; forces over wing section, airfoil nomenclature, pressure distribution over a wing section. Lift and drag components – generation of lift and drag; lift curve, drag curve, types of drag, factors affecting lift and drag; center of pressure and its significance; aerodynamic center, aspect ratio, Mach number and supersonic flight effects; simple problems on lift and drag.

- Pedagogy / Course delivery tools:
  - Chalk and talk, Power Point Presentation, Videos
- Links
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod01lec02.mp4
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod01lec03.mp4
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod01lec04.mp4
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod03lec09.mp4
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod03lec10.mp4
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod03lec11.mp4

- media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod03lec12.mp4
- media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod05lec22.mp4
- media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod05lec26.mp4
- media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod05lec27.mp4
- media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod06lec33.mp4

- Impartus recording:
  - **https://nptel.ac.in/courses/101104018**

Unit III

Aircraft Propulsion:

Aircraft power plants, classification based on power plant and location and principle of operation. Turboprop, turbojet and turbofan engines; ramjets and scramjets; performance characteristics. Aircraft power plants – basic principles of piston, turboprop and jet engines; Brayton cycle and its application to gas turbine engines; use of propellers and jets for production of thrust; comparative merits and limitations of different types of propulsion engines; principle of thrust augmentation.

- Pedagogy / Course delivery tools:
  - Chalk and talk, Power Point Presentation, Videos
- Links:
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod07lec37.mp4
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod07lec38.mp4
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod07lec39.mp4
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod07lec40.mp4
- Impartus recording:
  - **https://ocw.tudelft.nl/courses/introduction-aeronautical-engineering**

Unit IV

Flight Mechanics:

Elements of Airplane performance: Equations of motion, aircraft maneuvers; rate of climb, stalling, gliding, and turning. Power curves, correct and incorrect angles of bank; aerobatics, inverted maneuvers, ground effects, Simple numericals.

Static and Dynamic stability: longitudinal, lateral and directional stability; criteria for longitudinal static stability, Neutral point, Static margin.

- Pedagogy / Course delivery tools:
  - Chalk and talk, Power Point Presentation, Videos
- Links:
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod08lec41.mp4
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod08lec42.mp4
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod09lec45.mp4
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod09lec46.mp4
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod09lec47.mp4
- Impartus recording:
  - **https://ocw.mit.edu/courses/16-00-introduction-to-aerospace-engineering-and-design-spring-2003**

Unit V

Introduction to Aircraft Systems: Aircraft systems (Mechanical) – hydraulic and pneumatic systems and their applications; environment control system; fuel system, oxygen system.

Aircraft Systems (Electrical) – flight control system, cockpit instrumentation and displays; communication systems; navigation systems; power generation systems – engine driven alternators, auxiliary power ram air turbine; power conversion, distribution and management.

- Pedagogy / Course delivery tools:
  - Chalk and talk, Power Point Presentation, Videos
- Links:
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod04lec18.mp4
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod04lec20.mp4
  - media.dev.nptel.ac.in/content/mp4/101/101/101101079/MP4/mod04lec21.mp4
- Impartus recording:
  - **https://ocw.mit.edu/courses/16-00-introduction-to-aerospace-engineering-and-design-spring-2003**

Text books:

1. **John D. Anderson** - Introduction to Flight , McGraw-Hill Education, 8th edition, 2015, ISBN: 978-0078027673.
1. **Lalit Gupta and O P Sharma** - Fundamentals of Flight Vol-I to Vol-IV, Himalayan Books, 2006, ISBN:9788170020752.
2. **A.C. Kermode -** Mechanics of Flight, Pearson Education India, 10th edition, 1995, ISBN: 9780582237407.

Reference books:

1. **A.C. Kermode -** Flight without formulae, Pearson Education India, 1989. ISBN: 9788131713891.
2. **Nelson R. C. -** Flight stability and automatic control, McGraw-Hill International Editions, 1998. ISBN 9780071158381.
3. **Ian Moir, Allan Seabridge -** Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration, John Wiley & Sons, 2011, ISBN: 978111965006.

Course Outcomes

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

1. Understand the basic principle of aviation and the structures involved in aircraft. (PO-1, PO-2, PO-3, PO-11)
2. Apply concepts of atmosphere, aerodynamics, and forces to analyze aircraft performance. (PO-1, PO-2, PO-3, PO-5)
3. Apply principles of aircraft and rocket propulsion to analyze engine operation and thrust generation. (PO-1, PO-2, PO-3, PO-5, PO-11)
4. Apply principles of flight mechanics to analyze aircraft performance parameters and evaluate static and dynamic stability characteristics under various flight conditions. (PO-1, PO-2, PO-3, PO-6, PO-11)
5. Describe mechanical and electrical aircraft systems to understand their functions and applications in flight operations. (PO-1, PO-2, PO-3, PO-11)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal test – I	30	CO1,CO2,CO3
Internal test – II	30	CO3,CO4,CO5
Average of the two internal tests will be taken for 30 marks.		
Other components	**Marks**	**Course outcomes addressed**
Quiz	10	CO1,CO2,CO3
Assignment	10	CO3,CO4,CO5
Semester End Examination (SEE)	100	CO1,CO2,CO3,CO4,CO5

SOFT SKILLS

Course Code: HSCP15/25 **Credits:** 1:0:0
Pre-requisites: Nil **Contact Hours:** 15L+15P

Course Coordinator: Dr. Diwakar P

Course Content

Unit I

Social Skills

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.

- Pedagogy / Course delivery tools:
  - TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
- Language Lab
  - Quicklrn.com

Unit II

Emotional Skills I

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.

- Pedagogy / Course delivery tools:
  - TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
- Language Lab
  - Quicklrn.com

Unit III

Emotional Skills II

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).

- Pedagogy / Course delivery tools:
  - TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach

- Language Lab ➢ Quicklrn.com

Unit IV
Professional Skills I

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.

- Pedagogy / Course delivery tools: ➢ TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
- Language Lab ➢ Quicklrn.com

Unit V
Professional Skills II

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.

- Pedagogy / Course delivery tools: ➢ TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
- Language Lab ➢ Quicklrn.com

Text books:

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

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:
  - ❖ bbc Learn English online Grammar
  - ❖ Learn English Podcasts
  - ❖ IELTS Word Power
  - ❖ Bbc learning English grammer online
  - ❖ Sounds Right (Phonemic Chart)

Course Outcomes (COs):

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

1. Apply social skills for clear communication, persuasion, self-awareness, and active listening (PO-8, PO-9, PO-11)
2. Use emotional skills to build confidence, manage stress, and adapt to change (PO-9, PO-11)
3. Set ambitious goals, practice empathy, and apply creativity for problem-solving (PO- 9, PO-11)
4. Demonstrate discipline, time management, and structured problem-solving (PO-8, PO-9, PO-11)
5. Work in teams, negotiate, resolve conflicts, and think critically (PO-8, 9, 11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes attained**
Internal Test-I	30 (6 marks objective & 24 marks subjective pattern)	CO1, CO2, CO3
Internal Test-II	30 (6 marks objective & 24 marks subjective pattern)	CO4, CO5
Average of the two internal tests shall be taken for 30 marks.		
Other components		
Assignment-I	10	CO1, CO2, CO3
Assignment-II	10	CO3, CO4, CO5
Semester End Examination (SEE)	50 (10 marks objective & 40 marks subjective pattern)	CO1, CO2, CO3, CO4, CO5

KANNADA KALI

Course Code: HSCP16/26K **Credits:** 1:0:0

Pre-requisites: - **Contact Hours:** 15L

Course Coordinator: Mrs. Kanya Kumari S

Course Content

Unit I

(Parichaya) - Introduction

Kannada Bhashe - About Kannada Language, Eight Kannada Authors – JnanpiTh Awardies. Introduction to Kannada Language, Karnataka State and Literature.

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

Unit II

Kannada PadagaLu mattu Vaakyagalu. Kannada Words and Sentences

naamapadagaLu – Sarva naamapadagaLu – (Nouns-Pronouns) and it's usage in Kannada.

Kannada naamavisheshanagaLu - (Adjectives-Interrogatives) kriyapadagaLu, kriya visheshaNagaLu- (verb-adverb)

Sambhashaneyalli Prashnarthaka padagalu – vaakyagaLu mattu kriyapadagaLu-visheshaNagaLu (Kannada- Interrogative words & Sentences and verb-adverb in Conversation)

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

Unit III

Kannada Bhasheyalli Sambhashanegalu- Conversations in Kannada:

Samanya Sambhashaneyalli Kannadada Padagalu mattu Vaakyagalu.

(Kannada Words and Sentences in General Conversation with activities)

Vicharaneya / Bedikeya vakyagalu (Enquiry /Request sentences in Conversation)

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

Unit IV

Kannada padagaLu (eakavachana, bahuvachanagaLu, virudda padagaLu, dina nityadalli baLasuva padagaLu mattu sankya vyavaste

Sambhashaneyalli Eakavachana mattu Bhahuvachana- (Singular and Plural nouns) Conversation- Sambhashaneyalli Linga rupagaLu- Genders in Conversation

Viruddha padagalu /Virodarthaka padagalu (Antonyms) Asamanjasa Uchcharane (Inappropriate Pronunciation)

Sankhya Vyavasthe (Numbers system) -Samaya /Kalakke Sambhandhisida padhagalu (Words Relating to time) – Dikkugalige sambhadisida padhagalu (Words Relating to Directions)

Aaharakke sambandisida padagaLu (Names connected with food)
Manavana shareerada bhagagalu / Angagalu (Parts of the Human body) Manava Sambhandhada da padhagalu (Terms Relating to Human Relationship)
Manavana Bhavanegalige sambandisida Padagalu (Words Relating to Human's feelings and Emotions)
Vaasada staLakke sambhandisidanthaha padhagalu (Words Relating to place of leaving)

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

Unit V

Kannada akshara maale (Kannada alphabets and their practices with pronunciations)

swara aksharagaLu –vyanjanaksharagaLu.
Shabdakosha (Vocabulary) - Exercises to test their knowledge of understanding the Language.
tantragnana mattu AaDalita padagaLu-Technical and administrative worlds in Kannada

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

Text Book:

1. **Dr. L.Thimmesh, Prof. Keshava muurthy -** BaLake kannada Prasarangaa, VTU, 2020

Reference Books:

1. **Smt. Kanya Kumari S** – Kannada Kali, Kinnari publications, 1st edition, Bengaluru, 2022
2. **Lingadevaru Halemane** – Kannada Kali, Prasaranga Kannada University Hampi, 6th edition, 2019

Course Outcomes (COs):

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

1. Develop vocabulary (PO-9)
2. Identify the basic Kannada language skill (PO-9)
3. Develop listing & speaking skill in Kannada language (PO-9, PO-11)
4. Enrich language skill (PO-11)
5. Apply Kannada language skill for various purpose (PO-11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes attained**
Internal Test-I	30	CO1, CO2, CO3
Internal Test-II	30	CO4, CO5
Average of the two internal tests shall be taken for 30 marks		
Other components		
Assignment	10	CO1, CO2
Quiz	10	CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

ಕನ್ನಡ ಮನಸು

Course Code: HSCP16/26M **Credits:** 1:0:0

Pre-requisites: - **Contact Hours:** 15L

Course Coordinator: Mrs. Kanya Kumari S

ಘಟಕ -೧ (Unit I)

ಲೇಖನಗಳು (Articles)

ಕನ್ನಡ ಭಾಷೆ ನಾಡು -ನುಡಿ
ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ
ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ
ವಚನಗಳು - ಅಕ್ಕಮಹಾದೇವಿ -ಬಸವಣ್ಣ -ಅಲ್ಲಮಪ್ರಭು

- Pedagogy / Course delivery tools: ➢ Chalk & talk

ಘಟಕ-೨ (Unit II)

ಕಾವ್ಯಭಾಗ (Poetry)

ವಚನಗಳು ಮತ್ತು ಕೀರ್ತನೆ : ಪುರಂದರ ದಾಸರು
ತತ್ವ ಪದಗಳು : ಶಿಶುನಾಳ ಶರೀಫರು

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power point presentation

ಘಟಕ-೩ (Unit III)

ಆಧುನಿಕ ಕಾವ್ಯಗಳು

ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗ -ಡಿ.ವಿ.ಜಿ
ಕುರುಡು ಕಾಂಚಾಣ - ದ.ರಾ .ಬೇಂದ್ರೆ

- Pedagogy / Course delivery tools: ➢ Chalk & talk

ಘಟಕ-೪ (Unit IV)

ತಾಂತ್ರಿಕ ಧುರೀಣರು (ವ್ಯಕ್ತಿ ಪರಿಚಯ) ಕಥೆ -ಪ್ರವಾಸ ಕಥನ

ಡಾ.ಸರ್.ಎಂ.ವಿಶ್ವೇಶ್ವರಯ್ಯ - ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ - ಎ. ಎನ್. ಮೂರ್ತಿರಾಯರು
ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ
ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಡಾ. ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ

- Pedagogy / Course delivery tools: ➢ Chalk & talk

ಘಟಕ-೫ (Unit V)

ಕಂಪ್ಯೂಟರ್ ಹಾಗು ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ

"ಕ" ಮತ್ತು "ಬ" ಬರಹ ತಂತ್ರಾಂಶಗಳು
ತಾಂತ್ರಿಕ ಪದಕೋಶ: ತಾಂತ್ರಿಕ ಹಾಗು ಪಾರಿಭಾಷಿಕ ಕನ್ನಡ ಪದಗಳು

- Pedagogy / Course delivery tools: ➢ Chalk & talk

ಪಠ್ಯ ಪುಸ್ತಕ (Text book):

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ - ಡಾ. ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ - ವಿಶ್ರಾಂತ ಕುಲಪತಿಗಳು, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ, ಪ್ರಸಾರಾಂಗ - ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಪ್ರಥಮ ಮುದ್ರಣ, ೨೦೨೦

ಪೂರಕ ಪಠ್ಯ (Reference book):

೧. ಕನ್ನಡ ಮನಸು - ಪ್ರಸಾರಾಂಗ, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ, ಆರನೇ ಮುದ್ರಣ, ೨೦೧೯
೨. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಕೋಶ - ಡಾ. ರಾಜಪ್ಪ ದಳವಾಯಿ, ೨೦೧೮

Course Outcomes (COs):

ಕನ್ನಡ ಮನಸು ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು

೧. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡದ ಜೊತೆಗೆ ಕ್ರಿಯಾತ್ಮಕ, ಸಾಹಿತ್ಯ, ಸಂಸ್ಕೃತಿ ಮತ್ತು ನಾಡು ನುಡಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು (P0-11)
೨. ಕನ್ನಡ ಭಾಷೆಯ ವ್ಯಾಕರಣ, ಭಾಷಾ ರಚನೆಯ ನಿಯಮಗಳನ್ನು ಪರಿಚಯಿಸುವುದು (P0-9)
೩. ಕನ್ನಡ ಭಾಷಾ ಬರಹದಲ್ಲಿ ಕಂಡು ಬರುವ ದೋಷಗಳು, ಅವುಗಳ ನಿವಾರಣೆ (P0-9)
೪. ಸಾಮಾನ್ಯ ಅರ್ಜಿಗಳು, ಸರ್ಕಾರಿ ಹಾಗು ಅರೆ ಸರ್ಕಾರಿ ಪತ್ರ ವ್ಯವಹಾರದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡಿಸುವುದು (P0-11)
೫. ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆ ಬಗ್ಗೆ ಆಸಕ್ತಿ ಮೂಡಿಸುವುದು ಮತ್ತು ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ, ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗು ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು (P0-11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes attained**
Internal Test-I	30	CO1, CO2, CO3
Internal Test-II	30	CO4, CO5
Avarege of the two internal test two will be taken for 30 marks		
Other components		
Assignment	10	CO1, CO2
Quiz	10	CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

INNOVATION & DESIGN THINKING LAB

Course Code: AECP17/27 **Credits: 0:0:1**

Pre-requisites: Nil **Contact Hours: 30P**

Course Coordinator: Dr. Anita Kanavalli

Course Content

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

Course Outcomes (COs):

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

1. Empathize with community problems and define meaningful challenges. (PO1, PO2, PO8, PO9)
2. Apply design thinking principles and multidisciplinary skills to develop user-centric solutions. (PO1, PO2, PO3, PO4, PO8, PO9)
3. Build and test basic prototypes using tools available in the Atal Idea/Tinkering Lab or Makers Space. (PO1, PO2, PO3, PO4, PO6, PO8, PO9)
4. Pitch socially relevant ideas with scalable models. (PO1, PO2, PO3, PO4, PO6, PO8, PO9)
5. Collaborate effectively in diverse teams. (PO1, PO2, PO3, PO4, PO6, PO8, PO-9)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes attained**
Weekly evaluation of laboratory reports after the conduction of every experiment.	30	CO1, CO2, CO3
Other components		
Practical test 20	20	CO1, CO2, CO3
Semester End Examination (SEE)	50	CO1, CO2, CO3

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)

ELEMENTS OF MECHANICAL ENGINEERING LAB/WORKSHOP

Course Code: PSCLME28 **Credits: 0:0:1**

Pre-requisites: Nil **Contact Hours: 30P**

Course Coordinator: Dr.Aruna kumara P C

Course Content

Unit I

Fitting Shop: Fitting of any two common joints.
Demonstration of Radial drilling machine operations and typical milling operations

Pedagogy / Course delivery tools:	• Chalk and talk, PowerPoint presentation (PPT)and Videos.
Video Link 1 for fitting models	• https://www.youtube.com/watch?v=9_UPVCITv4w
Video Link 2 for drilling operation	• https://www.youtube.com/watch?v=UboDyGfX_AM
Video Link 2 for milling operation	• https://www.youtube.com/watch?v=WvgPYH0zn1w

Unit II

Welding Shop: Welding of any two common joints.
Sheet Metal Work: Sheet-metal models – Rectangular Prism closed at one end, Rectangular 90° tray & Funnel.

Pedagogy / Course delivery tools:	• Chalk and talk, PowerPoint presentation and Videos.
Video Link 1 for the welding model	• https://www.youtube.com/watch?v=zwVrHfgcKhs
Video Link 2 for sheet metal model	• https://www.youtube.com/shorts/6ltD5SEoRhE

Unit III

Machine Shop: Two lathe models involving step turning, taper turning, and knurling operations
Demonstration on the use of other machine tools for common machining operations
Demonstration on 3-D printing

Pedagogy / Course delivery tools:	• Chalk and talk, PowerPoint presentation (PPT), and Videos.
Video Link 1 for Lathe models	• https://www.youtube.com/watch?v=km6ickQglVY
Video Link 2 for 3D printing operation	• https://www.youtube.com/watch?v=m12bX1eEVDM

Text Book:

1. Workshop Manual - Department of Mechanical Engineering, MSRIT, Bangalore, 13th edition 2025.

Reference Books:

1. **S. K. H. Choudhury, A. K. H. Choudhury, Nirjhar Roy** - The Elements of Workshop Technology, Volume I & II, Media promoters and publishers, Mumbai, 11th edition, 2001.
2. **James Anderson, Earle E. Jatro** - Shop Theory, Tata McGraw hill publications, 2nd edition, 2005.
3. **Chee Kai Chua, Kah Fai Leong** - 3D Printing and Additive Manufacturing, The 5th edition of Rapid Prototyping, January 2007.

Course outcomes:

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

1. Remember the role of basic workshop practices in the functioning of various daily life appliances. (PO1, PO2, PO3, PO5, PO11)
2. Understand the significant details of workshop tools, machines and simple fabrication processes. (PO1, PO2, PO3, PO11)
3. Apply the knowledge of workshop practice methods to demonstrate utilitarian skills. (PO1, PO3, PO5, PO11).

Course Assessment and Evaluation:

Continuous Internal Evaluation(CIE) : 50		
Assessment Tool	**Marks**	**Course outcomes addressed**
Preparation of models and record submission	30	CO-1,CO-2 & CO-3
Other components		
Laboratory Test	15	CO-1,CO-2 & CO-3
Viva-Voce	05	CO-1,CO-2 & CO-3
Semester End Examination (SEE)	50	CO-1,CO-2,& CO-3

ELEMENTS OF CHEMICAL ENGINEERING LAB

Course Code: PSCLCH28 **Credits: 0:0:1**

Pre-requisites: Nil **Contact Hours: 30P**

Course Coordinator: Dr. Alex Koshy

Course Content

1. Introduction to MS Excel – Data logging, data sorting, conditional formatting, graph plotting.
2. Unit conversion using Excel formulas.
3. Introduction to Excel Solver and Dimensional analysis.
4. Steady-state material balance on a tank.
5. Material balance for a mixing process.
6. Gas law experiment (Ideal gas behavior).
7. Flow rate measurement and calculations.
8. Specific heat capacity determination.
9. Heat balance on a simple heating system.
10. Humidity measurement and Psychrometric chart.
11. First order batch reactor data validation.
12. Introduction to experimental error and incorporation of error bars.

Text books:

1. **Hougen, O.A., Waston, K.M. and Ragatz, R.A.** - Chemical Process Principles Part –I, Material and Energy Balances, 2nd edition, CBS publishers and distributors, New Delhi, 1995.
2. **Himmelblau, D.M.** - Basic Principles and Calculations in Chemical Engineering, 6th edition, Prentice Hall of India, New Delhi, 1997.
3. **Ghoshal, S.K., Sanyal, S.K., Datta, S.** - Introduction to Chemical Engineering, McGraw Hill Education, Noida, 2017.

Reference books:

1. **Bhatt, B.L. and Vora, S.M.** - Stoichiometry (SI Units), 3rd edition, 1996, Tata McGraw Hill Publishing Ltd., New Delhi, 1996.
2. **Richard M. Felder and Ronald W. Rousseau** - Elementary Principles of Chemical Processes, John Wiley & Sons, 3rd edition, 2005.

Course Outcomes

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

1. Use MS Excel to handle and present engineering data. (PO4, PO5, PO10, PSO1, PSO2)
2. Perform chemical engineering calculations using MS Excel. (PO4, PO5, PSO1, PSO2)
3. Use Excel Solver to solve a system of linear and non-linear equations and solve complex engineering problems involving optimization of parameters. (PO4, PO5, PSO1, PSO2)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes attained**
Internal Test	20	CO1, CO2, CO3
Other Components		
Conduction, Calculation, Record and Viva	30	CO1, CO2, CO3
Semester-End Examination (SEE)	50	CO1, CO2, CO3

ELEMENTS OF AERONAUTICAL ENGINEERING LAB

Course Code: PSCLAS28 **Credits: 0:0:1**

Pre-requisites: Nil **Contact Hours: 30P**

Course Coordinator: Dr.A.Senthamilselvi

Course Content

PART – A

1. Create a paper plane model and calculate the range and endurance of the same.
2. Sketching the detailed configuration of an Aircraft (Fighter or Commercial).
3. Fabrication of different types of wing configurations.
4. Fabrication of unpowered gliders by using balsa wood.
5. Calculate the cg and aerodynamic design parameters of modelled glider.
6. Assessing the performance parameters of the modelled glider.

PART – B

1. Lighter than Air concepts (Para Gliding)
2. Case studies on Aircraft investigation.
3. A study on sugar candy solid propellant.
4. Fabrication of aircraft fuselage structures by using sheet metal.
5. Selection and justification of appropriate riveting and joining techniques in aircraft applications.
6. Design and fabrication of powered gliders

Course Outcomes

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

1. Demonstrate practical fabrication skills in wing, fuselage, and glider structures. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-8, PO-9, PO-11)
2. Evaluate performance characteristics (range, endurance, CG, stability. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-8, PO-9, PO-11)
3. Conduct simple flight tests and verify theory with experimental results (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-8, PO-9, PO-11)
4. Develop innovative solutions in open-ended experimental setups (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-8, PO-9, PO-11)

Text books

1. **A. C. Kermode** - Flight without formulae, Pearson Education India, 1989, ISBN: 9788131713891
2. **Lalit Gupta, O. P. Sharma** - Fundamentals of Flight Vol-I to Vol-IV, Himalayan Books. 2006, ISBN:9788170020752

Reference books

1. **Madhav Khare** - How do Airplanes Fly.
2. **Martin Simons** - Model Aircraft Aerodynamics, Wiley Publications, 1994, ISBN 1-85486-121-2.

Course Assessment and Evaluation

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course Outcomes addressed**
Weekly evaluation of laboratory journals/ reports after the conduction of every Experiment	30	CO1, CO2 & CO3
Practical Test	20	CO1, CO2 & CO3
Semester End Examination (SEE)	50	CO1, CO2 & CO3

COMPUTER AIDED ENGINEERING DRAWING - EE

Course Code: MELM29 **Credits:** 0:0:1
Pre-requisites: Nil **Contact Hours:** 30P
Course Coordinator: Dr. Mohandas K N

Course Contents

Unit I

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 and RPP & LPP of 2D environment. 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:

Orthographic projections: Definitions - Planes of projection, reference line and conventions employed, Projections of points in First and Third quadrants (**No problems**), Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (**No problems**).

Orthographic Projections of Planes viz triangle, square, rectangle, pentagon, hexagon, and circular laminae (**Placed in First quadrant only using change of position method**).

- Pedagogy/Course delivery tools: ➢ Chalk and talk, Power point presentation
- Links: Orthographic Projections ➢ https://www.youtube.com/watch?v=uePTMVQlIA4
- Links: Orthographic projections of plane ➢ https://www.youtube.com/watch?v=GguSUmNxc8Q

Unit II

Development of Lateral Surfaces of Solids:

Development of sectioned (**Section plane perpendicular to VP and inclined to HP bisecting the axis only**) lateral surfaces of right regular prism, cylinder, pyramid and cone resting **with base on HP only.**

- Pedagogy/Course delivery tools: ➢ Chalk and talk, Power point presentation
- Links: Development of lateral surfaces ➢ https://www.youtube.com/watch?v=U5mz9_W-xdI

Unit III

Orthographic Projection of Solids:

Orthographic projection of right regular solids (**Solids Resting on HP only**): Prism & Pyramid (triangle, square, rectangle, pentagon, hexagon), Cylinder, Cone and Cube **(No freely suspended problems)**.

- Pedagogy/Course delivery tools: ➢ Chalk and talk, Power point presentation

- Links: Orthographic projection of Solids
  - https://www.youtube.com/watch?v=vu06T5caWpc&list=PLzDhXNnURXs8bfbPmddiS_ACDRW1WoWb

Unit IV

Isometric Projections:

Isometric scale, Isometric projection of hexahedron (cube), right regular prism, pyramid, cylinder, cone, sphere and frustum of solid. Isometric projection of combination of two simple solids **(Co-axial only)**.

- Pedagogy/Course delivery tools:
  - Chalk and talk, Power point presentation
- Links: Isometric Projection
  - https://www.youtube.com/watch?v=Vo9LC9d7FQA&t=3374s

Unit V

Multidisciplinary Applications & Practice: (For CIE only)

Free hand Sketching: True free hand, Guided Free hand, Roads**.**

Drawing Simple Mechanisms: Bicycles, Tricycles, Gear trains.

Electric Wiring and lighting diagrams: Like, Automatic fire alarm.

Basic Building Drawing: Architectural floor plan, basic foundation drawing.

Electronics Engineering Drawings: Simple Electronics Circuit Drawings, practice on layers concept.

- Pedagogy/Course delivery tools:
  - Chalk and talk, Power point presentation
- Links: Free hand sketching
  - https://www.youtube.com/watch?v=Ess0dmJB2lo
- Links: Electric wiring and lighting diagram
  - https://www.youtube.com/watch?v=c67wlH2lJL8
- Links: Electronics Engineering Drawings
  - https://www.youtube.com/watch?v=RpF7oFC-LPY

Text books:

1. **Sudhir Gopalakrishna & K. R. Gopalakrishna** - A Textbook of Engineering Graphics, Techno Series, 2024.
2. **N. D. Bhatt** - Engineering Drawing, Charotar Publishing house Pvt. Ltd, 2024.

Reference books:

1. **M H Annaiah** - Computer Aided Engineering Drawing, New Age International Private Limited, 7th edition, 2022.

Course Outcomes (COs):

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

1. Demonstrate the usage of suitable software for creating basic and applied engineering drawings. (PO-1, PO-5, PO-8, PO-9, PO-11)
2. Conceptually sketch and draw developments for typical lateral surfaces. (PO-1, PO-5, PO-8, PO-9)
3. Exhibit the knowledge of orthographic and isometric projections of typical solids. (PO-1, PO-5, PO-8, PO-9)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Class work and Print out	30	CO1,CO2,CO3
Assignments	10	CO1,CO2,CO3
Tests	10	CO1,CO2,CO3
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

ENGINEERING SCIENCE COURSES
I /II SEMESTER

BUILDING SCIENCE AND MECHANICS

Course Code: ESC131/231 **Credits:** 3:0:0
Pre-requisites: Nil **Contact Hours:** 45L

Course Coordinator: Dr Basavana Gowda GM

Course Content

Unit I

Introduction to building science:

Importance and Scope of various fields of Civil Engineering: Surveying, Structural Engineering, Geotechnical Engineering, Water Resources Engineering, Transportation Engineering, Environmental Engineering, Construction Planning and Project Management. Basic Materials of Construction: Types and Uses of Bricks, Stones, Cement, Fine and Coarse aggregates, Structural Steel, Wood and Concrete.

Structural Elements of a Building: Concept of Foundation, Plinth, Lintel, Chejja, Masonry wall, Column, Beam, Slab, Flooring and Staircase.

- Pedagogy / Course delivery tools:
  - Chalk & talk
  - **Introduction:**
- Impartus recording:
  - https://a.impartus.com/ilc/#/video/id/534326
  - https://a.impartus.com/ilc/#/video/id/536441

Unit II

Sustainable Built Environment:

Emerging materials: Types and Uses of Autoclaved Aerated Concrete (AAC) blocks, Bamboo, Recycled plastics, Material selection criteria, Durability and Sustainability of Built Environment, Introduction to Smart City concept.

Green Building: Concept of HVAC, Green building materials and rating systems - IGBC, LEED, GRIHA (Green Rating for Integrated Habitat Assessment) for new buildings – Purpose - Key highlights - Point System with Differential weightage.

- Pedagogy / Course delivery tools:
  - Chalk & talk
  - https://www.cedengineering.com/userfiles/Leed%20Rating%20System.pdf
- Links:
  - https://www.mapleridge.ca/1780/Sustainable-Building-Features

Unit III

Force Systems: Concept of idealization, System of forces, Principles of transmissibility of a force, Resolution and composition of forces, Law of Parallelogram of forces, Concurrent and non-concurrent coplanar force systems, Moment of forces, Couple, Varignon's theorem.

Equilibrium of concurrent Force system: Free body diagram, equations of

equilibrium, Lami's Theorem, Numerical examples.

- Pedagogy / Course delivery tools:
  - Chalk and talk, Power Point Presentation, videos
- Impartus recording:
  - **Introduction to Engg. Mechanics** https://a.impartus.com/ilc/#/video/id/532408
  - **Resultants** https://a.impartus.com/ilc/#/video/id/537603

Unit IV

Equilibrium of non-concurrent Force system:
Equilibrium of Coplanar Non -concurrent force systems: Numerical examples. Types of loadings, beams and supports, Concept of Statically determinate and indeterminate structures (Definitions with examples only), Support reactions: Numerical examples on Statically determinate beams.

- Pedagogy / Course delivery tools:
  - Chalk & talk, Power point presentation, Videos
- Impartus recording:
  - https: //a.impartus.com/ilc/#/video/id/550330

Unit V

Centroid of Plane areas: Introduction, Locating the centroid of rectangle, triangle, circle, semicircle and quadrant of a circle using method of integration, centroid of composite areas and simple built up sections: Numerical examples.
Moment of Inertia of plane Areas: Introduction, Moment of inertia about an axis, Parallel axes theorem, Perpendicular axes theorem, Polar moment of inertia, Radius of gyration, Numerical examples.

- Pedagogy / Course delivery tools:
  - Chalk & talk
- Links:
  - Centroid: https://www.youtube.com/watch?v=QK_TuE2lfSc
  - Moment of Inertia: https://www.youtube.com/watch?v=Bls5KnQOWkY

Text books:

1. **Rangwala** - Building Construction, Charotar Publishing House Pvt. Ltd., 33rd edition, 2016
2. **Bansal R. K., Rakesh Ranjan Beohar, Ahmad Ali Khan** - Basic Civil Engineering and Engineering Mechanics, Laxmi Publications, 3rd edition, 2015
3. **Kolhapure B. K.** - Elements of Civil Engineering and Engineering Mechanics, Eastern Book Promoters Belgaum, 11th edition, 2018
4. **M. N. Shesha Prakash, Ganesh B. Mogaveer** - Elements Of Civil Engineering and Engineering Mechanics, Phi Learning, 3rd edition.

Reference books:

1. **Beer F. P., Johnston E. R.** - Mechanics for Engineers: Statics and Dynamics, McGraw Hill, 4th edition, 1987
2. **Meriam J. L., Kraige L. G.** - Engineering Mechanics-Statics, Wiley publication, Vol I – 6th edition, 2008

3. **Irving H. Shames** - Engineering Mechanics-Statics and Dynamics, Prentice-Hall of India (PHI), 4th edition, 2002
4. **Hibbler R. C.** - Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press, New Delhi, 2017
5. **Timoshenko S, Young D. H., Rao J. V., Sukumar Patil** - Engineering Mechanics, McGraw Hill Publisher, 5th edition, 2017
6. **Bhavikatti S. S.** - Engineering Mechanics, New Age International Publications, 4th edition, 2018
7. **Reddy Vijaykumar K., Suresh Kumar K.** - Engineering Mechanics, BS Publications, 3rd edition, 2013

Course Outcomes (COs):

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

1. Explain the fundamental concepts of building science, disciplines of civil engineering, construction materials, and structural elements of buildings (PO-1, PO-6)
2. Describe the sustainability aspects of the built environment through appropriate selection of green materials and interpretation of rating systems (PO-1, PO-6)
3. Apply the principles of equilibrium for Coplanar Concurrent force systems (PO-1, PO-2, PO-3)
4. Compute the support reactions using Conditions of Equilibrium (PO-1, PO-2, PO-3)
5. Determine the centroid and Moment of Inertia of simple and composite plane areas using first principles (PO-1, PO-2, PO-3)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal Test-I	30	CO1, CO2, CO3
Internal Test-II	30	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks		
Other Components		
Quiz	10	CO1, CO2, CO3
Assignment	10	CO3, CO4, CO5
Semester End Examination (SEE) (Scaled to 50 Marks)	100	CO1, CO2, CO3, CO4, CO5

INTRODUCTION TO ELECTRICAL ENGINEERING

Course Code: ESC132/232 **Credits:** 3:1:0
Pre-requisites: Nil **Contact Hours:**30L+30T

Course Coordinator: Dr. Nagaraj C

Course Content

Unit I

Introduction: Conventional and non-conventional energy resources; General structure of electrical power systems using single line diagram approach.
Power Generation: Hydel, Nuclear, Solar & wind power generation (Block Diagram approach). Grid and its types. Types of loads.

- Pedagogy / Course delivery tools:
  - Chalk & talk, Power Point Presentation
- Links:
  - **power generation, transmission distribution and Tariff:** http://www.nptelvideos.in/2012/11/power-sys-generation-transmission.html

Unit II
DC Circuits

Ohm's Law and its limitations. KCL, KVL, Thevenin, Maximum power transform and Superposition theorems. Series, parallel, series-parallel circuits. (Only for resistive networks) Simple Numerical.

- Pedagogy / Course delivery tools:
  - Chalk & talk
- Links:
  - **Introduction to KCL, KVL and Power Balance:** https://nptel.ac.in/courses/108105159

Unit III
A.C. Fundamentals

Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor. (Only definitions)
Analysis of R, L, C, R-L, R-C and R-L-C Series circuits. Concept of power and power factor. (Simple Numerical).

- Pedagogy / Course delivery tools:
  - Chalk and talk, Power Point Presentation
- Links:
  - **AC and DC waveform:** https://www.youtube.com/watch?v=vN9aR2wKv0U
  - **Generation of sine wave:** https://www.youtube.com/watch?v=gQyamjPrw-U

Unit IV

Introduction to Electrical Machines

Transformers: Necessity of transformer, principle of operation, Types and construction of single- phase transformers, EMF equation, losses, Efficiency. Simple numerical.

Introduction to Three-Phase systems.

Three-phase induction Motors: Concept of rotating magnetic field, Principle of operation, constructional features of motor, types – squirrel cage and wound rotor. Slip and its significance simple numerical.

- Pedagogy / Course delivery tools:
  - Chalk & talk, Power point presentation
- Links:
  - **Transformer:** https://www.youtube.com/watch?v=vh_aCAHThTQ
  - **3-Phase Induction Motor:** https://www.youtube.com/watch?v=AQqyGNOP_3o https://www.youtube.com/watch?v=Mle-ZvYi8HA

Unit V

Domestic Wiring: Requirements, Types of wiring: Two way and three-way control of load.

Electricity Bill: Power rating of household appliances, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety measures: Fuse and Fuse gauge. Miniature circuit breaker (MCB), merits and demerits.

Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

- Pedagogy / Course delivery tools:
  - Chalk & talk, Power Point Presentation
- Links:
  - **MCB:** https://www.youtube.com/watch?v=9Xgn40eGcqY
  - **Electrical safety animation:** https://www.youtube.com/watch?v=yAz9Ungv2Xc

Text books:

1. **D. C. Kulshreshtha** - Basic Electrical Engineering, Tata McGraw Hill, 1st edition 2019.
2. **B. L. Theraja** - A Text book of Electrical Technology, S Chand and Company, Reprint edition, 2014.

Reference books:

1. **D. P. Kothari, I. J. Nagrath** - Basic Electrical Engineering, Tata McGraw Hill 4th edition, 2019.
2. **V. K. Mehta, Rohit Mehta** - Principles of Electrical Engineering & Electronics, S. Chand and Company Publications, 2nd edition, 2015.
3. **Rajendra Prasad** - Fundamentals of Electrical Engineering, PHI, 3rd edition, 2014.

Web links for video lectures(e-Resources):

1. https://nptel.ac.in/courses/108/108/108108076/
2. https://a.impartus.com/ilc/#/course/59745/295

Course Outcomes (COs):

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

1. Interpret the concepts of Electrical Power. (PO-1)
2. Solve problems in DC and AC circuits. (PO-1)
3. Exemplify the concepts of Electrical Machines. (PO-1)
4. Explain the types of wiring and tariffs. (PO1)
5. Identify types of protective systems and safety precautions. (PO-1,6)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal Test-I	30	CO1, CO2
Internal Test-II	30	CO2, CO3
Average of the two internal tests shall be taken for 30 marks		
Other Components		
Assignment	10	CO4, CO5
Quiz	10	CO2
Semester End Examination (SEE) (Scaled to 50 Marks)	100	CO1, CO2, CO3, CO4, CO5

INTRODUCTION TO ELECTRONICS & COMMUNICATION ENGINEERING

Course Code: ESC133/233 **Credits:** 3:0:0
Pre-requisites: Nil **Contact Hours:** 45L

Course Coordinator: U S Pavitha

Course Content

Unit I

Power Supplies: Block Diagram, Rectifiers, Reservoir and Smoothing Circuits, Improved Ripple Filters, Full Wave Rectifiers, Bi Phase Rectifiers Circuits, Bridge Rectifier Circuits, Voltage Regulators, Output Resistance and Voltage Regulation, Voltage Multipliers, (Only Voltage Doubler) Switched Mode Power Supplies.
Amplifiers: Types of Amplifiers, Gain, Input and Output Resistance, Frequency Response, Bandwidth, Phase Shift, Negative Feedback.

- Pedagogy / Course delivery tools: ➢ Chalk & talk
- Links: ➢ https://nptel.ac.in/courses/117103063
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/80947/295

Unit II

Oscillators: Positive Feedback, Condition for Oscillations, Ladder Network Oscillator, Wein Bridge Oscillator, Single-Stage Astable Oscillator, Crystal Controlled Oscillators (Only Concepts, Working, and Waveforms. No Mathematical Derivations)
Operational Amplifiers: Operational Amplifier Parameters, Operational Amplifier Characteristics, Operational Amplifier Configurations, Operational Amplifier Circuits.

- Pedagogy / Course delivery tools: ➢ Chalk & talk
- Links: ➢ https://nptel.ac.in/courses/117103063
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/80947/295

Unit III

Analog Communication Schemes: Introduction, Modern Communication System Scheme: Information Source and Input Transducer, Transmitter, Channel or Medium, Noise, Receiver, Concept of Modulation, Concept of Radio Wave Propagation (Ground, Space, Sky), Types of Communication Systems.
Modulation Schemes: Amplitude Modulation, Angle Modulation, Advantages of Digital Communication Over Analog Communication, Multiplexing, Digital Modulation Schemes: ASK, FSK, PSK, (Explanation with Waveform).

- Pedagogy / Course delivery tools: ➢ Chalk & talk
- Links: ➢ https://nptel.ac.in/courses/117103063
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/80947/295

Unit IV

Boolean Algebra and Logic Circuits: Binary Numbers, Number Base Conversion- Binary, Decimal And Octal and Hexa Decimal Numbers and Vice-Versa, Complements-1's and 2's, Basic Definitions, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Digital Logic Gates.

Combinational Logic: Introduction, Design Procedure, Adders- Half Adder, Full Adder.

- Pedagogy / Course delivery tools: ➢ Chalk & talk
- Links: ➢ https://nptel.ac.in/courses/117103063
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/80947/295

Unit V

Embedded Systems: Definition, Embedded Systems Vs General Computing Systems, Classification of Embedded Systems, Major Application Areas of Embedded Systems, Purpose of an Embedded System, Core of The Embedded System: Microprocessors, GPP Vs ASIP, Microcontrollers, Microprocessor Vs Microcontroller, DSP, RISC V/S CISC,

Memory: ROM, Sensors, Actuators, LED, 7-Segment LED Display.

- Pedagogy / Course delivery tools: ➢ Chalk & talk
- Links: ➢ https://nptel.ac.in/courses/117103063
- Impartus recording: ➢ https://a.impartus.com/ilc/#/course/80947/295

Text books:

1. **Mike Tooley** - Electronic Circuits Fundamentals & Applications, Elsevier, 5th edition, 2020.
2. **S. L. Kakani, Priyanka Punglia** - Communication Systems, New Age International Publisher, 1st edition, 2017.
3. **K. V. Shibu** - Introduction to Embedded Systems, McGraw Hill Education (India) Private Limited, 2nd edition, 2019.
4. **M. Morris Mano** - Digital Logic and Computer Design, Pearson Education, 2017, ISBN-978-93-325- 4252-5.

Course Outcomes (COs):

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

1. Analyse basic electronic circuits using the principles of rectifiers, voltage regulators, and amplifiers. (PO1, PO2, PO3)
2. Analyse the behaviour of analog circuits including oscillators and operational amplifiers in signal generation and conditioning applications. (PO1, PO2, PO3)
3. Illustrate the fundamental concepts of analog and digital modulation techniques based on their characteristics and suitability for communication systems. (PO1, PO2, PO3)

4. Interpret the structure and functionality of embedded systems and digital logic components such as microcontrollers, sensors, and logic gates. (PO1, PO2, PO3)
5. Apply number system conversions and Boolean algebra to design and implement basic combinational logic circuits. (PO1, PO2, PO3)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal Test-I	30	CO1, CO2, CO3
Internal Test-II	30	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks		
Other Components		
Quiz	10	CO1, CO2
Troubleshooting/ Assignment	10	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE) (Scaled to 50 Marks)	100	CO1, CO2, CO3, CO4, CO5

INTRODUCTION TO MECHANICAL ENGINEERING

Course Code: ESC134/234 **Credits:** 3:0:0
Pre-requisites: Nil **Contact Hours:** 45L

Course Coordinator: Dr. Ashok Kumar K

Course Content

Unit I

Introduction to Mechanical Engineering (Overview only):
Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.
Engineering materials: Introduction, Classification, Ferrous and Non-Ferrous metals: Types, Properties and broad applications.
Energy Sources and Power Plants:
Basic working principles of Hydel power plant, Thermal power plant, nuclear power plant, Solar power plant, Tidal power plant and Wind power plant.

- Pedagogy / Course delivery tools:
  - Chalk & talk
  - https://online-engineering.case.edu/blog/emerging-trends-in-mechanical-engineering?utm_source=chatgpt.com
- Links:
  - https://www.youtube.com/watch?v=HYpgpMymDcI
  - https://www.youtube.com/watch?v=LGIlTpd_HuU
  - https://www.youtube.com/watch?v=C6vaEQwLISM

Unit II

Machine Tool Operations:
Lathe: Principle of working of a center lathe, lathe operations: Turning, facing, knurling, thread cutting, taper turning by swivelling the compound rest.
Drilling Machine: Working of simple drilling machine, drilling operations: drilling, boring, reaming, tapping, counter sinking, counter boring,
Milling Machine: Working and types of milling machine, milling operations: plane milling, end milling and slot milling. **(No sketches of machine tools, sketches to be used only for explaining the operations).**
Introduction to Advanced Manufacturing Systems: Introduction, components of CNC, advantages and applications of CNC, Basic principles of 3D printing.

- Pedagogy / Course delivery tools:
  - Chalk & talk
  - https://www.youtube.com/watch?v=nb-Bzf4nQdE
- Links:
  - https://onlinecourses.nptel.ac.in/noc21_me04/preview
  - https://onlinecourses.nptel.ac.in/noc19_me46/preview

Unit III

Introduction to IC Engines: Components and working principles, 4-Stroke Petrol and Diesel engines, Application of IC Engines, performance of IC engines (Simple numericals).

Introduction to Refrigeration and Air Conditioning: Principle of refrigeration, Refrigerants and their desirable properties. Working principle of VCR refrigeration system, working principle of room air conditioner & Applications of air Conditioners

- Pedagogy / Course delivery tools:
  - Chalk & talk, Power Point Presentation, videos
- Links:
  - https://www.youtube.com/watch?v=ZSkB3zrU8T4
  - https://www.torr-engineering.com/the-refrigeration-cycle/

Unit IV

Mechanical Power Transmission:

Gear Drives: Types - spur, helical, bevel, worm and rack and pinion, velocity ratio, simple and compound gear trains (simple numerical problems)

Belt Drives: Introduction, Types of belt drives (Flat and V-Belt Drive), length of the belt and tensions ratio (simple numerical problems)

Joining Processes: Soldering, Brazing and Welding, Definitions, classification of welding process, Arc welding, Gas welding, (types of flames).

- Pedagogy / Course delivery tools:
  - Chalk & talk
- Links:
  - https://nptel.ac.in/courses/117103063
- Impartus recording:
  - https://a.impartus.com/ilc/#/course/80947/295

Unit V

Insight into future mobility technology: Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles. Advantages and disadvantages of Electric Vehicles (EVs) and Hybrid vehicles.

Robotics: Introduction to Robots, History, Criteria for defining a robot, work volume, robot anatomy, joint configuration, sensors, industrial and collaborative robots

- Pedagogy / Course delivery tools:
  - Chalk & talk
- Links:
  - https://www.youtube.com/watch?v=h5ysddrlXLw
  - https://onlinecourses.nptel.ac.in/noc25_me161/preview?utm

Text books:

1. **K. R. Gopalakrishna, Sudhir Gopalakrishna, S.C.Sharma** – Elements of Mechanical Engineering, Sudha Publications, Jan 2016.
2. **Pravin kumar** - Basic Mechanical Engineering, Dorling Kindersley (India) Pvt. Ltd., 2013.
3. **Ali Emadi** - Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design, CRC Press, 2nd edition.

4. **Mikell P Groover, Mitchell Weiss, Roger N. Nagel, Nicholas G Odrey** - Industrial Robotics Technology, Programming and Applications, McGraw-Hill International Edition, 1986.
5. **Andreas Gebhardt** - Understanding Additive Manufacturing-Hanser Publications, Cincinnati.

Reference books:

1. **K. P. Roy, S. K. Hajra Choudhury, A. K. Hajra Chaudhury, Nirjhar Roy** - Elements of Mechanical Engineering, Media Promoters & Publishers Pvt. Ltd., 7th edition, 2012.
2. **John Lowry** - Electrical Vehicle Technology Explained , John Wiley & Sons Ltd., 2nd edition, 2012.
3. **P. M. Agrawal, Dr. V. J. Patel** - CNC Fundamentals and Programming, Charotar Publishing House Pvt. Ltd., 3rd edition, 2022.
4. **Appu Kuttan K. K** – Robotics, I. K. International Publishing House Pvt. Ltd., 2013.
5. **Manu Srivastava, Sandeep Rathee, Sachin Maheshwari, T. K. Kundra** - Additive Manufacturing Fundamentals and Advancements, CRC Press, 2019.

Course Outcomes (COs):

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

1. Outline the role of Mechanical Engineering in industries and society, energy sources and power plants, engineering materials, and emerging trends in various sectors. (PO-1, PO-2, PO-6, PO-7, PO-12)
2. Understand the basics of Conventional Machining methods and understand the basic components of CNC and the importance of 3D printing techniques (PO-1, PO-2, PO-5, PO-6, PO-7, PO-12)
3. Comprehend the working principles, components, and applications of IC engines, and understand the principles and applications of refrigeration and air-conditioning systems. (PO-1, PO-2, PO-6, PO-7, PO-12)
4. Realize the fundamentals of power transmission systems and the concepts of metal joining processes (PO-1, PO-2, PO-7, PO-12)
5. Illustrate the concepts of Electric/Hybrid Vehicle Technology and fundamentals of Robotics (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-7, PO-11, PO-12)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal Test-I	30	CO1, CO2, CO3
Internal Test-II	30	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks		
Other Components		
Quiz	10	CO1,CO2,CO3
Assignment	10	CO3,CO4,CO5
Semester End Examination (SEE) (Scaled to 50 Marks)	100	CO1, CO2, CO3, CO4, CO5

ESSENTIALS OF INFORMATION TECHNOLOGY

Course Code: ESC135/235 **Credits:** 3:0:0
Pre-requisites: Nil **Contact Hours:** 45L

Course Coordinator: Aishwarya M F Prabhakar

Course Content

Unit I

Data Storage: Bits and Their Storage, Main Memory, Mass Storage, Representing Information as Bit Patterns, The Binary System, Storing Integers, Storing Fractions.
Data Manipulation: Computer Architecture, Machine Language, Program Execution, Arithmetic/Logic Instructions, Communicating with Other Devices.

- Pedagogy / Course delivery tools: ➢ Chalk & talk

Unit II

Operating Systems: The History of Operating Systems, Operating System Architecture, Coordinating the Machine's Activities, Handling Competition Among Processes, Security.
Algorithms: The Concept of an Algorithm, Algorithm Representation, Algorithm Discovery.

- Pedagogy / Course delivery tools: ➢ Chalk & talk

Unit III

Networking and the Internet: Network Fundamentals, The Internet, The World Wide Web, Internet Protocols, Security.
Cybersecurity: Overview—What is Cybersecurity? Brief History of Cybersecurity Events, The Basic Information Security Model, Cyber Hygiene, Teams in Cybersecurity.
Ethical Issues in Information Technology: Overview, Ownership Rules, Ethics and Online Content.

- Pedagogy / Course delivery tools: ➢ Chalk & talk, Power Point Presentation, videos

Unit IV

Software Engineering: The Software Engineering Discipline, The Software Life Cycle, Software Engineering Methodologies, Modularity, Tools of the Trade.
Database Systems: Database Fundamentals, The Relational Model.

- Pedagogy / Course delivery tools: ➢ Chalk & talk

Unit V

Introduction to HTML and Website Development: What is HTML? Cascading Style Sheets (CSS), Website, Design and Storyboarding, Structure of a Website.
Computer Graphics: The Scope of Computer Graphics, Overview of 3D Graphics, Modelling, Rendering.

- Pedagogy / Course delivery tools: ➢ Chalk & talk

Web links and Video Lectures (e-Resources):

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

Text books:

1. **J. Glenn Brookshear and Dennis Brylow -** Computer Science: An Overview, Pearson Education Limited, 12th edition, 2017
2. **Roy, Shambhavi; Daniel, Clinton; and Agrawal, Manish** -Fundamentals of Information Technology, Digital Commons at The University of South Florida, 2023

Reference books:

1. **V. Rajaraman -** Introduction to Information Technology, 3rd edition, PHI Learning, 2018.
2. **Pelin Aksoy** - Information Technology in Theory, 1st edition, Cengage.

Course Outcomes (COs):

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

1. Illustrate different information representation and manipulation schemes. (PO-1, PO-2)
2. Make use of Information Technology (IT) infrastructure for information exchange. (PO-1, PO-2)
3. Apply basic software engineering concepts for Website and application development. (PO1, PO-2)
4. Develop queries for quick insert, access and updating of structured information. (PO1, PO-2)
5. Identify role of cybersecurity and ethics issues in Information Technology (IT). (PO1, PO-2)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal Test-I	30	CO1, CO2, CO3
Internal Test-II	30	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks		
Other Components		
Quiz	10	CO1,CO2,CO3
Assignment	10	CO3,CO4,CO5
Semester End Examination (SEE) (Scaled to 50 Marks)	100	CO1, CO2, CO3, CO4, CO5

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