



RAMAIAH
Institute of Technology

CURRICULUM - REVISED

Outcome Based Education

(Effective from the Academic Year 2021 – 2022)

I & II Semester

COMMON TO ALL BRANCHES

RAMAIAH INSTITUTE OF TECHNOLOGY

(Autonomous Institute, Affiliated to VTU)

(Approved by AICTE, New Delhi & Govt. of Karnataka)

Accredited by NBA & NAAC with A⁺ Grade

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 17 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 is a participant to the Technical Education Quality Improvement Program (TEQIP), an initiative of the Government of India. The institute has 380 competent faculty out of which 60% 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. **M S Ramaiah Institute of Technology has obtained "Scimago Institutions Rankings" All India Rank 65 & world ranking 578 for the year 2020.**

The Entrepreneurship Development Cell (EDC) and Section 8 company "Ramaiah Evolute" have been set up on campus to incubate startups. **M S Ramaiah Institute of Technology secured All India Rank 8th for the year 2020 for Atal Ranking of Institutions on Innovation Achievements (ARIIA), by MoE, Govt. of India.** 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. MSRIT is a member of DELNET, CMTI and VTU E-Library Consortium. MSRIT has a modern auditorium 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 65th rank among 1143 top Engineering institutions of India for the year 2021 and is 1st amongst the Engineering colleges affiliated to VTU, Karnataka.

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 a staff strength of 23 members. At present, there are 22 Ph.D. holders. Current expertise of the faculty covers a broad range of areas including Fluid mechanics, Linear Algebra, Numerical Methods, Number Theory, Probability, Statistics and Queuing 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.

DEPARTMENT OF PHYSICS:

The Physics department of RIT has a team of dynamic and well qualified faculty (all with Ph.D.) with a passion for research. Majority of them have more than 15 years of teaching experience and 10 years of research experience. The Department has very good infrastructure, well equipped spacious laboratories, computational and research facilities. Physics department of RIT is recognized as a research center by VTU in 2008 to offer Ph.D. programs. Eight students have been awarded Ph.D. degree from the department till now and presently 10 students are pursuing Ph.D. Six research projects with external funding to the tune of Rs. 60 lakhs from BRNS and VGST have been successfully completed. One International Conference and two Faculty Development Programmes (FDP) have been successfully conducted by the department in last one year. 30 research papers have been published in International peer reviewed journals with high impact factor in last one year. Total research publications in National / International Journals from 2008 to till date is 200.

DEPARTMENT OF CHEMISTRY:

The Chemistry Department is one of the oldest Departments (established in 1962) of Ramaiah Institute of Technology. The Department consists of eleven well qualified and experienced faculty and one visiting professor. 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. Fifteen research scholars have registered for Ph.D. and awarded 13 Ph.D.'s. The faculty members of the Department have published about 50 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.

DEPARTMENT OF HUMANITIES:

The Department of Humanities has seven faculty members, with three doctorates. The department engages in teaching Communicative English, Constitution of India, Kannada, Communication skills for BE/BArch 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, Building Vocabulary, Grammar, Listening, Speaking skills, Power Point presentations and Group activities form integral part of the course.

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

- Imparting quality technical education by nurturing a conducive learning environment through continuous improvement and customization
- Establishing research clusters in emerging areas in collaboration with globally reputed organizations
- 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

VISION & MISSION OF THE DEPARTMENTS:

DEPARTMENT OF MATHEMATICS

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 CHEMISTRY

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 PHYSICS

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 HUMANITIES

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.

PROGRAM OUTCOMES (POs):

- PO1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2: Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3: Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO4: Conduct investigations of complex problems:** Use research - based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- PO6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9: Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO12: Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Faculty List:

- **Department of Mathematics**

Sl. No.	Name	Qualification	Designation
1.	Dr. N L Ramesh	M.Sc., Ph.D.	Professor & Head I Year Coordinator
2.	Dr. S H C V Subbabhata	M.Sc., M.Phil., Ph.D.	Professor
3.	Dr. G Neeraja	M.Sc., Ph.D.	Professor
4.	Dr. Monica Anand	M.Sc., Ph.D.	Associate Professor
5.	Dr. Dinesh P A	M.Sc., M.Sc. (IT), M.Phil., Ph.D.	Associate Professor
6.	Dr. M V Govindaraju	M.Sc., Ph.D.	Assistant Professor
7.	Dr. Vijaya Kumar	M.Sc., Ph.D.	Assistant Professor
8.	Dr. A Sreevallabha Reddy	M.Sc., Ph.D.	Assistant Professor
9.	Dr. R Suresh Babu	M.Sc., Ph.D.	Assistant Professor
10.	Dr. M S Basava Raj	M.Sc., Ph.D.	Assistant Professor
11.	Mr. B Azghar Pasha	M.Sc., (Ph.D.)	Assistant Professor
12.	Dr. Aruna A S	M.Sc., Ph.D.	Assistant Professor
13.	Dr. Girinath Reddy M	M.Sc., Ph.D.	Assistant Professor
14.	Dr. Uma M	M.Sc., Ph.D.	Assistant Professor
15.	Dr. S Ram Prasad	M.Sc., Ph.D.	Assistant Professor
16.	Dr. Kavitha N	M.Sc., Ph.D.	Assistant Professor
17.	Dr. Sushma S	M.Sc., Ph.D.	Assistant Professor
18.	Dr. Kalyan Chakravarthy Y S	M.Sc., Ph.D.	Assistant Professor
19.	Dr. Shashi Prabha Gogate S	M.Sc., Ph.D.	Assistant Professor
20.	Dr. Praveena M M	M.Sc., Ph.D.	Assistant Professor
21.	Dr. Veena B N	M.Sc., Ph.D.	Assistant Professor
22.	Dr. Srikantha N	M.Sc., Ph.D.	Assistant Professor
23.	Dr. Sowmya G	M.Sc., Ph.D.	Assistant Professor

- Department of Physics**

Sl. No.	Name	Qualification	Designation
1.	Dr. A. Jagannatha Reddy	M.Sc., M.Phil, Ph.D.	Professor & Head
2.	Dr. Seema Agarwal	M.Sc., M.Phil, Ph.D.	Associate Professor
3.	Dr. Ravindra M Melavanki	M.Sc., Ph.D.	Assistant Professor
4.	Dr. K. L. Sandhya	M.Sc., Ph.D.	Assistant Professor
5.	Dr. Nagesh B V	M.Sc., Ph.D.	Assistant Professor
6.	Dr. G. N. Anil Kumar	M.Sc., Ph.D.	Assistant Professor
7.	Dr. B.Siddlingeshwar	M.Sc., Ph.D.	Assistant Professor
8.	Dr. S. Vajjayanthimala	M.Sc., Ph.D.	Assistant Professor
9.	Dr. Kalpana Sharma	M.Sc., Ph.D.	Assistant Professor
10.	Dr. Ambika M R	M.Sc., Ph.D.	Assistant Professor
11.	Ms. Gopika C	M.Sc.	Teaching assistant

- Department of Chemistry**

Sl. No.	Name	Qualification	Designation
1.	Dr. B. M. Nagabushana	M.Sc., Ph.D.	Professor & Head
2.	Prof. B.S. Durgakeri	M.Sc.	Visiting Professor
3.	Dr. Nagaraju Kottam	M.Sc., Ph.D.	Associate Professor
4.	Dr. M. N. Manjunatha	M.Sc., Ph.D.	Assistant Professor
5.	Dr. P. Murali Krishna	M.Sc., Ph.D.	Assistant Professor
6.	Dr. Basappa C Yallur	M.Sc., Ph.D.	Assistant Professor
7.	Dr. Malathi Challa	M.Sc., Ph.D.	Assistant Professor
8.	Dr. Sharanabasappa Patil	M.Sc., Ph.D.	Assistant Professor
9.	Dr. R. Hari Krishna	M.Sc., Ph.D.	Assistant Professor
10.	Dr. Gurushantha K	M.Sc., Ph.D.	Assistant Professor
11.	Dr. C. Sampath	M.Sc., Ph.D.	Assistant Professor
12.	Dr. Sharath D	M.Sc., Ph.D.	Research Scientist

- Department of Humanities**

Sl. No.	Name	Qualification	Designation
1	Dr. N L Ramesh	M.Sc., Ph.D.	Professor & I/C HOD
2	Dr. Premila Swamy D	MA, Ph.D.	Assistant Professor
3	Mrs. Kanya Kumari S	MA, M.Phil	Assistant Professor
4	Mr. Uday Kumar H M	MA, MBA, (Ph.D.)	Assistant Professor
5	Mrs. Sukanya N	MA	Part time lecturer
6	Mrs. Nimmy V.S	L.L.M	Part time lecturer
7	Dr. Kiran Amar Magavi	MA, MHRM, Ph.D.	Part time lecturer

Category of Components for UG Program
(Effective from the Academic Year 2021-22)

Sl. No.	Category	Breakup of Credits (Total 160)
1	Humanities and Social Sciences including Management courses (HSMC)	08
2	Basic Science Courses (BSC)	22
3	Engineering Science Courses including Workshop, Drawing, Basics of Electrical/Mechanical/Computer Science, etc (ESC)	20
4	Professional Core Courses (PCC)	54
5	Professional Elective Courses (PEC)	15
6	Open Elective Courses (OEC) & Ability Enhancement Courses (AEC)	11
7	Mini and Major Project work (PW)/Technical Seminar (TS) /Summer Internship and Research/ Industrial Internship (INT)	27
8	Mandatory Non- Credit Courses	03
	Total	160

RAMAIAH INSTITUTE OF TECHNOLOGY, BENGALURU-560054

(Autonomous Institute, Affiliated to VTU)

REVISED SCHEME OF TEACHING FOR THE ACADEMIC YEAR 2021-22

I Semester B.E. (PHYSICS CYCLE)

Branches: CSE, AI & ML, AI & DS, CSE(CS), CSE(AI & ML), ISE, ECE

S.L. No.	Course Code	Course Title	Teaching Department	Category	Credits			Total contact hours / week	
					L	T	P		
1	MA11	Advanced Calculus	Mathematics	BSC	3	1	0	4	5
2	HS12	Communicative English	Humanities	HSMC	1	0	1	2	3
3	EE13	Basic Electrical Engineering	Electrical & Electronics	ESC	2	1	0	3	4
4	CV14	Basics of Civil Engineering & Mechanics	Civil Engineering	ESC	3	0	0	3	3
5	PY15	Engineering Physics	Physics	BSC	2	1	0	3	4
6	AEC16	Design Thinking*	Respective Departments	AEC	1	0	0	1	1
7	MEL17	Computer Aided Engineering Drawing	Mechanical Engineering	ESC	2	0	1	3	4
8	PYL18	Engineering Physics Laboratory	Physics	BSC	0	0	1	1	2
Total					14	3	3	20	26

* Ability Enhancement Course-I

L –Lecture, T – Tutorial, P- Practicals/ Drawing

AICTE Activity Points to be earned by students admitted to BE program:

Every regular student, who is admitted to the 4-year degree program, is required to earn 100 activity points in addition to the total credits earned for the program. Students entering 4 years degree program through lateral entry are required to earn 75 activity points in addition to the total credits earned for the program. The activity points earned by the student shall be reflected on the students 8th semester grade card. The activities to earn the points can be spread over the duration of the course. However, minimum prescribed duration should be fulfilled. Activity points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. In case student fails to earn the prescribed activity points; 8th semester grade card shall be issued only after earning the required activity points. Students shall be eligible for the award of degree only after the release of the 8th semester grade card.

RAMAIAH INSTITUTE OF TECHNOLOGY, BENGALURU-560054

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REVISED SCHEME OF TEACHING FOR THE ACADEMIC YEAR 2021-22

II Semester B.E. (PHYSICS CYCLE)

Branches: CSE, AI & ML, AI & ML, AI & DS, CSE(CS), CSE(AI & ML), ISE, ECE

S.L. No.	Subject Code	Subject	Teaching Department	Category	Credits			Total contact hours / week	
					L	T	P		
1	MA21	Multivariate Calculus & Differential Equations	Mathematics	BSC	3	1	0	4	5
2	ME22	Fundamentals of Mechanical Engineering	Mechanical Engineering	ESC	3	0	0	3	3
3	EC23	Basic Electronics	EC/ET	ESC	2	1	0	3	4
4	CS24	Computing Fundamentals and C Programming	CSE/ISE	ESC	2	1	0	3	4
5	CY25	Engineering Chemistry	Chemistry	BSC	2	1	0	3	4
6	AEC26	A Scientific approach to Health*	Respective Departments	AEC	1	0	0	1	1
7	CYL27	Engineering Chemistry Laboratory	Chemistry	BSC	0	0	1	1	2
8	CSL28	C Programming Laboratory	CSE/ISE	ESC	0	0	1	1	2
9	MEL29	Workshop Practice	Mechanical Engineering	ESC	0	0	1	1	2
				Total	13	4	3	20	27

*Ability Enhancement Course - II

L –Lecture, T – Tutorial, P- Practicals/ Drawing

AICTE Activity Points to be earned by students admitted to BE program:

Every regular student, who is admitted to the 4-year degree program, is required to earn 100 activity points in addition to the total credits earned for the program. Students entering 4 years degree program through lateral entry are required to earn 75 activity points in addition to the total credits earned for the program. The activity points earned by the student shall be reflected on the students 8th semester grade card. The activities to earn the points can be spread over the duration of the course. However, minimum prescribed duration should be fulfilled. Activity points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. In case student fails to earn the prescribed activity points; 8th semester grade card shall be issued only after earning the required activity points. Students shall be eligible for the award of degree only after the release of the 8th semester grade card.

Summer Internship I:

All the students admitted shall have to undergo a mandatory summer internship of 03 weeks during the intervening vacation of II and III semesters. Summer Internship shall include Inter / Intra Institutional activities. A viva-voce examination shall be conducted during III semester and the prescribed credit shall be included in III semester. The internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete during subsequent examination after satisfying the internship requirements.

RAMAIAH INSTITUTE OF TECHNOLOGY, BENGALURU-560054

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REVISED SCHEME OF TEACHING FOR THE ACADEMIC YEAR 2021-22

I Semester B.E. (CHEMISTRY CYCLE)

Branches: EEE, MLE, ETE, EIE, ME, CV, IEM, CH, BT

S.L. No.	Subject Code	Subject	Teaching Department	Category	Credits			Total contact hours / week	
					L	T	P		
1	MA11	Advanced Calculus	Mathematics	BSC	3	1	0	4	5
2	ME12	Fundamentals of Mechanical Engineering	Mechanical Engineering	ESC	3	0	0	3	3
3	EC13	Basic Electronics	EC/ET	ESC	2	1	0	3	4
4	CS14	Computing Fundamentals and C Programming	CSE/ISE	ESC	2	1	0	3	4
5	CY15	Engineering Chemistry	Chemistry	BSC	2	1	0	3	4
6	AEC16	Design Thinking*	Respective Departments	AEC	1	0	0	1	1
7	CYL17	Engineering Chemistry Laboratory	Chemistry	BSC	0	0	1	1	2
8	CSL18	C Programming Laboratory	CSE/ISE	ESC	0	0	1	1	2
9	MEL19	Workshop Practice	Mechanical Engineering	ESC	0	0	1	1	2
Total					13	4	3	20	27

*Ability Enhancement Course - I

L –Lecture, T – Tutorial, P- Practicals/ Drawing

AICTE Activity Points to be earned by students admitted to BE program:

Every regular student, who is admitted to the 4-year degree program, is required to earn 100 activity points in addition to the total credits earned for the program. Students entering 4 years degree program through lateral entry are required to earn 75 activity points in addition to the total credits earned for the program. The activity points earned by the student shall be reflected on the students 8th semester grade card. The activities to earn the points can be spread over the duration of the course. However, minimum prescribed duration should be fulfilled. Activity points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. In case student fails to earn the prescribed activity points; 8th semester grade card shall be issued only after earning the required activity points. Students shall be eligible for the award of degree only after the release of the 8th semester grade card.

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REVISED SCHEME OF TEACHING FOR THE ACADEMIC YEAR 2021-22

II Semester B.E. (CHEMISTRY CYCLE)

Branches: EEE, MLE, ETE, EIE, ME, CV, IEM, CH, BT

S.L. No.	Subject Code	Subject	Teaching Department	Category	Credits			Total contact hours / week	
					L	T	P		
1	MA21	Multivariate Calculus & Differential Equations	Mathematics	BSC	3	1	0	4	5
2	HS22	Communicative English	Humanities	HSMC	1	0	1	2	3
3	EE23	Basic Electrical Engineering	Electrical & Electronics	ESC	2	1	0	3	4
4	CV24	Basics of Civil Engineering & Mechanics	Civil Engineering	ESC	3	0	0	3	3
5	PY25	Engineering Physics	Physics	BSC	2	1	0	3	4
6	AEC26	A Scientific Approach to Health*	Respective Departments	AEC	1	0	0	1	1
7	MEL27	Computer Aided Engineering Drawing	Mechanical Engineering	ESC	2	0	1	3	4
8	PYL28	Engineering Physics Laboratory	Physics	BSC	0	0	1	1	2
Total					14	3	3	20	26

* Ability Enhancement Course - II

L –Lecture, T – Tutorial, P- Particles/ Drawing, S – Self Study Component

AICTE Activity Points to be earned by students admitted to BE program (For more details refer to Chapter 6, AICTE, Activity Point Program, Model Internship Guidelines):

Every regular student, who is admitted to the 4-year degree program, is required to earn 100 activity points in addition to the total credits earned for the program. Students entering 4 years degree program through lateral entry are required to earn 75 activity points in addition to the total credits earned for the program. The activity points earned by the student shall be reflected on the students 8th semester grade card. The activities to earn the points can be spread over the duration of the course. However, minimum prescribed duration should be fulfilled. Activity points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. In case student fails to earn the prescribed activity points; 8th semester grade card shall be issued only after earning the required activity points. Students shall be eligible for the award of degree only after the release of the 8th semester grade card.

Summer Internship I:

All the students admitted shall have to undergo a mandatory summer internship of 03 weeks during the intervening vacation of II and III semesters. Summer Internship shall include Inter / Intra Institutional activities. A viva-voce examination shall be conducted during III semester and the prescribed credit shall be included in III semester. The internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete during subsequent examination after satisfying the internship requirements.

I SEMESTER

ADVANCED CALCULUS

Course Code: MA11

Credits: 3:1:0

Pre-requisites: -

Contact Hours: 42L + 14T

Course Coordinators: Dr. S.H.C.V. Subba Bhatta & Mr. B. Azghar Pasha

Unit-I

Differential Calculus-I: Polar curves, Angle between the radius vector and the tangent, Angle between the curves, Length of perpendicular from pole to the tangent, Pedal equations.

Derivative of arc length & Radius of Curvature in Cartesian, polar & parametric forms (All without proof)

Partial Differentiation: Partial derivatives, Total differential coefficient, Differentiation of composite and implicit functions, Euler's theorem. Jacobians and properties.

- Pedagogy/Course delivery tools: ➤ Chalk and talk
- Links: ➤ <https://nptel.ac.in/courses/111/105/111105121/>
- Impartus recording: ➤ <https://a.impartus.com/ilc/#/course/107625/1030>

Unit-II

Integral Calculus - I: Reduction formulae for $\sin^n x$, $\cos^n x$, $\sin^m x \cos^n x$, Evaluation of these integrals with standard limits, Tracing of curves (both Cartesian and polar)- Illustration of the same using online tools or open source software. Beta and Gamma functions-Introduction, properties (without proof).

Application of integration – length of arc of a curve, plane areas, volumes and surface area of revolution

- Pedagogy/Course delivery tools: ➤ Chalk and talk, PowerPoint Presentation, Videos
- Online tool & Open source software: ➤ Use of Online tools such as **DESMOS** or open-source software such as **Scilab** to demonstrate the characteristics of graphs
- Links: ➤ <https://nptel.ac.in/courses/111/104/111104144/>
- Impartus recording: ➤ <https://a.impartus.com/ilc/#/course/107625/1030>

Unit-III

Vector differentiation: Vector functions of a single variable, Derivative of a vector function, Geometrical interpretation, Velocity and acceleration.

Scalar and vector fields, Gradient of a scalar field, Directional derivative, Divergence of a vector field, Solenoidal vector, Curl of a vector field, Irrotational vector, Laplacian operator, Vector identities.

- Pedagogy/Course delivery tools: ➤ Chalk and talk
- Links: ➤ <https://nptel.ac.in/courses/111/105/111105134/>
- Impartus recording: ➤ <https://a.impartus.com/ilc/#/course/107625/1030>

Unit-IV

Integral Calculus - II: Multiple integrals- evaluation of double and triple integrals, Change of order of integration, Change of variables. Applications of double and triple integrals to find areas and volumes. Evaluation of multiple integrals using online tools or open source software.

- Pedagogy/Course delivery tools: ➤ Chalk and talk, PowerPoint Presentation, Videos
- Online tool & Open source software: ➤ Demonstration of evaluation of multiple integrals using open source software
- Links: ➤ <https://nptel.ac.in/courses/111/105/111105121/>
- Impartus recording: ➤ <https://a.impartus.com/ilc/#/course/107625/1030>

Unit-V

Vector integration: Line integrals, surface integrals and volume integrals. Green's theorem (with proof) and its applications, Stokes' theorem and Gauss divergence theorem (without proofs) and its applications.

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Videos
- Links: ➤ <https://nptel.ac.in/courses/111/105/111105134/>
- Impartus recording: ➤ <https://a.impartus.com/ilc/#/course/107625/1030>

Text Books:

1. **George B. Thomas, Maurice D. Weir, Joel R. Hass** - Thomas' Calculus, Pearson, 13th edition, 2014.
2. **B.S. Grewal** – Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2017.

Reference Books:

1. **Erwin Kreyszig** – Advanced Engineering Mathematics, Wiley publication, 10th edition, 2015.

2. **Srimanta Pal & Subodh C Bhunia** - Engineering Mathematics, Oxford University Press, 3rd Reprint, 2016.
3. **B. V. Ramana** - Higher Engineering Mathematics, Tata McGraw-Hill, 11th edition, 2010.

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 and Jacobians. (PO-1, 2)
2. Trace a curve using its guiding properties and use integration to find its perimeter, surface area and volume. (PO-1, 2)
3. Apply vector differentiation to identify solenoidal and irrotational vectors. (PO-1, 2)
4. Evaluate multiple integrals and use them to find areas and volumes. (PO-1, 2)
5. Exhibit the interdependence of line, surface and volume integrals using integral theorems. (PO-1, 2)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 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 30marks.		
Other components	Marks	Course outcomes addressed
Quiz	10	CO1,CO2,CO3
Assignment	10	CO3,CO4,CO5
Semester End Examination:	100	CO1,CO2,CO3,CO4,CO5

COMMUNICATIVE ENGLISH

Course Code: HS12/22

Credits: 1:0:1

Pre-requisites: -

Contact Hours: 14L+14P

Course Coordinators: Dr. Premila Swamy D & Mr. Udayakumar H M

Unit-I

Fundamentals of Communication

Introduction to Communication & process, Language as a tool of Communication, 7Cs of effective communication, Barriers to Communication, Forms of Communication, Nonverbal Communication, Body Language and its significance, Interpersonal Communication Skills, Distinction between General and Technical Communication.

- Pedagogy / Course delivery tools: ➤ Chalk and talk, Power point presentation, Videos.
- Lab component / Practical Topics: ➤ English Language Lab – GLOBERENA English Language Body Language Software – Body Language, Nonverbal Communication.
- Links: Communication skills ➤ <https://nptel.ac.in/courses/109/104/109104031>

Unit-II

Listening and Speaking Skills

Introduction to Listening Skills- significance, barriers, Listening for comprehensibility. Listening for word stress, shift, question tags, syllables, vowel sounds, consonant sounds, accent and Intonation.

Spoken Communication for different contexts, Art of effective speaking, Effective Presentation & Group Discussion techniques.

- Pedagogy / Course delivery tools: ➤ Chalk and talk, Power point presentation, Videos.
- Lab component / Practical Topics: ➤ English Language Lab – GLOBERENA English Language Software – Listening & Speaking activities.
- Links: Listening & Speaking Skills: ➤ https://www.youtube.com/watch?v=JIKU_WT0Bl
➤ <https://nptel.ac.in/content/storage2/courses/109104030/Module4/Lecture10.pdf>

Unit-III

English Grammar and Vocabulary

Subject-Verb agreement, Usage of appropriate Prepositions and Connectives, Word Formation-Prefix, Suffix, Compound words, Error Analysis. Idioms and Phrases,

Commonly Confused Words. Developing Vocabulary-Synonyms, Antonyms, Homonyms, Homophones, and Homographs

- Pedagogy / Course delivery tools: ➤ Chalk and talk, Power point presentation, Videos.
- Lab component / Practical Topics: ➤ English Language Lab – GLOBERENA English Language Software – Grammar Exercises
- Links: Grammar ➤ <https://academicguides.waldenu.edu/writingcenter/grammar/subjectverbagreement>
➤ <https://nptel.ac.in/courses/109/106/109106094/>

Unit-IV

Reading and Writing Skills

Reading skills- Reading Techniques-Skimming, Scanning, Intensive and Extensive reading, Text reading – interpretation of general and technical texts, annotations, drawing inferences, Reading Comprehension exercises

Techniques for effective Writing Skills- Paragraph and Précis’ writing.

- Pedagogy / Course delivery tools: ➤ Chalk and talk, Power point presentation, Videos.
- Lab component / Practical Topics: ➤ English Language Lab – GLOBERENA English Language Software – Reading & Writing Exercise
- Links: Reading & Writing skills ➤ <https://nptel.ac.in/courses/109/106/109106129>
➤ <https://nptel.ac.in/courses/109/107/109107172/>

Unit-V

Professional & Technical Writing Skills

Basics of Letter writing: Formal and Informal, e-mail etiquette and netiquette. Difference between Bio-data, CV and Resume, Drafting of CV and Job Application Letter (Cover letter).

Report Writing: Types of Report, Rules of Report Writing; Structure of a Report, Drafting Project Reports.

- Pedagogy / Course delivery tools: ➤ Chalk and talk, Power point presentation, Videos.
- Lab component / Practical Topics: ➤ English Language Lab – GLOBERENA English Technical Writing Language Software – Resume & Letter writing Exercises.
- Links: Resume ➤ <https://nptel.ac.in/content/storage2/courses/109104030/Module5/Lecture13.pdf>
➤ <https://www.youtube.com/watch?v=VSWWjL0a0x0>

Text Books:

1. **Meenakshi Raman & Sangeetha Sharma** - Technical communication – Principles and Practice Oxford University Press – 2007.
2. **A. J. Thomson & A. V. Martinet**, A Practical English Grammar, Oxford University Press –1987.

Reference Books:

1. **M Ashraf Rizvi**, Effective Technical Communication, McGraw Hill Education (India) Private Limited-2005.
2. **Sanjaya kumar**, Communication Skills, PushpaLata, Oxford Press, 2016.
3. **Dr. Premila D Swamy & Udayakumar. H M**, Communication skills for Engineers, Archers and Elevators Publishing House Bangalore, India, 2021.
4. **S K. Khandelwal & R K Gupta**, Functional Grammar & Composition, Laxmi Publication (P) Ltd.
5. **N. Krishna Murthy**, Modern English Grammar, Trinity press, 2016.
6. **John Seely** - The Oxford Guide to Effective Writing and Speaking. OUP, 2005.
7. Oxford Advanced Learners's Dictionary, 8th edition, 2013.
8. **Martin Hewings** - Advanced Grammar in Use, Cambridge University Press, 2013.

Course Outcomes (COs):

On successful completion of the course students will be able to

1. Understand the objectives of General and Technical Communication along with nuances of language etiquette. (PO-9, 10, 12)
2. Internalize active listening and spoken skills and apply related strategies. (PO-10, 12)
3. Utilize correct grammar and effective vocabulary in General and Technical Communication. (PO-10, 12)
4. Apply Reading & Writing Strategies for Career growth. (PO-9, 10, 12)
5. Apply Professional Writing skills for Professional development. (PO-9, 10, 12)

Course Assessment and Evaluation:

Continuous Internal Evaluation : 50 Marks		
Assessment tool	Marks	Course outcomes attained
Internal Test-I	30	CO1, CO2, CO3
Internal Test-II	30	CO3, CO4, CO5
Average of the two internal test shall be taken for 30 marks		
Other components	Marks	Course outcomes addressed
Assignment-I	10	CO1, CO2, CO3
Assignment-II	10	CO3, CO4, CO5
Semester End Examination:	100	CO1,CO2,CO3,CO4,CO5

BASIC ELECTRICAL ENGINEERING

Course Code: EE13/23

Credits: 2:1:0

Pre – requisites: -

Contact Hours: 28L + 14T

Course Coordinators: Mr. Vinayaka V Rao & Dr. Nagaraj C

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: ➤ Chalk and Talk, Power Point Presentation
- Link for power generation, transmission distribution and Tariff: ➤ <http://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 Ohm's 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: ➤ Chalk and Talk
- Link for AC and DC waveform: ➤ <https://www.youtube.com/watch?v=vN9aR2wKv0U>
- Link for Generation of sine wave: ➤ <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: ➤ Chalk and Talk, Power Point Presentation
- Link for DC Generator: ➤ https://www.youtube.com/watch?v=d_LOXUEFA-o
- Link for Transformer: ➤ 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, 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=Mlc-ZvYi8HA>

Unit-V

Introduction to Special 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=eyqwLiowZiU>

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. Kothari and I. J. Nagrath** - Basic Electrical Engineering, Tata McGraw Hill, 2010.
2. **V K Mehta**, Principles 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 (COs):

At the end of the course, students 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 lighting systems (PO-1)
5. Identify types of protective systems and safety precautions (PO-1,6)

Course Assessment and Evaluation:

Continuous Internal Evaluation : 50 Marks		
Assessment tool	Marks	Course outcomes attained
Internal Test-I	30	CO1, CO2
Internal Test-II	30	CO3
Average of the two internal test shall be taken for 30 marks		
Other components	Marks	Course outcomes addressed
Assignment	10	CO4, CO5
Quiz	10	CO2, CO3
Semester End Examination:	100	CO1, CO2, CO3, CO4, CO5

BASICS OF CIVIL ENGINEERING AND MECHANICS

Course Code: CV14/24

Credits: 3:0:0

Pre-requisites: -

Contact Hours: 42L

Course Coordinators: Mrs. B. Suguna Rao & Mr. G. M. Basavanagowda

Unit-I

Introduction to Civil Engineering and Construction Materials

Basics of Civil Engineering & Broad disciplines of Civil Engineering – Structural Engineering, Geotechnical Engineering, Hydraulics & Water Resources, Transportation Engineering, Environmental Engineering, Construction planning & management.

Basic Materials of Construction- Bricks, Cement & mortars, Plain, Reinforced & Prestressed Concrete, Structural steel, Water, Construction Chemicals, Carbon Composites; Plastics in Construction.

New, Marginal & smart materials: Flyash, new-age concrete, recycling of materials, Application of smart and sustainable materials in civil engineering constructions.

Computational Methods in Civil Engineering: Typical software's used in Civil Engineering.

- Pedagogy/Course delivery tools: ➤ Chalk and Talk, Power point presentations, Videos
- Link: Introduction ➤ <https://a.impartus.com/ilc/#/video/id/534326>
- Link: Scopes of Various fields ➤ <https://a.impartus.com/ilc/#/video/id/536441>

Unit-II

Civil Engineering – Societal and Global Impact

Infrastructure - Habitats, Megacities, Smart Cities, futuristic visions; Current and Futuristic transportation systems. Energy generation and Transmission, Water provisioning; Telecommunication needs.

Environment-Traditional & futuristic systems; Water Supply and Sanitation Engineering, Hazardous waste treatment.

Water Management- Traditional & futuristic systems; Flood control, multi-purpose water projects, water sharing techniques.

Built environment–Facilities management, Climate control; Energy efficient built environments and LEED ratings, Recycling, Temperature/ Sound control in built environment, Barrier free built environment, Security systems; Intelligent/ Smart Buildings.

Civil Engineering Projects & Socio-economic developments. Contributions of Civil Engineering projects to GDP, 3D printing.

- Pedagogy/Course delivery tools: ➤ Chalk and Talk, Power point presentations, Videos
- Link: Infrastructure ➤ <https://www.youtube.com/watch?v=wpvbVyUCi78>
- Link: Habitats ➤ <https://www.youtube.com/watch?v=Irq4BigInDU>

Unit-III

Introduction to Engineering Mechanics and Force System

Basic idealizations - Particle, Continuum and Rigid body. Introduction to SI units. Force - Definition, classification of force systems, composition and resolution of forces. Numerical Problems on composition and resolution of forces. Principle of Transmissibility of forces. Resultant of coplanar concurrent force system. Problems on coplanar concurrent force systems.

Couple, Moment of a couple, Characteristics of couple, Moment of a force, Equivalent force - Couple system; Numericals on moment of forces, couples and equivalent force - Couple system. Varignon's theorem, Resultant of non-concurrent force systems. Numericals on Resultant of non-concurrent force systems.

- Pedagogy/Course delivery tools: ➤ Chalk and Talk, Power point presentations, Videos
- Link: Introduction to Engineering ➤ <https://a.impartus.com/ilc/#/video/id/532408>
Mechanic
- Link: Resultants ➤ <https://a.impartus.com/ilc/#/video/id/537603>

Unit-IV

Equilibrium of Force System

Equilibrium of coplanar concurrent system of forces, Free body diagram, Conditions of equilibrium. Definition of Equilibrant, Numericals on equilibrium of coplanar concurrent force systems.

Equilibrium of non-concurrent system of forces, Types of loads, supports for beam, statically determinate and indeterminate beams, Numericals on statically determinate beams subjected to concentrated load, uniformly distributed load, Uniformly Varying Load and their combinations.

Definition of Friction and its applications, angle of friction, angle of repose, coefficient of friction. Types of Friction, laws of static friction, Description and application of friction on blocks on horizontal and inclined planes.

- Pedagogy/Course delivery tools: ➤ Chalk and Talk, Power point presentations, Videos
- Link: Friction concepts ➤ <https://www.youtube.com/watch?v=AlenFWwK3Ek>
- Link: Equilibrium Concepts ➤ <https://a.impartus.com/ilc/#/video/id/550330>

Unit-V

Centroid and Moment of Inertia

Definition of Centroid & Centre of Gravity, Axes of Symmetry, Location of Centroid of Rectangle, Triangle, Semicircle, Quadrant and sector of a circle by method of integration. Numerical problems on Centroid of Composite sections.

Concept of Moment of inertia, Perpendicular axis theorem, Parallel axis theorem, and Moment of inertia of Rectangular, Circular, Semicircular, Quadrant of a circle, Triangular sections by method of integration. Numericals on moment of inertia of composite section.

- Pedagogy/Course delivery tools: ➤ Chalk and Talk, Power point presentations
- Link: Centroid ➤ https://www.youtube.com/watch?v=QK_TuE2lfSc
- Link: Moment of Inertia ➤ <https://www.youtube.com/watch?v=BlS5KnQOWkY>

Text Books:

1. **H. J. Sawant and S. P. Nitsure**-Elements of Civil Engineering & Mechanics, Technical Publications, Pune, 2nd edition 2016.
2. **S. S. Bhavikatti**- Engineering Mechanics, 2nd edition, New Age International Publishers, January 2019.

Reference Books:

1. **N. Subramanian** - Building Materials, Testing and Sustainability, Oxford University Press, 1st edition, 2019. <https://india.oup.com/orcs/9780199497218>.
2. **B. K. Kolhapure** - Elements of Civil Engineering and Engineering Mechanics, Eastern book promoters, Belgaum, 2015.
3. **F. P. Beer and E. R. Johnson**-Vector Mechanics for Engineers-Statics and Dynamics, Tata Mc Graw Hill. 12th edition, 2019.
4. **Stephen Timoshenko and D. H. Young** - Engineering Mechanics, McGraw Hill Education, 5th edition, 2017
5. **M. N. Shesha Prakash and Ganesh B. Mogaveer** - Elements of Civil Engineering and Engg. Mechanics, PHI Learning Private Ltd, New Delhi, 3rd edition, 2014.

Web links and Video Lectures (e-Resources):

1. <https://a.impartus.com/ilc/#/video/id/590602>
2. <https://a.impartus.com/ilc/#/video/id/2027011>
3. <https://a.impartus.com/ilc/#/video/id/2066396>

4. <https://binged.it/30jO8II>
5. <https://binged.it/3D5PiiJ>

Course Outcomes (COs):

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

1. Understand the importance and practical relevance of civil engineering fields for infrastructure and societal applications. (PO-1, 2)
2. Recognize the societal and global impact towards employment creation and its contribution to the GDP. (PO-1)
3. Analyze the Coplanar concurrent and non concurrent force system. (PO-1, 2, 3)
4. Determine the equilibrium of force systems and frictional forces and to interpret the results. (PO-1, 2, 3)
5. Solve the problems on the location/identification of the centroid and to compute the moment of inertia of plane areas. (PO-1, 2, 3)

Course Assessment and Evaluation:

Continuous Internal Evaluation : 50 Marks		
Assessment tool	Marks	Course outcomes attained
Internal Test-I	30	CO2 & CO3
Internal Test-II	30	CO4 & CO5
Average of the two internal test shall be taken for 30 marks		
Other components		
Assignment	10	CO1 & CO2
Quiz	10	CO3 & CO4
Semester End Examination:	100	CO1, CO2, CO3, CO4, CO5

ENGINEERING PHYSICS

Course Code: PY15/25

Credits: 2:1:0

Pre-requisites: -

Contact Hours: 28L+14T

Course Coordinator: Dr. Seema Agarwal

Unit-I Lasers and Optical fibers

Lasers: Interaction of radiation with matter—Induced Absorption—spontaneous emission and stimulated emission—Expression for energy density of radiation in terms of Einstein coefficients at thermal equilibrium—Requisites of a laser system-- Three and four level lasers--Principle and operation of He-Ne and semiconductor Lasers, Applications of Lasers in defence and medical fields.

Optical Fibers: Propagation mechanisms in optical fibers, Angle of acceptance and Numerical aperture –Types of optical fibers—Step index and graded index fibers-- Intermodal dispersion—Attenuation in optical fibers, Applications of Optical fibers in communication and sensors

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Power point presentation, Videos
- Lab component/ Practical Topics: ➤ Laser diffraction, Numerical aperture of optical fibre, Attenuation in optical fibers.
- Links: Stimulated Emission: ➤ <https://www.youtube.com/watch?v=YHmGNDMV1cY>

Unit-II Elasticity and Vibrations

Elasticity: Basics of elasticity—Types of Elastic Moduli — Poisson's ratio— Torsion of a cylinder and determination of couple per unit twist—Torsion pendulum— Determination of rigidity modulus using torsion pendulum --Bending moment of a beam (qualitative) – Cantilever loaded at free end.

Vibrations: Introduction — Analysis of under damped vibrations, over and critical damping (qualitative) —logarithmic decrement and quality factor—Forced vibrations and Resonance —LCR circuits and electrical resonance (only qualitative)

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Power point presentation, Videos
- Lab component/Practical Topics: ➤ Torsional pendulum, Single cantilever, LCR resonance.

Unit-III

Concepts of Modern Physics and Quantum Mechanics

Wave nature of particles: Matter waves - de-Broglie wavelength — Heisenberg's uncertainty principle; relationships, Applications (Non confinement of electrons in atomic nucleus) - Characteristics of a well behaved wave function—Born approximation and normalization of the wave function—Setting up of one dimensional time independent Schrodinger's wave equation from classical wave equation—Eigen values and energy of a particle in an infinite one dimensional potential well, Step potential—Expression for reflection and transmission coefficients for the cases of (i) $E < V$ and (ii) $E > V$, Qualitative discussion of tunnel effect

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Power point presentation, Videos
- Lab component/Practical Topics: ➤ Stefan's law, Interference at airwedge, Planck's constant.
- Links: Dual nature of radiation: ➤ <https://www.youtube.com/watch?v=h1tffE-L2Dc&list=RDCMUCEik-U3T6u6JA0XiHLbNbOw&index=10>

Unit-IV

Electrical conduction in solids

Metals: Classical free electron theory of metals—Drawbacks—Assumptions of Quantum free electron theory— Density of energy states in a metal --- Fermi energy at 0K—Effect of temperature on Fermi-Dirac Distribution function - Merits of quantum free electron theory.

Semiconductors: Formation of energy bands in solids (qualitative)—Density of energy states in conduction and valence bands of a semiconductor—Concentration of electrons in conduction band at thermal equilibrium — Law of mass action in semiconductors - Intrinsic carrier concentration—Hall effect – Expression for Hall coefficient

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Power point presentation, Videos.
- Lab component/Practical Topics: ➤ Fermi Energy, Energy gap of semiconductors, Hall coefficient.
- Links: Particle in a box: ➤ <https://youtu.be/VWk-GU0BSfw>

Unit-V

Materials Science

Crystal structure: Crystal planes, Determination of Miller indices of crystal planes, Interplanar spacing in terms of Miller indices, Bragg's law, X-ray diffractometer.

Nanomaterials: Introduction, Size effects: Quantum confinement, Density of states, High surface area to volume ratio. Scaling laws in miniaturization.

Characterization of nanomaterials: Phase identification of the materials by PXRD pattern, Scanning Tunneling Microscope (STM) and Atomic Force Microscope (AFM) techniques

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Power point presentation, Videos.
- Lab component/Practical Topics: ➤ Diffraction, Phase identification of the materials by PXRD pattern
- Links: Bragg's law: ➤ <https://www.youtube.com/watch?v=QHMzFUo0NL8>

Text Books:

1. **Gaur and Gupta:** Engineering Physics, Dhanpat Rai Publishers, New Delhi, 8th revised edition 2017.
2. **M. N. Avadhanulu and P. G. Kshirsagar:** A Textbook of Engineering Physics, 10th revised edition, S. Chand & Company Ltd, NewDelhi

Reference Books:

1. **Resnick, Halliday and Jearl Walker** - Fundamentals of Physics, John Wiley & Sons, Inc., 11th edition, 2018.
2. **D.S. Mathur** – Elements of properties of matter, S.Chand and company, 11th edition, 2013.
3. **Kenneth S. Krane**- Modern Physics, Wiley-India- 3rd edition, 2019

Web links and Video Lectures (e-Resources):

1. <http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html>
2. https://onlinecourses.nptel.ac.in/noc20_mm14/preview
3. <https://phet.colorado.edu/>
4. <http://a.impartus.com/ilc/#!/course/59743/295>
5. <https://a.impartus.com/ilc/#!/course/132316/636>

Course Outcomes (COs):

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

1. Enumerate the construction and working of simple laser systems, understand the propagation mechanism of EM waves in optical fibers. (PO-1,2)
2. Analyze elastic modulii in different cases and enumerate free, damped and forced vibrations. (PO-1,2)
3. Distinguish between phase and group velocities; solve Schrödinger's time independent wave equation for the case of infinite potential well. (PO-1,2)

4. Apply the quantum theory to understand the electrical conductivity of metals and calculate carrier concentration in metals and semiconductors. (PO-1,2)
5. Apply the concepts of X-ray diffraction to identify the phase and characterization of nanomaterials.(PO-1,2)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50 Marks		
Assessment tool	Marks	Course outcomes attained
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		
Assignment	10	CO1, CO2, CO3
Quiz	10	CO3, CO4, CO5
Semester End Examination:	100	CO1, CO2, CO3, CO4, CO5

DESIGN THINKING

Course Code: AEC16

Credits: 1:0:0

Pre-requisites: -

Contact Hours: 14L

Course Coordinator: Dr. Pradipkumar Dixit

Unit-I

Introduction

Introduction to Design Thinking, Design and Business, Design Thinking for Education, Design Thinking Mindsets: Six Key Mindsets, Other Mindsets for Success

- Pedagogy/Course delivery tools: ➤ Chalk and Talk, Power point presentation
- Link: ➤ <https://www.youtube.com/watch?v=dAWwFG3X6u0>
➤ <https://www.youtube.com/watch?v=jPvNkR9d6-c>

Unit-II

The Design Thinking Process

The Design Thinking Process, The Five Phases of Design Thinking: Empathize Phase, Self-Awareness and Partnerships, Interviews, Observations, Immersion, Research, Empathy Map, Projects, Define Phase, Synthesis: Finding Needs and Insights, Problem Statement, “How Might We” Question.

- Pedagogy/Course delivery tools: ➤ Chalk and Talk, Power point presentation
- Link: ➤ <https://www.youtube.com/watch?v=5CUt2QQsJfc>

Unit-III

Ideate Phase and Prototyping

Ideate Phase, Demystifying Creativity, Innovation, and Originality, Ideate Principles, Pre-Brainstorming: Mindset, Warm-Ups, and Practice, Prototype Phase, Rapid Prototyping, Prototyping in Action, Facilitation and Mentorship, Makerspace, Tools, and Materials.

- Pedagogy/Course delivery tools: ➤ Chalk and Talk, Power point presentation, Videos

Unit-IV

Testing Phase

Test Phase, Embracing Failure, Testing with End Users, Testing without End Users, Iteration

- Pedagogy/Course delivery tools: ➤ Chalk and Talk, Power point presentation, Videos

Unit-V

Design Thinking Workshop

Design thinking workshop on Empathize, Design, Ideate, Prototype and Test

- Pedagogy/Course delivery tools: ➤ Chalk and Talk, Power point presentation
- Link: ➤ https://www.youtube.com/channel/UCOjS4V_nBkylZpnlJFMJnTw
- <https://www.youtube.com/watch?v=-FzFk3E5nxM>

Text Books:

1. **David Lee**, Design Thinking in the Classroom, Ulysses Press, Korea, 2018
2. **Hasso Plattner, Christoph Meinel and Larry Leifer (eds)**, “Design Thinking: Understand – Improve – Apply”, Springer, 2011

Reference Books:

1. **John. R. Karsnitz, Stephen O’Brien and John P. Hutchinson** - Engineering Design, Cengage learning (International edition) 2nd edition, 2013.
2. **Roger Martin** - The Design of Business: Why Design Thinking is the Next Competitive Advantage, Harvard Business Press, 2009.
3. **Idris Mootee** - Design Thinking for Strategic Innovation: What They Can’t Teach You at Business or Design School, John Wiley & Sons 2013.
4. **Jeanne Liedtka, Andrew King, Kevin Bennett** - Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover –2013.

Web links and Video Lectures (e-Resources):

1. Design Thinking Tools & Methods: <https://youtu.be/VTEExElJHalk>
2. Stanford: Design Thinking Course
<https://www.youtube.com/watch?v=-FzFk3E5nxM>
3. What is Design Thinking?
<https://www.youtube.com/watch?v=0V5BwTrQOCs>

4. Design Thinking HBR
<https://www.youtube.com/watch?v=z3IbHLfcyWo>
5. How it Works?: Design Thinking
<https://www.youtube.com/watch?v=pXtN4y3O35M>
6. Design Thinking: Solving Life's Problems
<https://www.youtube.com/watch?v=UQYoWwHg3qA>

Course Outcomes (COs):

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

1. Understand design thinking (PO-5, 6)
2. Understand and initiate design thinking process (PO-5, 6)
3. Generate and develop design ideas and prototype (PO-5, 6)
4. Test and analyse failures. (PO-5, 6)
5. LEARN how Design Thinking can be applied to simple processes too. (PO-5, 6, 10)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50 Marks		
Assessment tool	Marks	Course outcomes attained
Internal Test-I	30	CO1, CO2
Internal Test-II	30	CO3
Average of the two internal test shall be taken for 30 marks		
Other components	20	
Semester End Examination: (90 minutes duration)	50	CO1, CO2, CO3, CO4, CO5

COMPUTER AIDED ENGINEERING DRAWING

Course Code: MEL17/27

Credits: 2:0:1

Pre-requisites: -

Contact Hours: 28L+14P

Course Coordinator: Dr. Sridhar B S

Unit-I Introduction

Standard tool bar / menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, lineconventions, material conventions and lettering.

Orthographic projections: Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four 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).

Projection of Planes: Projection of Planes such as triangle, square, rectangle, pentagon, hexagon and circle.

Development of Surfaces: Development of Lateral Surfaces of Solids- All Prisms and Pyramids including Cylinder and Cone.

- Pedagogy/Course delivery tools: ➤ Chalk and Talk, Power point presentation, animated videos
- Link: Projection of points ➤ <https://www.youtube.com/watch?v=fK4h5gM73w8>
- Link: Projection of lines ➤ <https://www.youtube.com/watch?v=0ivmbp2HSuE>
- Link: Orthographic projections ➤ <https://www.youtube.com/watch?v=j5nwO-JwVv4>
- Link: Development of Surfaces ➤ <https://www.youtube.com/watch?v=4xNJVbBojz0>
- Link: Projection of plane surfaces ➤ <https://www.youtube.com/watch?v=7-zq81tDwmM>

Unit-II

Projection of Solids

Projection of Solids such as cube, prism, pyramid, cylinder, Cone and tetrahedron (No problems on freely suspended from corner and drawing profile view when three positions involved).

- Pedagogy/Course delivery tools: ➤ Chalk and Talk, Power point presentation, animated videos
- Link: Projection of Solids ➤ <https://www.youtube.com/watch?v=b-hNKFoUFNE>

Unit-III

Isometric Projection

Isometric scale, isometric projection of simple solids & their frustums, combination of two solids (Co-axial).

- Pedagogy/Course delivery tools: ➤ Chalk and Talk, Power point presentation, animated videos
- Link: Projection of Solids ➤ <https://www.youtube.com/watch?v=viNCXvO9bzY>

Text Books:

1. **K R Gopalakrishna** - Engineering Drawing, Subhas publishers, Bangalore, 32nd edition 2012.
2. **N D Bhat & V M Panchal** - Engineering Drawing, Charota Publishing house, Gujarat, 42nd edition 2010.

Reference Books:

1. **N.S. Parthasarathy & Vela Murali** - Engineering Drawing, Oxford University Press.
2. **Luzadder Warren J. Duff John M** - Fundamentals of Engineering Drawing with an introduction to interactive Computer Graphics for Design and Production, Eastern – Prentice Hall of India Pvt Ltd, New Delhi
3. 'A Primer on computer aided Engineering Drawing', Published by VTU, Belgaum, 8th edition, 2011.

Course Outcomes (COs):

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

1. Demonstrate the usage of a CAD software for creating engineering drawings: commands such as draw, copy, move, mirror, rotate, dimensioning. (PO-1, 5, 9, 10, 12)

2. Sketch and draw using the CAD software, the orthographic projections of the following with various conditions of position and orientation: points, lines, Planes and Solids.(PO-1, 5, 9, 10)
3. Sketch and draw using the CAD software Isometric projection of a combination of two coaxial solids. (PO-1, 5, 9, 10).

Web links and video lectures (e-Resources)

1. https://www.youtube.com/watch?v=q65_tM02_pl
2. <https://www.youtube.com/watch?v=GWMWLccZOB4>
3. <https://www.youtube.com/watch?v=AoNIOxnxDO0&list=PLIhUrsYr8yHx7TVB51jN3HZVyW3R6RiBg>
4. <https://www.youtube.com/watch?v=1vgnXWqiKUY>
5. <https://www.youtube.com/watch?v=PnvtivWNkEY>
6. <https://www.youtube.com/watch?v=F8Ptn1H8tdA>

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50 Marks		
Assessment tool	Marks	Course outcomes attained
Internal Test	10	CO-1,CO-2 & CO-3
Other components <ul style="list-style-type: none"> • Manual Drawing [Sketch Book] • Computer Solutions [Print out] • Assignments 	40 (15+15+10) 15 Marks 15 Marks 10 Marks	CO-1,CO-2 & CO-3
Semester End Examination:		
	50	CO-1,CO-2 & CO-3

Note:

1. Students should complete the sketches before start to work on the computer.
2. Proportionate Sketch carries 60% marks and computer aided solutions with Print out carries 40% Marks
3. Students have to answer any one full question from **Unit I** [Only Sketching-Computer Printout not required - carrying 10 Marks] & any two questions from **Unit II & Unit III** [Including Sketching and Computer Printout Carrying 20 Marks each]

ENGINEERING PHYSICS LABORATORY

Course Code: PYL18/28

Credits: 0:0:1

Pre-requisites: -

Contact Hours: 14P

Course Coordinator: Dr. B. Siddlingeshwar

Experiment No.	Description
1.	General Instructions and Introduction to Error Analysis.
2.	Plotting of forward and reverse bias characteristics of a Zener Diode and determination of breakdown voltage.
3.	Determination of numerical aperture, Acceptance angle and bending loss in Optical Fibre Cable.
4.	Measurement of capacitance and dielectric constant of a capacitor by charging and discharging it through a resistor.
5.	Calculation of Planck's constant using LEDs.
6.	Verification of Stefan's law
7.	Identification of different components (L,C or R) of a Black Box and calculation of their values through frequency response curves.
8.	Determination of Moment of inertia of an irregular body and calculation of rigidity modulus of the material of the suspension wire using torsional oscillations.
9.	Measurement of Young's Modulus of the material of the single cantilever beam.
10.	Determination of Energy gap of semiconductor.
11.	Determination of Fermi energy of a metal.
12.	Measurement of operating wavelength of semiconductor laser using Laser diffraction.
13.	Calculation of thickness of given paper strip by the method of interference fringes (Air wedge).
14.	Frequency response of series and parallel LCR circuits and calculation of Q-factor and band width.
15.	Determination of Hall coefficient and concentration of charge carriers of the semiconductor.
16.	Simulation of electrical experiments using Pspice

- Students are required to perform 12 prescribed experiments (from 2 to 16) in the above list. Cyclic order will be followed.
- Experiment 16 is compulsory for all students.

Reference Book:

1. Laboratory manual prepared by the Physics department, RIT, Bangalore
2. https://www.youtube.com/channel/UCSQIEd4W_loJWv_uJ2dfQw

Web links and Video Lectures (e-Resources):

1. <https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=1>
2. <https://bop-iitk.vlabs.ac.in/basics-of-physics/List%20of%20experiments.html>
3. https://virtuallabs.merlot.org/vl_physics.html
4. <https://phet.colorado.edu>
5. <https://www.myphysicslab.com>

Course Outcomes (COs):

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

1. Determine elastic constants of material using torsion pendulum and cantilever. (PO-1, 4)
2. Apply the concepts of interference and diffraction of light to determine thickness of thin films and wavelength of light. (PO-1, 4)
3. Construct and analyze simple AC and DC circuits to determine electrical parameters, familiarity with the concepts of modern Physics. (PO-1, 4, 5)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50 Marks		
Assessment tool	Marks	Course outcomes attained
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:	50	CO1, CO2, CO3

II SEMESTER

MULTIVARIATE CALCULUS & DIFFERENTIAL EQUATIONS

Course Code: MA21

Credits: 3:1:0

Pre-requisites: -

Contact Hours: 42L+14T

Course Coordinators: Dr. S.H.C.V. Subba Bhatta & Mr. B. Azghar Pasha

Unit-I

Differential Calculus - II: Taylor's series and Maclaurin's series expansion of one variable (without proof) and its applications to solve algebraic and transcendental equations - Newton-Raphson method.

Taylor's series and Maclaurin's series expansion of two variables (without proof) and its applications to solve the system of nonlinear equations - Newton-Raphson method.

Maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers.

Demonstration of programs using open source software to solve algebraic and transcendental equations & system of non-linear equations using Newton-Raphson method.

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Power Point Presentation, Videos
- Online tool/Open source Software ➤ Use of open source software such as Scilab to demonstrate
 - Roots of algebraic and transcendental equations using NR method
 - Solution of system of non-linear equations using NR Method
- Links: ➤ <https://nptel.ac.in/courses/111/106/111106101/>
➤ <https://nptel.ac.in/courses/111/105/111105121/>
- 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-II

Applications of first order and first degree differential equations: Applications of first order and first degree ODEs to solve LCR circuits, Newton's law of cooling and orthogonal trajectories.

Numerical solution of first order ODE: Taylor's series method, Euler's & modified Euler's method, fourth order Runge-Kutta method.

Demonstration of programs using open source software to solve ODE's using Euler's & modified Euler's method, fourth order Runge-Kutta method.

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Power Point Presentation, Videos
- Online tool/Open source Software ➤ Use of open source software such as Scilab to demonstrate particular solution of first order ODE's numerically.
- Links: ➤ <https://nptel.ac.in/courses/111/106/111106100/>
➤ <https://nptel.ac.in/courses/111/106/111106101/>
- 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-III

Linear differential equations of higher Order: Linear differential equations of higher order with constant coefficients. Cauchy's and Legendre's linear differential equations, Method of variation of parameters – Engineering applications.

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Power Point Presentation, Videos
- Links: ➤ <https://nptel.ac.in/courses/111/105/111105121/>
- Impartus recording: ➤ <https://a.impartus.com/ilc/#/course/119640/593>
➤ <https://a.impartus.com/ilc/#/course/59742/295>

Unit-IV

Linear Algebra: Elementary transformations on a matrix, Echelon form & rank of a matrix, Consistency of system of linear equations. Gauss elimination, Jacobi's & Gauss – Seidel method to solve system of linear equations. Eigen values and eigen vectors of a matrix, Rayleigh power method to determine the dominant eigen value of a matrix, diagonalization of square matrices. Solution of system of ODEs by matrix method.

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Power Point Presentation, Videos
- Online tool/Open source Software ➤ Use of open source software such as Scilab to demonstrate the
 - Solution of system of linear equations using Gauss elimination method
 - Solution of system of linear equations using iterative methods
 - Eigen values & Eigen vectors
- Links: ➤ <https://nptel.ac.in/courses/111/108/111108066/>
➤ <https://nptel.ac.in/courses/111/105/111105035/>
- Impartus recording: ➤ <https://a.impartus.com/ilc/#/course/619570/1030>

Unit-V

Partial differential equations: Introduction to PDE, Solutions of partial differential equations - direct integration method, Lagrange's method and method of separation of variables.

Solution of PDE's using Finite difference method: Classification of second order PDE, Solution of one dimensional heat equation using Schmidt method, one dimensional wave equation using explicit method. Solution of two dimensional Laplace equation.

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Power Point Presentation, Videos
- Links: ➤ <https://nptel.ac.in/courses/111/101/111101153/>
- Impartus recording: ➤ <https://a.impartus.com/ilc/#/course/290290/703>
➤ <https://a.impartus.com/ilc/#/course/171951/703>

Text Books:

1. **George B. Thomas, Maurice D. Weir, Joel R. Hass** - Thomas' Calculus, Pearson, 13th edition, 2014.
2. **B.S. Grewal** – Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2017.

Reference Books:

1. **Erwin Kreyszig** –Advanced Engineering Mathematics, Wiley publication, 10th edition, 2015.
2. **Peter V. O' Neil** – Advanced Engineering Mathematics, Thomson Brooks/ Cole, 7th edition, 2011.
3. **Glyn James & Phil Dyke** – Advanced Modern Engineering Mathematics, Pearson Education, 5th edition, 2018.
4. **Srimanta Pal & Subobh C Bhunia** - Engineering Mathematics, Oxford University Press, 3rd Reprint, 2016.

Course Outcomes (COs)

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

1. Determine extreme values, roots of algebraic & transcendental equations and solution of non-linear system of equations. (PO-1, 2)
2. Solve first order differential equations analytically and numerically. (PO-1, 2)
3. Solve higher order linear differential equations with constant and variable coefficients. (PO-1, 2)
4. Solve system of linear equations and ordinary differential equations using matrices.(PO-1,2)
5. Find the solution of PDE's analytically and numerically. (PO-1, 2)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50 Marks		
Assessment tool	Marks	Course outcomes attained
Internal Test-I	30	CO1,CO2,CO3
Internal Test-II	30	CO3,CO4,CO5
Average of the two internal test shall be taken for 30 marks		
Other components	Marks	Course outcomes attained
Quiz	10	CO1,CO2,CO3
Assignment	10	CO3,CO4,CO5
Semester End Examination:	100	CO1,CO2,CO3,CO4,CO5

FUNDAMENTALS OF MECHANICAL ENGINEERING

Course Code: ME12/22

Credits: 3:0:0

Pre-requisites: -

Contact Hours: 42L

Course Coordinator: Dr. Anil Kumar T

Unit-I

Engineering Materials and Metal Joining Processes

Engineering Materials: Mechanical Properties of Engineering materials, Ferrous and Non-ferrous materials, classification, examples and broad applications.

Metal Joining Processes: Welding, Classification of welding, Oxyacetylene welding, Arc welding, Electrodes, Soldering and Brazing, Resistance Welding-Spot, Seam. Projection, Flash welding, percussion welding, Resistance Butt welding

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Power point presentation, animated videos
- Lab component/ Practical topics: ➤ Arc Welding and soldering
- Links: Mechanical Properties of Engineering materials ➤ <https://www.youtube.com/watch?v=WSRqJdT2COE&t=83s>
- Links: Oxyacetylene welding ➤ <https://www.youtube.com/watch?v=-SA4D098u-Q>

Unit-II

Internal Combustion Engines and Electric Vehicles Basics

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 Basics: Types of batteries, Regenerative braking systems

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Power point presentation, animated videos, Demonstration using IC engine models
- Lab component/Practical topics: ➤ Internal Combustion Engine
- Links: Internal Combustion Engine ➤ <https://www.youtube.com/watch?v=mRcFO7X8yP4>
- Links: Electric Vehicle ➤ <https://www.youtube.com/watch?v=xE0d0JtXVLw>

Unit-III

Refrigeration & Air Conditioning and Non-Conventional Machining Methods

Refrigeration and Air Conditioning: Classification of Refrigeration, Working Principles of Vapor Compression, Properties of Refrigerant, Working principle of Window Air Conditioner. Heating and Ventilation.

Non-Conventional Machining Methods: Abrasive Jet Machining, Water Jet Machining, Ultrasonic Machining, Electron Beam Machining

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Power point presentation, animated videos
- Lab component/Practical topics: ➤ Refrigeration
- Links: Refrigeration ➤ <https://www.youtube.com/watch?v=h5wQoA15OnQ>
- Links: Electron Beam Machining ➤ <https://www.youtube.com/watch?v=QuZ-qkthCCY>

Unit-IV

Power Transmission, Gear Drives & Gear Trains

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, Pulleys; Stepped, Tight and loose, Idler, V-belt drive. Simple numerical problems; **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 and Reverted 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://www.youtube.com/watch?v=0mb_XMGja_c
- Links: Gear trains ➤ <https://www.youtube.com/watch?v=tjNsUzxRjfw>

Unit-V

Robot Technology, Computer Numerical Control Machines and Additive Manufacturing

Fundamentals of Robot Technology: Robot Anatomy, work volume, Robot Drive systems, Control systems and Dynamic Performance, Precision of movement, End Effectors, Robotic Sensors, Robot Applications

Computer Numerical Control Machines: Numerical control, Computer numerical control and Direct numerical control

Additive Manufacturing: Basic Definition and Applications; Direct and Indirect Application levels, Nomenclature of Additive manufacturing machines, Types of

Additive manufacturing process, SLA Process, SLS process, FDM process, Applications of Additive manufacturing

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Power point presentation, animated videos
- Lab component/Practical topics: ➤ Robot technology
- Links: Computer Numerical Control ➤ https://www.youtube.com/watch?v=e_PDuQePdOE
- Links: SLS Process ➤ https://www.youtube.com/watch?v=9E5MfBAV_tA

Text Books:

1. **K. R. Gopalakrishna, SudhirGopalakrishna, S.C.Sharma** – Elements of Mechanical Engineering, Sudha Publications, Jan 2016.
2. **Pravinkumar**, 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, Seventh edition, 2012.
2. **John Lowry**-Electrical Vehicle Technology Explained –, John Wiley & Sons Ltd, Second 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, TK Kundra** - Additive Manufacturing Fundamentals and Advancements CRC Press, 2019

Web links and Video Lectures (e-Resources):

1. <https://nptel.ac.in/courses/112/103/112103263/>
2. <https://nptel.ac.in/courses/108/106/108106170/>
3. <http://www.nptelvideos.in/2012/12/refrigeration-and-airconditioning.html>

4. <https://www.youtube.com/watch?v=7L42aRs68WI>
5. <http://www.nptelvideos.in/2012/12/robotics.html>

Course Outcomes (COs)

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

1. Acquire knowledge on a host of materials used in aerospace, human implants, defense, jet engines, automobiles, etc. and on basics of metal joining processes. (PO-1, 2, 12)
2. Comprehend the basics of IC Engines and the fundamentals of Electric Vehicle technology. (PO-1, 2, 7)
3. Recognize broadly and understand the basics of Non-Conventional Machining Methods as well learn basics of Refrigeration and Air-Conditioning. (PO-1, 2, 12)
4. Understand the fundamental power transmission systems that are used in the industrial world. (PO-1, 2)
5. Realize the importance of 3D manufacturing techniques and also fundamentals of Robotics and CNC technology. (PO-1, 2, 12)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50 Marks		
Assessment tool	Marks	Course outcomes attained
Internal Test-I	30	CO-1, CO-2
Internal Test-II	30	CO-3, CO-4, CO-5
Average of the two internal test shall be taken for 30 marks		
Other components	Marks	Course outcomes attained
Assignment	10	CO-1, CO-2, CO-3
Quiz	10	CO-4, CO-5
Semester End Examination:	100	CO1,CO2,CO3,CO4,CO5

BASIC ELECTRONICS

Course Code: EC13/ 23

Credits: 2:1:0

Pre-requisites: -

Contact Hours: 28L +14T

Course Coordinator: Mrs. Veena G N

Unit-I

Semiconductor Diodes and Applications: P-N junction diode, DC equivalent circuits, DC load line analysis of Diode with numerical, Half-Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Capacitor filter circuit, Zener diode voltage regulators (with no load and loaded regulator), Types of Diodes: LED, Varactor diode, Tunnel diode, Photo diode, Schottky diode

- Pedagogy / Course delivery tools: ➤ Chalk and talk, Videos.
- Links: DC load line analysis of Diode: ➤ <https://www.youtube.com/watch?v=TaTGnbxIMdY>
➤ <https://nptel.ac.in/courses/117/103/117103063/>
➤ <https://a.impartus.com/ilc/#/course/80947/295>
➤ <https://a.impartus.com/ilc/#/course/119642/593>

Unit-II

Bipolar Junction Transistors: BJT & its Configurations, Common Emitter Characteristics, (Numerical examples as applicable)

BJT Biasing: DC load line and bias point, Fixed bias & Voltage divider bias (Accurate) (Numerical examples as applicable)

AC analysis of BJT Circuits: Common emitter circuit analysis (Qualitative analysis only)

- Pedagogy / Course delivery tools: ➤ Chalk and talk, Videos.
- Links: voltage divider biasing: ➤ <https://www.youtube.com/watch?v=VKr9SB3cULc>
➤ <https://nptel.ac.in/courses/117/103/117103063/>
➤ <https://a.impartus.com/ilc/#/course/80947/295>
➤ <https://a.impartus.com/ilc/#/course/119642/593>

Unit-III

Op-Amp: Ideal Op-Amp, Basic Op-amp circuits: Inverting amplifier, Non Inverting amplifier, Voltage Follower, Summer, Subtractor, Integrator, Differentiator. (Numerical examples as applicable)

Field Effect Transistors: Junction Field effect transistors (JFET), JFET characteristics and parameters, Metal Oxide Semiconductor Field Effect Transistors (MOSFETs):

Depletion and Enhancement MOSFET, Complementary Metal Oxide Semiconductor (CMOS).

- Pedagogy / Course delivery tools: ➤ Chalk and talk, Videos.
- Links: JFET characteristics: ➤ <https://www.youtube.com/watch?v=Dd4im8TMAk0>
➤ <https://nptel.ac.in/courses/117/103/117103063/>
➤ <https://a.impartus.com/ilc/#/course/80947/295>
➤ <https://a.impartus.com/ilc/#/course/119642/593>

Unit-IV

Fundamentals of Digital Electronics: Number Systems and Conversions: Decimal, Binary, Octal and Hexadecimal. Binary Arithmetic: Addition & Subtraction (1s & 2s Complement method).

Boolean Algebra: Theorems, De Morgan's theorem. Digital Circuits: Logic gates, NOT, AND, OR, XOR, NAND, NOR and X-NOR gates. Algebraic simplification, NAND and NOR implementation, Half adder, Full adder.

Flip Flops: Introduction to Latch & Flip-Flops, NAND gate latch/ NOR gate latch, SR Flip-Flop.

- Pedagogy / Course delivery tools: ➤ Chalk and talk, Videos.
- Links: NAND and NOR implementation: ➤ <https://www.youtube.com/watch?v=F2ATq6HYHpY&t=303s>
➤ <https://www.youtube.com/watch?v=F2ATq6HYHpY>
➤ <https://a.impartus.com/ilc/#/course/80947/295>
➤ <https://a.impartus.com/ilc/#/course/119642/593>

Unit-V

Sensor Applications: Introduction to Transducer, Classification of Transducer – Passive Electrical Transducers: Resistive Transducers, LVDT, Active Electrical Transducers: Piezoelectric Transducer, Photoelectric Transducer.

Applications: Block diagram of analog and digital communication systems, Digital TV system, Satellite communication, Principle of operations of Mobile phone.

- Pedagogy / Course delivery tools: ➤ Chalk and talk, Power point presentation, Videos.
- Links: Transducer: ➤ <https://www.youtube.com/watch?v=aFdWzYyZ2Gg>

Text Books:

1. **David. A. Bell** – Electronic Devices and Circuits, 5th Edition, Oxford University Press, 2008.
2. **D. P. Kothari, I. J. Nagrath** – Basic Electronics, 2nd Edition, McGraw Hill Education (India) Private Limited, 2014.

Reference Books:

1. **H S Kalsi** – Electronic Instrumentation and Measurements, McGraw Hill Education, 4th edition, 2019.
2. **George Kennedy, Bernard Davis, S. R. M Prasanna** – Electronic Communication Systems, McGraw Hill Education, 6th edition, 2017.

Course Outcomes (COs):

On successful completion of the course students will be able to

1. Describe semiconductor devices and its applications (PO-1, 2, 3, 8, 9, 12)
2. Analyze the various circuits of BJT. (PO-1, 2, 3, 8, 9, 12)
3. Employ Op-Amp in various circuits. (PO-1, 2, 3, 8, 9, 12)
4. Analyze digital circuits. (PO-1, 2, 3, 8, 9, 12)
5. Appreciate the importance of transducers and communication system. (PO-1, 8, 9, 12)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50 Marks		
Assessment tool	Marks	Course outcomes attained
Internal Test-I	30	CO-1, CO-2
Internal Test-II	30	CO-3, CO-4, CO-5
Average of the two internal test shall be taken for 30 marks		
Other components	Marks	Course outcomes attained
Assignment	10	CO-1, CO-2
Quiz	10	CO-3, CO-4, CO-5
Semester End Examination:	100	CO1, CO2, CO3, CO4, CO5

COMPUTING FUNDAMENTALS AND C PROGRAMMING

Course Code: CS14/24

Credits: 2:1:0

Pre-requisites: -

Contact Hours: 28L+14T

Course Coordinator: Dr. Jagadish S Kallimani

Unit-I

Computing Fundamentals and Overview of C

Computing Fundamentals: Introduction, Uses of Computers, History of Computing, Generations of Computers, Software and Hardware, Organization of a Computer, **Von Neumann architecture, Operating Systems, Application Software, Programming Languages, Types of data**, ASCII and EBCDIC, Software development life cycle.

Overview of C: Importance of C, Basic Structure of C Programs. Constants, Variables and Data types: Character Set, C-Tokens, Keywords and Identifiers, Constants, Variables, Data Types, Defining Symbolic Constants. Managing Input and Output Operations: Reading a Character, Writing a Character, Formatted Output.

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Power point presentation
- Lab component/Practical topics: ➤ LINUX operating systems, Basic LINUX commands, Input/ Output formatting

Unit-II

Operators, Expressions and Control Structures

Operators and Expressions: Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic Operators, Type Conversions in Expressions, Operator Precedence and Associativity.

Control Structures: Algorithm Development, Decision Making and Branching: Simple IF statement, If-Else Statement, Nesting of If-Else, Else-If Ladder, Switch Statement. The GOTO Statement. Decision Making and Looping: Introduction, While Statement, DO statement, FOR statement, Nested Loops, Break and Continue Statements.

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Power point presentation
- Lab component/Practical topics: ➤ C-Programming-Operators, Expressions, all conditional statements

Unit-III

Arrays, Matrices and Strings

Arrays and Matrices: One-Dimensional Array, Two-Dimensional Arrays (Declaration and Compile Time and Run Time Initialization), Reading and Displaying Arrays, Searching and Sorting.

Strings: Introduction, Character Arrays, Declaring and Initializing String Variables, Reading Strings from Terminal, Writing Strings to Screen, Arithmetic Operations on Characters, String Handling Functions, Other StringFunctions.

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Power point presentation
- Lab component/Practical topics: ➤ C-Programming-One and Two dimensional arrays, character arrays and strings

Unit-IV

User Defined Functions and Files

User Defined Functions: Introduction, Need for User-Defined Functions, Elements of User-Defined Functions, Definition of Functions, Return Values and Their Types, Function Calls, Categories of Functions, Recursion. The scope, visibility and lifetime of variables: Automatic variables, Static Variables, Register Variables, and External Variables.

Files: Introduction to Files, Types of Files, Declaring a File Pointer Variable, Opening a File, Closing a File, Read Data From Files, Writing Data to Files, Detecting the End-Of-File

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Power point presentation
- Lab component/Practical topics: ➤ C-Programming-Library Functions, user defined Functions, Function Calls, File Operations

Unit-V

Structures and Pointers

Structures: Defining a Structure, Declaring Structure Variables, Accessing Structure Members, Structure Initialization, Copying and Comparing Structure variables, Arrays of Structures, Arrays within Structure, Unions: Introduction, Difference between structures and Unions.

Pointers: Introduction, Understanding Pointers, Accessing the Address of a Variable, Declaring Pointer Variables, Initialization of Pointer Variables, Accessing a variable through its pointer, Pointer Expressions, Pointers and Arrays, Pointers and Character Strings, Pointers as Function Arguments.

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Power point presentation
- Lab component/Practical topics: ➤ C-Programming- Structures, Unions and Pointers

Text Books:

1. **ReemaThareja** - Programming in C, Oxford University press 2nd edition, 2015
2. **E. Balagurusamy** - Programming in ANSI C, TMH, 7th edition, 2016

Reference Books:

1. **H Schildt** - C: The Complete Reference, 4th edition, 2017, McGraw Hill Education, ISBN-13: 978-0070411838.
2. **Behrouz A Forouzan & Richard F Gilberg** - Computer Science: A Structural Programming Approach using C, Thomas Brooks publication, 2nd edition, 2006.
3. **Yashvant Kanetkar** - Let Us C, BPB Publications, 15th edition, 2016.
4. **V Rajaraman**-Computer Basics and C Programming, PHI India 2008.

Video Lectures (e-Resources)

1. <https://a.impartus.com/ilc/#!/course/59746/295>. (Login to a.impartus.com using your credentials. Type this URL to access the course videos)

Course Outcomes (COs):

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

1. Identify basic elements of computing systems and Constants, Variables and Data Types. (PO-1, 2, 3, 4, 5, 12)
2. Illustrate the use of operators, control structures, decision making and looping statements of C Programming Language. (PO-1, 2, 3, 4, 5, 12)
3. Implement the concepts and techniques related to Arrays, Matrices and Strings. (PO-1, 2, 3, 4, 5, 12)
4. Construct Programming solutions using user defined functions and files for storage. (PO-1, 2, 3, 4, 5, 12)
5. Infer the need for user defined data types like structures & unions and pointers. (PO-1, 2, 3, 4, 5, 12)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 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 test shall be taken for 30 marks		
Other components	Marks	Course outcomes attained
Quiz	10	CO1,CO2, CO3
Assignment	10	CO4, CO5
Semester End Examination:	100	CO1,CO2,CO3,CO4,CO5

ENGINEERING CHEMISTRY

Course Code: CY15/25

Credits: 2:1:0

Pre-requisites: -

Contact Hours: 28L+14T

Course Coordinators: Dr. B. M. Nagabhushana & Dr. Nagaraju Kottam

Unit-I

Electrochemical Cell, Battery Technology

Electrochemical Cells: Basic concepts of electrochemistry - electrode potential, origin of single electrode potential, Galvanic cells. Derivation of Nernst equation, Reference electrodes - calomel electrode, measurement of single electrode potential using saturated calomel electrode. Determination of pH of a solution using glass electrode. Concentration cells. Numerical problems on electrode potential, EMF of cells and concentration cells.

Battery Technology: Basic concepts. Mechanism of battery operation, battery characteristics. Classification of batteries – Primary, secondary and reserve batteries. Modern batteries: construction, working and applications of Nickel-Metal hydride battery, Li-ion (Lithium batteries). New generation Batteries: Introduction and Example- Al-air batteries (No construction details).

Self-study: Ion-selective electrode - Glass electrode. Solar energy storage battery.

- Pedagogy/Course delivery tools: ➤ Chalk and Talk, Power point presentation, Videos
- Lab component/Practical topics: ➤ Determination of pH, Potentiometric titration using calomel & platinum electrode assembly.
➤ Determination of electrode potential of unknown metal using Nernst equation
- Link: ➤ <http://msrit.edu/study-material/chemistry.html>

Unit-II

Corrosion Science

Corrosion Science: Metallic corrosion - Definition, electrochemical theory of corrosion. Types of corrosion - Differential metal corrosion, differential aeration corrosion (Ex: pitting and waterline corrosion) and Stress corrosion. Factors affecting the rate of corrosion. Corrosion control Methods: Chemical Methods: Inorganic coatings- anodizing and phosphating. Corrosion inhibitors. Physical Methods: Cathodic Protection-sacrificial anode method. Metal coating- Anodic and cathodic metal coatings with examples.

Self-study: Multifunctional coatings (Thermal resistance, photo resistance and scratch resistance).

- Pedagogy/Course delivery tools: ➤ Chalk and Talk, Power point presentation, Videos
- Lab component/Practical topics: ➤ Analysis of rust solution by external indicator method
- Link: ➤ <http://msrit.edu/study-material/chemistry.html>

Unit-III

Energy sources & Chemistry of nanomaterials

Energy Sources: Introduction, characteristics of good fuel. Calorific value – Definition, net and gross calorific values. Determination of calorific value of a solid fuel by bomb calorimeter. Numerical problems, Liquid fuels: Petroleum cracking - fluidized bed catalytic cracking, Reformation of petrol. Knocking – mechanism, octane number, cetane number, prevention of knocking,

Chemistry of nanomaterials: Introduction to nanomaterials. Synthesis: top-down and bottom-up approaches. Chemical methods of synthesis- solution combustion and hydrothermal methods. Characterization techniques like PXRD, SEM, and TEM (only mention & introduction). Applications of nanomaterials.

Self-study: Bio- fuels: Bio-diesel, Solar energy: Sixth generation P-V cells.

- Pedagogy/Course delivery tools: ➤ Chalk and Talk, Power point presentation, Videos
- Lab component/Practical topics: ➤ Synthesis of nanomaterials by wet chemical methods
- Link: ➤ <http://msrit.edu/study-material/chemistry.html>

Unit-IV

Water Technology

Water Technology: Hardness – definition, types of hardness and its determination by EDTA method – numerical problems. Determination of dissolved (DO) oxygen by Winklers method. Biological Oxygen Demand (BOD)–definition, determination and numerical problems. Chemical Oxygen Demand (COD) – Definition, determination and numerical problems. Determination of amount of chloride present in water sample by Argentometric method. Determination of nitrate using phenol disulphonic acid (spectrophotometric method). Potable water – Definition. Membrane based Technology for water purification: purification of water by reverse osmosis.

Self-study: Recycling of waste water-physical, chemical and biological systems.

- Pedagogy/Course delivery tools: ➤ Chalk and Talk, Power point presentation, Videos
- Lab component/Practical topics: ➤ Determination of total hardness, COD of waste water, Chloride content by titration method.
➤ Estimation of copper by colorimetric method and Measurement of conductivity of electrolytes
- Link: ➤ <http://msrit.edu/study-material/chemistry.html>

Unit-V

Polymer Science & Liquid Crystals

Polymer Science: Introduction to high polymers. Glass transition temperature (T_g), factors influencing T_g . Crystalline melting point. Conducting polymers - Definition, mechanism of conduction in polyacetylene. High performance (Engineering) polymers: Synthesis, properties and applications of Teflon and PMMA.

Liquid Crystals: Introduction, meaning, positional and orientational order in solid, liquid crystals and liquids. Director. Classification – thermotropic and lyotropic with examples. Types of mesophases – Nematic, Chiral nematic (cholesteric), Smectic and Columnar – arrangements of molecules with examples. Liquid crystalline behavior in homologues series – PAA series. Applications of liquid crystals.

Self-study: Bio-polymers

- Pedagogy/Course delivery tools: ➤ Chalk and talk, Power point presentation, Videos
- Lab component/Practical topics: ➤ Synthesis of urea-formaldehyde
- Link: ➤ <http://msrit.edu/study-material/chemistry.html>

Text Books:

1. **P. C. Jain and Monica Jain**, A text Book of Engineering Chemistry, Dhanapat Rai Publications, New Delhi, 17th Edition, 2018.
2. **R. V. Gadag and Nithyananda Shetty**, A text Book of Engineering Chemistry. Medtech Publishers. 1st Edition 2019.

Reference Books:

1. **F. W. Billmeyer**, Text Book of Polymer Science, John Wiley & Sons, 4th edition, 2007.
2. **M. G. Fontana, N. D. Greene**, Corrosion Engineering, McGraw Hill Publications, New York, 3rd edition, 2005.
3. **B. R. Puri, L. R. Sharma & M. S. Pathania**, Principles of Physical Chemistry S. Nagin Chand & Co., 48th edition 2019.
4. **G. A. Ozin and A. C. Arsenault**, Nanochemistry: A Chemical approach to Nanomaterials, RSC Publishing, 2005.
5. **S. Chandrashekar**, Liquid Crystals, Cambridge University Press, 2nd edition, 2010
6. **Peter J. Collings**. Introduction to Liquid Crystals, CRC Press, 2nd edition, 2019.

Web links and Video Lectures (e-Resources):

1. <http://msrit.edu/study-material/chemistry.html>
2. <https://nptel.ac.in/courses/122/101/122101001/>

Course Outcomes (COs):

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

1. Apply the knowledge of electrochemistry to improve the efficiency of batteries. (PO-1, 2, 7).
2. Interpret the reasons of corrosion, monitor and control by using the proper techniques. (PO-1, 2, 7).
3. Apply different conventional & renewable sources of energy to generate power. Have concept on rearing high octane quality fuels. (PO-1, 2, 7).
4. Analyze the water samples and will have the knowledge to obtain potable water using different techniques. (PO-1, 2, 7).
5. Apply the knowledge in synthesis of advanced polymers, conducting polymers and liquid crystal materials for different applications. (PO-1, 2, 7).

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50 Marks		
Assessment tool	Marks	Course outcomes attained
Internal Test-I	30	CO1, CO2, CO4
Internal Test-II	30	CO2, CO3, CO5
Average of the two internal test shall be taken for 30 marks		
Other components	Marks	Course outcomes attained
Assignment	10	CO2, CO3
Quiz	10	CO3, CO4
Semester End Examination:	100	CO1, CO2, CO3, CO4, CO5

A SCIENTIFIC APPROACH TO HEALTH

Course Code: AEC26

Credits: 1:0:0

Pre-requisites: -

Contact Hours: 14 L

Course Coordinator: Dr. Prabha Ravi

Unit-I

Good Health and its balance for positive mindset

Health- its importance, factors, beliefs and behaviour, Good health benefits, Health and Society, Health and family, Health and Personality, Health and behaviour, Disparities of health in different vulnerable groups. Health and psychology, Methods to improve good psychological health. Psychological disorders (Stress and Health – Stress management), Mindfulness for Spiritual and Intellectual health, Changing health habits for good health. Health and personality.

- Pedagogy/Course delivery tools: ➤ Chalk and Talk, Power Point Presentation
- Link for YouTube videos/
Animation videos ➤ https://www.youtube.com/watch?v=71_NkXgAK1g
➤ <https://www.youtube.com/watch?v=mwuahwbIBnE>

Unit-II

Building of healthy lifestyles for better future

Role of diet for good health, Food and health, Nutritional guidelines for good health and wellbeingness, Obesity and overweight disorders and its management, Eating disorders-proper exercises for its maintenance (Physical activities or health), Fitness components for health, Wellness and physical function.

- Pedagogy/Course delivery tools: ➤ Chalk and Talk
- Link for YouTube videos/
Animation videos ➤ <https://www.youtube.com/watch?v=c06dTj0v0sM>
➤ <https://www.youtube.com/watch?v=Y8HIFRPU6pM>

Unit-III

Creation of Healthy and caring relationships

Building communication skills (Listening and speaking), Friends and friendship -education, the value of relationships and communication, Relationships for Better or worsening of life, understanding of basic instincts of life (more than a biology), Changing health behaviours through social engineering.

- Pedagogy/Course delivery tools: ➤ Chalk and Talk
- Link for YouTube videos/
Animation videos ➤ <https://www.youtube.com/watch?v=IwZIFG-3Y4o>
➤ <https://www.youtube.com/watch?v=rzEI6ZVmGW8>

Unit-IV

Avoiding risks and harmful habits

Characteristics of health compromising behaviors, addictions -recognizing and avoiding, addictive behaviors, Types of addictions, influencing factors for addictions, Differences between addictive people and non addictive people and their behavior with society, Effects and health hazards from addictions.

- Pedagogy/Course delivery tools: ➤ Chalk and Talk
- Link for YouTube videos/
Animation videos ➤ https://www.youtube.com/watch?v=S-12Zj_JIRQ
➤ <https://www.youtube.com/watch?v=OnFVFFAImEg>

Unit-V

Preventing and fighting against diseases for good health

Occurrence of infections and reasons, protection from different types of transmitted infections, Current trends of socioeconomic impact, Reducing risks and coping with chronic conditions, Management of chronic illness for Quality of life, Health and Wellness of youth, Measuring of health and wealth status.

- Pedagogy/Course delivery tools: ➤ Chalk and Talk
- Link for YouTube videos/
Animation videos ➤ <https://www.youtube.com/watch?v=X0OxrsgAP2w>
➤ <https://www.youtube.com/watch?v=Ap1FXfy91d4>

Text Books:

1. **Charles Abraham, Mark Conner, Jones and Daryl O'Connor** - Health Psychology, Fiona, Routledge 711 Third Avenue, NewYork, NY10017, 2nd edition.
2. **Jane Ogden**, Health Psychology A Textbook, McGraw-Hill Education (India) Private Limited- Open University Press, 4th edition.

Reference Books:

1. **Health Psychology**, SHELLEYE. TAYLOR - University of California, LosAngeles, McGraw-Hill Education (India) Private Limited - Open University Press, 9th edition.

2. **Scientific Foundations of Health (Health & Wellness) - General Books** published for university and colleges references by popular authors and published by the reputed publisher.

Video Lectures:

1. SWAYAM/NPTL/MOOCs/Weblinks/Internet sources/
YouTube videos and other materials/notes.

Course Outcomes (COs):

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

1. Demonstrate the skills to live a healthy life and be a part of a healthy community. (PO-6, 7)
2. Learn how to use their stream of study towards sustainable living. (PO-7, 8)
3. Demonstrate the knowledge as a gateway for exchange of innovative thinking contributing to healthy individual and community. (PO-8, 9)
4. Learn to cultivate psycho-social behavioral quality. (PO-9, 10)
5. Understand the importance of science and scientific applications to enhance health. (PO-10, 12)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50 Marks		
Assessment tool	Marks	Course outcomes attained
Internal Test-I	30	CO1, CO2
Internal Test-II	30	CO3
Average of the two internal test shall be taken for 30 marks		
Other components	20	
Semester End Examination: (90 minutes duration)	50	CO1, CO2, CO3, CO4, CO5

ENGINEERING CHEMISTRY LABORATORY

Course Code: CYL17 /27

Credits: 0:0:1

Pre-requisites: -

Contact Hours: 14P

Course Coordinators: Dr. Nagaraju Kottam & Dr. M. N. Manjunatha

1. Determination of total hardness of water sample by EDTA method.
2. Determination of COD of an industrial waste water sample.
3. Determination of Iron in the given sample of rust solution by external indicator method.
4. Determination of % Cu in brass by iodometric method.
5. Colorimetric estimation of metal ions (Copper) in effluent water.
6. Estimation strength of HCl and CH_3COOH present in an acid-mixture by conductometry
7. Estimation of FAS in the given solution potentiometrically
8. Determination of pKa value of the given weak acid using pH meter.
9. Estimation of sodium present in water sample by Flame photometry.
10. Determination of amount of chloride present in water sample by Argentometric method
11. Synthesis of nanomaterials by wet chemical methods.
12. Determination of electrode potential of unknown metal using secondary reference electrode and verification of Nernst equation.
13. Preparation of Urea –formaldehyde.
14. Preparation of Polyacrylamide polymer.

Reference books:

1. Vogel's quantitative Chemical Analysis, Pearson Publication, 6th edition, 2009.
2. Chemistry for Environmental Engineering, 5th edition, Clair N. Sawyer and Perry L, Mc. Carty; Mc. Graw-Hill Book Company, New York, 2003.
3. Chemistry Manual – RIT, 2021-22

Web links and Video Lectures (e-Resources):

1. <http://msrit.edu/study-material/chemistry.html>
2. https://www.youtube.com/watch?v=85tMHHOj7PU&ab_channel=ChemSASTRA

Course Outcomes (COs):

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

1. Handle the apparatus in chemical laboratories for analysis of various materials (PO-1, 2, 7).
2. Analyze the suitability of water for domestic and industrial consumption (PO-1, 2, 7).
3. Evaluate the content and composition of new materials encountered in engineering applications (PO-1, 2, 7).

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50 Marks		
Assessment tool	Marks	Course outcomes attained
Weekly evaluation of laboratory manuals/records after the conduction of every experiment.	30	CO1,CO2,CO3
Practical test	20	CO1,CO2,CO3
Semester End Examination:	50	CO1,CO2,CO3

C PROGRAMMING LABORATORY

Course Code: CSL18 / 28

Credits: 0:0:1

Pre-requisites: -

Contact Hours: 14P

Course Coordinator: Dr. Jagadish S Kallimani

Sl. No.	Topics Covered
Cycle I	
1.	Introduction to Linux Operating system and Basic LINUX Commands
2.	Libreoffice Writer, Spreadsheets (Calc), Algorithms and Flowcharts
3.	Input and Output formatting in C programming
4.	Implementation of different operators in C
5.	Programs using different Conditional statements
6.	Learning usage of Switch and GOTO statements in C
7.	C programs using Iterative statements
Cycle II	
8.	Programs to implement of one dimensional arrays in C
9.	Programs to implement of two dimensional arrays in C
10.	Learning the usage of Character array and Strings
11.	C Programming using different type of Functions and Function Calls
12.	C Programs related to File handling
13.	Implementing Structures and Unions in C
14.	C Programs using Pointers

Note: Each Lab Session is of two hours duration/week

Reference Books:

1. **Reema Thareja** - Programming in C, 2nd edition, Oxford University press 2015
2. **E. Balagurusamy** - Programming in ANSI C, TMH, 7th edition, 2016
3. **Behrouz A Forouzan & Richard F Gilberg** - Computer Science: A Structural Programming Approach using C, Thomas Brooks publication, 2nd edition, 2006.
4. **Yashvant Kanetkar** - Let Us C, BPB Publications, 15th edition, 2016.
5. <https://www.libreoffice.org/get-help/documentation/>

Course Outcomes (COs):

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

1. Understand basic LINUX commands and prepare Documents, Spreadsheets using Libre Office Tool (PO-1, 2, 3, 4, 5, 12)
2. Design and implement C-programs using language constructs such as Operators, Conditional and Iterative Statements. (PO-1, 2, 3, 4, 5, 12)
3. Design and implement C-programs to implement concepts related to Arrays, Functions, Strings, Structures, Pointers and Files (PO-1, 2, 3, 4, 5, 12)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50 Marks		
Assessment tool	Marks	Course outcomes attained
Weekly Evaluation-Lab Record	30	CO1, CO2, CO3
Lab Test	20	CO1, CO2, CO3
Semester End Examination:	50	CO1, CO2, CO3

WORKSHOP PRACTICE

Course Code: MEL19/29

Credits: : 0:0:1

Pre-requisites: -

Contact Hours: 14P

Course Coordinator: Dr. Aruna Kumara P C

1. **Fitting Shop:** Fitting of any three common joints.
2. **Welding Shop:** Welding of any three common joints.
3. **Sheet Metal Work** Sheet-metal models – Rectangular Prism closed at one end, Rectangular 90° tray & Funnel.
4. **Machine Shop:** Two lathe models involving step turning, taper turning and knurling operations.
5. **Demonstration** of Radial drilling machine operations and typical milling operations.
6. **Practice** of drilling using lathe and drilling machine.
7. **Practice** of use of Power Tools for common machining operations.
8. **Demonstration** on 3-D printing

Text Book:

1. Work shop manual-Department of Mechanical Engineering. MSRIT, Bangalore, 9th edition 2021.

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 and Kah Fai Leong** -3D Printing and Additive Manufacturing, The 5th edition of Rapid Prototyping, January 2007.
- Pedagogy/Course delivery tools: ➤ Chalk and talk, power point presentation and Videos
 - Video Links for fitting model: ➤ https://www.youtube.com/watch?v=9_UPVCITv4w
 - Video Link for sheet metal model(Funnel): ➤ <https://www.youtube.com/watch?v=owEdInIhSIU>
 - Video Link for Arc Welding: ➤ <https://www.youtube.com/watch?v=CoHVA7nr82A>
 - Video Link for Lathe model: ➤ <https://www.youtube.com/watch?v=hheFVuUBpxo>
 - Video Link 1 for 3d printed model: ➤ https://www.youtube.com/watch?v=QchiA_Q-1kY
 - Video Link 2 for 3d printed model: ➤ <https://www.youtube.com/watch?v=JzNdvZLoKAI>

Course Outcomes (COs):

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. (PO-1, 2, 3, 5, 12)
2. Understand the significant details of workshop tools, machines and simple fabrication processes. (PO-1, 2, 3, 12)
3. Apply the knowledge of workshop practice methods to demonstrate utilitarian skills. (PO-1, 3, 5, 12).

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50 Marks		
Assessment tool	Marks	Course outcomes attained
Preparation of models and record submission	30	CO1, CO2, CO3
Laboratory Test	20	CO1, CO2, CO3
Semester End Examination:	50	CO1, CO2, CO3

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