



ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES (AUTONOMOUS)

(Affiliated to AU, Approved by AICTE & Accredited by NBA & NAAC with 'A'Grade)

PROSPECTUS & ACADEMIC REGULATIONS

2020-2021



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**ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND
SCIENCES (A)**

(UGC AUTONOMOUS)

**Approved by AICTE, Affiliated to Andhra University,
Accredited by N.B.A. & NAAC with 'A' Grade
(Estd : 2001)**



2020 - 21

Academic Regulations

Curriculum & Syllabi (First Year I&II Semesters)

DEPARTMENT OF MECHANICAL ENGINEERING



ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES (AUTONOMOUS)

VISION...

ANITS envisages to emerge as a world-class technical institution whose products represent a good blend of technological excellence and the best of human values.

MISSION...

To train young men and women as competent and confident engineers with excellent communicational skills, to face the challenges of future technological changes, and also to impart holistic technical education using the best of infrastructure, outstanding technical and teaching expertise and an exemplary work culture, besides moulding them into good citizens.

QUALITY POLICY...

ANITS is engaged in imparting quality technical education. It constantly strives towards achieving high standards of teaching, training and development of human resources by encouraging its faculty and staff to work as a team and to update their knowledge and skills continually to match the needs of industry.

FOREWORD

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES (ANITS) was founded by Anil Neerukonda Educational Society (ANES) in the fond memory of Anil Neerukonda, son of Dr. B. R. Prasad Neerukonda.

Its humble journey started in 2001 with an intake of 220 students into four undergraduate B.Tech programmes. Within 14 years of its establishment, the institute registered phenomenal growth and is accredited by NAAC with 'A' Grade and by NBA for the second time. It is permanently affiliated to Andhra University and has achieved autonomous status in 2015. Further, the institute has been currently ranked as 4th among the private engineering colleges in Andhra Pradesh by APPSCHE. It has been recognized as "Centre for Excellence" by Infosys and is accorded by Andhra University as "Centre for Research".

Today, the institute offers seven B.Tech. Programmes and four M.Tech. Programmes with an annual total intake about 1170 students. The institute offers amenities like separate hostels for boys and girls, indoor and outdoor games, transport covering all the major locations of Visakhapatnam and medical aid provided by Anil Neerukonda hospital and NRI Institute of Medical Sciences, another educational institution of ANES.

Apart from the State-of-the-Art laboratories, well established teaching methodology and implementation of the best practices, the wonderful co-ordination of the management, faculty & parents has so far played a crucial role in shaping the future of the ANITIANS and has been the talisman of the Institute's phenomenal growth.

The success stories of our champions at several qualifying exams for the higher studies like GRE, TOEFL, CAT, the impressive track record of the placements with highest known packages in MNCs like Google, Oracle, Infosys, TCS and so on are the sweetest fruits of our efforts.

PRAGNANAM BRAHMA, the motto of ANITS, is truly practiced by all the members of ANITS family, a direct effort to serve the society, nation and the mankind as well.

Hearty welcome to ANITS family.

Prof.T.V.Hanumantha Rao

PRINCIPAL

ACHIEVEMENT & HIGHLIGHTS

- ANITS has established “Institution’s Innovation Council(IIC)” as per the guidelines of MHRD Innovation cell, to develop the ecosystem required for entrepreneurship.
- ANITS has signed MOU with National Research Development Corporation (NRDC) India, to help students and faculty to apply and protect IPRs and convert their ideas to startups.
- Tatikella Abhishek (IV/IV CSE B Section) won the Virtusa National Neural Hack Challenge 2018 at Chennai.
- The ANITS students are selected for TCS “Code-Vita” season – VI World Finals (2018).
- Secured 3rd place in Top Engineering Colleges in Andhra Pradesh, survey by CSR – GHRDC 2017
- Secured 20th place in Ranking of Outstanding Engineering college of excellence by CSR – GHRDC 2017
- ANITS CSI Student Branch bagged the “Best Accredited Student Branch Award” by Computer Society of India during the academic year 2016-17 for the 5th time in Andhra Pradesh & Karnataka (Region-V).
- Students won various contests organized by reputed companies like TCS, Infosys ASPIRATIONS, TCS CODE VITA, ACM ICPC etc and brought laurels to the Institute.
- Secured 38th place in the Annual World Finals of ACM International Collegiate Programming Contest(ACM ICP 2014) sponsored by IBM and hosted by UralFederal University (Russia) from 22nd to 26th June,2014.
- ‘AAA’ rating of ANITS by **Career 360** Magazine (May 2013)
- 'CSI Student Branch bagged 'Best Student Branch Award' consecutively for 3 years (2011-2014) in the entire Andhra Pradesh & Karnataka region (Region-V).

- Mr. Anudeep, former student of CSE branch (2010-14) secured a job in Google with a pay package of 1.44.crores + perks.
- Award of “Centre of Excellence” by Infosys Technologies Ltd during 2010-11.
- Extension of permanent affiliation by Andhra University
- Conferred Autonomous status
- Accredited by NAAC with ‘A’ Grade
- NBA reaccreditation to EEE, ECE, CSE, Mech., and IT courses.
- Recognition as ‘Research Centre’ and award of ‘Permanent Affiliation’ by Andhra University
- Recognition under 2(f) & 12(b) of the UGC act.
- Securing highest pass percentage among all the private affiliated colleges of the University.
- Good number of placements in reputed organizations.
- Quality publications by the faculty in Journals of repute with impact factor.
- ANITS has been recognized as Skill Development Centre (SDC) under Andhra Pradesh State Skills Development Corporation (APSSDC) (A State Government Organization)
- MOUs with about 18 organizations and accreditation by TCS, Infosys, Capgemini India (Hyderabad), Silver Partner of keane India L&T(ECC), Tech-Mahindra, Hyundai, BGR Energy, Zunik Energies, FMC Technologies etc., for campus recruitment.
- Students secured top positions at national level in Code-Vita contest organized by TCS and National Chamions in 'ASPIRATIONS organized by Infosys with IITs, NITs and other premium engineering colleges across the Nation and emerged as Winners.
- **In-house development of software for student feedback, result analysis, attendance, web-site design etc.**
- Top-Ten Most Preferred Colleges out of 700+ Private Engg. Colleges in the state of Andhra Pradesh (APSCHE bulletin).

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DEPARTMENT PROFILE

The Mechanical Engineering Department of ANITS was started in the academic year 2005-06 and offers courses of B.Tech. programme with an in-take of 210 and M.Tech. (Machine Design) with an in-take of 18. The department is presently having 41 highly qualified faculty members who are having rich academic and industrial experience. The department possesses best infrastructure facilities in various labs like Workshop, Strength of Material lab, Fluid Mechanics lab, CAD/CAM Lab, Heat transfer lab, Mechatronics Lab, e-yantra Lab and Experimental stress analysis lab. To serve the student needs beyond curriculum and make them industry ready, additional experiments are being conducted in the labs and softwares were installed which are beyond the prescribed syllabus.

The department strongly believes that for disseminating knowledge to the students and to make them abreast with latest developments, good research activities are the need of the day along with regular teaching. Due to the subtle efforts of faculty and the infrastructure available, the department attracts students of good EAMCET ranks in this region. Special impetus is given to students to improve their managerial skills. They are motivated to organize various events in the department which includes national seminars and technical symposiums. They are also encouraged to participate in various events organized by reputed colleges and have won many prizes every year bringing laurels to the department. To make the students aware of latest technologies and also industrial needs, guest lectures by eminent persons from academics and industry, industrial visits etc., are being organized regularly in the department. Apart from this, Mechanical Engineering department has started various student chapters such as ISHRAE {Indian Society for Heating, Refrigerating and Air Conditioning Engineers} IE chapter and entrepreneurship development cell (EDC) which organizes various training programs to enhance career prospects of students. The department has various student clubs i.e., Society of Automotive Engineers (SAE) Collegiate Club, CYBORG Robotics club and U2CAN student activity club.

DEPARTMENT OF MECHANICAL ENGINEERING

VISION OF THE DEPARTMENT:

- ANITS, Mechanical Department envisages to become a premier centre of learning for knowledge seekers with state of art laboratories, research facilities and highly competent luminaries in the faculty ranks.

MISSION OF THE DEPARTMENT:

- To make our students competent and build their career upon a solid foundation of knowledge.
- To make our students future leaders for industry, academia and society whose ideas are based on fundamental knowledge, analytical skills, creativity and ethics.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1 To enable the students to address the challenges faced in mechanical and other allied streams with a solid foundation on the principles of mechanical engineering, mathematics, sciences and with good knowledge in modern computational, analytical and simulation tools and techniques.

PEO2 To educate the students to design, construct, manage and develop mechanical engineering systems with a research orientation, in a way such that the systems are strong technically, viable economically and accepted socially to enhance quality of life.

PEO3 To enable the students to communicate effectively to excel in their profession, pursue life-long learning, good at teamwork and adhere to ethics to achieve their career and organizational goals

PROGRAM OUTCOMES (POs)

- PO-1 **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO-2 **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.
- PO-3 **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.
- PO-4 **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.
- PO-5 **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.
- PO-6 **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.
- PO-7 **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.
- PO-8 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO-9 **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO-10 **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.
- PO-11 **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.
- PO-12 **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.
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PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO-1 The student will be able to apply the principles of mathematics, sciences and engineering fundamentals to formulate, review & analyze the problems in the fields of manufacturing and machine design.

PSO-2 The student will be able to develop solutions through experimental investigation & simulation using modern software tools & further analyze the data obtained to arrive at valid conclusions in manufacturing & machine design streams.

ACADEMIC REGULATIONS

ACADEMIC REGULATIONS FOR B.TECH PROGRAMME UNDER AUTONOMOUS STATUS

(W.E.F. THE ADMITTED BATCH OF 2020-21)

I. Admissions :

Admissions into first year of B.Tech. programme and admissions into second year (lateral entry) of B.Tech. programme of the Institute will be as per the norms stipulated by Andhra University & Andhra Pradesh State Council for Higher Education (APSCHE), Govt. of Andhra Pradesh. The academic regulations formulated will be applicable for the batch of students admitted in 2019-20 and in case of Lateral Entry admissions from 2020-21.

II. Programmes Offered :

The following are the B.Tech. Programmes offered by the Institute.

1. Chemical Engineering
2. Civil Engineering
3. Computer Science & Engineering
4. Electrical & Electronics Engineering
5. Electronics & Communication Engineering
6. Information Technology
7. Mechanical Engineering

III. Structure of the B. Tech. Programme :

The programme consists of Humanities, Basic Sciences, Engineering Sciences, Engineering and Technology courses. The complete programme is distributed over eight semesters with two semesters per academic year. Every branch of B.Tech programme will have a curriculum and syllabi for the courses recommended by the Board of Studies and approved by the Academic Council. The academic programmes of the Institute follow the credit system. The curriculum of B.Tech programme is designed to have a total of 160 credits of which a student should acquire all 160 credits to get the degree awarded and to determine the final CGPA. The lateral

entry students shall have a total of 122 credits of which one should acquire all 122 credits to get the degree awarded and to determine the final CGPA.

Different types of courses offered :

Apart from the Professional Core (PC), Basic Sciences (BS), Humanities and Social Sciences (HS), Engineering Sciences (ES) and project (PR), various other courses are offered in the programme as mentioned below.

Open Elective (OE) category :

Under this category electives from other technical and / or emerging subjects / inter disciplinary subjects / MOOCs are offered.

Open elective is a course offered by any department other than home department and the student has to choose elective offered by other departments as and when offered by the department.

To make the students abreast with the latest technological developments, the departments also offer emerging subjects in the curriculum.

The student can register for MOOCs course as per the curriculum designed and as and when scheduled by the department. However, its grade will be accorded by a duly constituted departmental committee.

Professional Elective category (PE) :

Professional elective is a specialized course offered by the department. The student has to register for professional electives as offered by the department during the programme as per his choice and as provided in the curriculum.

Mandatory Non Credit Courses

In order to enhance the life skills of the students and acquaint them with general awareness in multi-disciplinary fields, mandatory non credit courses were designed which will have student engagement with faculty but does not carry any credits. Induction programme, courses such as Human values & Professional Ethics,

Environmental Studies etc., are categorized as Mandatory non credit courses.

For the award of the degree, the student has to secure a minimum pass grade or above in all the mandatory courses, registered open electives, MOOCs, registered professional electives.

IV. *Duration of the Programme :*

The duration of the programme is four academic years consisting of two semesters in each academic year. A student is permitted to complete the programme in a stipulated time frame of 8 consecutive academic years from the date of initial admission. Students joining the programme in the 2nd year through lateral entry scheme shall have to complete the programme in a stipulated time frame of 6 consecutive academic years from the date of initial admission.

V. *Medium of Instruction :*

The medium of instruction and examination is in English.

VI. *Minimum Instruction Days :*

Each semester normally consists of a minimum of 90 working days.

VII. *Academic Calendar :*

The dates of all important events, such as commencement of class work, examinations, vacations, etc., during the academic year will be specified in the Academic Calendar of the Institute.

VIII. *Examinations & Evaluation Process :*

The performance of a student in each semester shall be evaluated subject-wise with a maximum of 100 marks each for theory and practical/ drawing subjects.

(A) *Theory Course :*

For all lecture based theory courses, the assessment shall be for 40 marks through internal evaluation and 60 marks through external semester-end examination.

i) *Internal evaluation :*

The sessional marks shall be awarded through internal evaluation by the teachers concerned based on the continuous assessment which includes class tests, quiz, viva-voce, assignments, student regularity, two mid-examinations etc., according to a scheme notified by the department at the beginning of the semester.

Out of the 40 internal evaluation marks, 20 marks are assigned for 2 internal-mid exams, 10 marks for assignments, 5 marks for projects/ case studies /quiz/tests and 5 marks for attendance. The weighted average of 2 internal-mid exams is considered for the 20 marks allocated.

Under any circumstances, no re-examination shall be conducted for the internal mid examinations.

ii) *External evaluation :*

The question paper shall be set externally and the answer scripts are valued through a double valuation system.

The average of the two valuations will be taken for the award of marks. In case, the difference of the marks obtained in the two valuations is more than 20%, then a third examiner shall value the script. Out of the three valuations, the average of marks obtained in third valuation and the marks obtained nearer to third valuation out of first two valuations shall be considered. No revaluation for any subject/course shall be entertained as already double valuation system is in existence. However, recounting is allowed on the request of the candidate on payment of specified fee. Challenge valuation shall also be entertained within a stipulated period set by examination section on payment of specified fee.

(B) *Laboratory Course :*

Each student will perform about 10 to 12 experiments in each laboratory course. Laboratory course will be evaluated for 100 marks, out of which 50 marks are for external examination and 50 marks are for internal evaluation. The internal marks are awarded based on continuous assessment (RUBRICS MODEL), internal lab examination and student regularity. The external examination will be conducted by two examiners, one of them being laboratory class teacher as internal examiner (nominated by the Principal on recommendation of HOD) and an external examiner nominated by the Principal from the panel of experts recommended by the HOD.

A candidate shall be declared to have passed any theory subject/ course if he/she secures not less than 40% in external theory examination and also a minimum of 40% of total marks of that course which assures a minimum of 'P' grade.

A candidate shall be declared to have passed any practical course if he/she secures not less than 50% in external laboratory examination and also a minimum of 50% of total marks of that course which assures a minimum of 'C' grade.

In case of subjects evaluated through internal assessment such as QA-I & II, verbal aptitude, soft skills etc., if a candidate fails, he/she is given an opportunity to improve to pass grade

(P) irrespective of the score he gets over and above pass mark in the re-examination within one month on payment of special examination fee. If he fails in the re-examination, he has to appear for the exam in the consecutive semester/ year along with the subsequent batches.

Any student appearing for the semester-end practical examination is eligible only if he/she submits the bonafide record certified by the laboratory class teacher and the HOD.

(C) Project Work :

The project work is evaluated through internal assessment in the IV Year I semester through continuous assessment process and a final evaluation by a committee nominated by the HOD. In IV year II semester, the assessment process consists of both internal and external evaluation. The internal evaluation will be done through continuous assessment process and the external evaluation will be done by a duly constituted committee consisting of at least one external expert nominated by the Principal. If a student fails in the fourth year first semester project, he has to appear for re-assessment within one month for which he has to pay the re-examination fee if any.

(D) Industrial Training :

The industrial training is assessed internally for 100 marks by an internal evaluation committee constituted by the HOD.

(E) Supplementary Exam :

The supplementary examinations will be conducted after the completion of the regular examination of the corresponding semester.

IX. Attendance Regulations :

Attendance of a student is computed by considering total number of periods conducted in all courses as the denominator and the total number of periods actually attended by the student in all courses, as the numerator. It is desirable for a student to put in 100% attendance in all the subjects. However, a candidate shall be permitted to appear for the semester end examination provided he maintains a minimum of 75% overall attendance in the semester.

The shortage of attendance on medical grounds can be condoned up to a maximum of 9% provided the student puts in at least 66% attendance and provided the Principal is satisfied with the genuineness of the reasons. The Medical Certificates are to be submitted to the Head of the Department when the candidate reports to the classes immediately after the absence. Medical certificates submitted after finalization of attendance shall not be entertained. Condonation fee as fixed by the institute for those who put in attendance greater than 66% and less than 75% shall be charged before the semester-end examinations.

In the case of students who participate in co-curricular, extra-curricular activities like student seminars, N.S.S, N.C.C, Inter-collegiate tournaments and any such other activities involving the representation of the Institute, with the prior approval of the Principal, the candidate may be deemed to have attended the classes during the actual period of such activity, solely for the purpose of attendance.

A student, who could not satisfy the minimum attendance requirement of 66% in any semester, shall be declared 'Detained'. He is not eligible to appear for the semester end examinations.

He will not be promoted to the next semester and shall have to repeat that semester with the next batch(es) of students. Such students who are detained and seek readmission, should submit an undertaking/a declaration that they will abide by the regulations existing at the time of readmission.

X. Minimum Academic Requirements :

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in Item No. IX.

A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory subject if only he secures not less than 40% marks in the semester-end examination and a minimum of 40% marks in the sum of the internal evaluation and semester-end examination taken together. In the labs/ projects, the student should secure a minimum of 50% marks in the external examination and a minimum of 50% marks in the sum of internal evaluation and external examination evaluation taken together.

Further, a candidate has to secure a minimum of 40 % in theory examination (excluding sessional marks) and a minimum of 50 % (excluding sessional marks) in the Practical Examination / Project / Field Work / Viva Voce / Industrial Training in Semester –End / Year

– End Examination and 50% aggregate to pass.

A student will be promoted to the next semester, if only he satisfies the minimum attendance requirement. Further the student should also satisfy minimum credit requirement to be promoted to III Year or to IV year as per the norms given below.

A student shall be promoted from II Year to III Year only if he fulfills the academic requirement of total 40 % of all credits from regular and supplementary examinations of I Year and II Year – I Semester {i.e., total 3 semesters} examinations, irrespective of whether the candidate takes the examination in all the subjects or not.

A student shall be promoted from III Year to IV Year only if he fulfills the academic requirements of total 40% of credits from regular and supplementary examinations of I Year, II Year and III Year- I Semester {i.e., total 5 semesters}, irrespective of whether the candidate takes the examinations in all the subjects or not.

For lateral entry students, there is no credit based restriction for promotion from II year to III year. But a lateral entry student shall be promoted from III year to IV year only if he fulfills the academic requirements of total 40% of credits from regular and supplementary examinations of II year and III year- I Semester {i.e., total 3 semesters} irrespective of whether the candidate takes the examinations in all the subjects or not.

Students, who fail to complete their B.Tech. Programme within eight academic years from the year of their admission or fail to acquire the credits stipulated for the programme shall forfeit their seat in B.Tech. Programme and their admission shall stand cancelled. For lateral entry students they have to complete the programme in six years from their year of admission.

XI. Award of Grades :

The absolute grading system is adopted as follows :

S.No	Range of marks %		Grade	Grade Points	Remarks
1	> 90	< 100	O	10	Out Standing
2	> 80	< 90	A+	9	Excellent
3	> 70	< 80	A	8	Very Good
4	> 60	< 70	B+	7	Good
5	> 55	< 60	B	6	Above Average
6	> 50	< 55	C	5	Average
7	> 40	< 50	P	4	Pass
8		< 40	F	0	Fail
9			I	0	Ab (Absent)

Note: Minimum grade to pass in a laboratory course is 'C'.

The performance of a student at the end of each semester is indicated in terms of Semester Grade Point Average (SGPA). The SGPA is calculated as below :

$$\text{SGPA} = \frac{\sum(\text{credits of a course} \times \text{grade points awarded for a course})}{\sum(\text{Credits of a course})}$$

SGPA is calculated for the candidates who have passed in all the courses in that semester.

Cumulative Grade Point Average (CGPA) will be calculated from II semester onwards up to the final semester and its calculation is similar to that of SGPA, considering all the courses offered from the first semester onwards.

CGPA is calculated for those who clear all the courses including present semester.

XII. Award of Class :

For award of class, all 160 credits are considered in case of four year programme and 122 credits in case of lateral entry admitted students. A candidate, who becomes eligible for the award of B.Tech., degree, shall be placed in one of the following classes.

S.No.	Class	CGP A
1	First Class with Distinction	7.0 or more*
2	First Class	6.0 or more
3	Second Class/Pass	5.0 or more but less than 6.0

****First class with Distinction will be awarded only to those students who clear all the subjects of the program in first attempt of regular examinations.***

The CGPA can be converted to aggregate percentage by multiplying CGPA with 10, in case of requirement by any other university or for any other purpose.

XIII. Eligibility for Award of B.Tech. Degree :

A student shall be eligible for the award of the B.Tech degree

if he fulfills all the following conditions :

- 1) Registered and successfully completed all the components prescribed for eligibility in the Programme of study to which he is admitted within the stipulated period,
- 2) Obtained CGPA greater than or equal to 5.0 (Minimum requirement for Pass),
- 3) No disciplinary action is pending against him and
- 4) Has no dues to the Institute including hostels.

XIV. Malpractices :

The Controller of Examinations/Dean of Examinations shall refer the cases of suspected malpractices in mid examinations and semester-end examinations to Malpractice Enquiry Committee constituted by the Institute. Such committee shall follow the approved scales of punishment. The Principal shall take necessary action against the erring students based on the recommendations of the committee.

XV. Transitory Regulations

1. The student who is detained, on re-admission has to continue the course work along with the regular students of the respective semester in which the student gets re-admission.
2. The student shall be required to do all the courses in the curriculum prescribed for the batch of students in which the student joins subsequently.
3. The student has to register for pre-requisite / substitute / Compulsory subjects offered in place of subjects already studied earlier. However, exemption will be given to those candidates who have already passed such courses in the earlier semester(s) he was originally admitted into and substitute subjects are offered in place of them as decided by the Board of Studies.
4. The mode of internal evaluation and end-semester examinations shall be on par with the regular students, i.e.,

the student has to follow the then mode of internal evaluation and the then question paper model for the end-semester examinations along with the regular students of the respective semester in which the student gets re-admission. The marks secured in the internal and end-semester examinations will be pro-rated in accordance with the regulations under which the student was first admitted.

5. For the subjects studied under earlier regulations but failed, the student has to appear, pass and acquire credits from the supplementary examinations as and when conducted. The question paper model shall remain same as one in which the student took examination during earlier regulations.
6. The promotion criteria based on attendance as well as credits shall be in accordance with the regulations under which the student was first admitted.
7. The decision of the Board of Studies will be final on any other clarification in this regard.

XVI. *Amendments to Regulations :*

The Institute may, from time to time, revise, amend, or change the Regulations, Schemes of Examinations, and / or Syllabi and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the Institute.

XVII. *General :*

- (i) **Where the words ‘he’, ‘him’, ‘his’, occur in the regulations, they include ‘she’, ‘her’, ‘hers’.**
- (ii) **The academic regulation should be read as a whole for the purpose of any interpretation.**
- (iii) **In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.**

CURRICULUM

I Year Course structure												
Semester-I												
Course Code	Title of the course	Category	Periods						Sessionals Marks	Semesterend Exammarks	Total Marks	Credits
			L	T	P	E	O	Total				
MEC111	Engineering Mathematics - I	BS	3	0	0	2	4	9	40	60	100	3
MEC112	Engineering Physics	BS	3	0	0	1	3	7	40	60	100	3
MEC113	Engineering Chemistry	BS	3	0	0	1	3	7	40	60	100	3
MEC114	Biology for Engineers	BS	2	1	0	1	3	7	100	---	100	3
MEC115	Engineering Graphics	ES	2	0	3	1	4	10	40	60	100	3.5
MEC116	Engineering Physics Lab	BS	0	0	3	0	1	4	50	50	100	1.5
MEC117	Engineering Chemistry Lab	BS	0	0	3	0	1	4	50	50	100	1.5
MEC118	Engineering Workshop	ES	0	0	3	0	1	4	50	50	100	1.5
MEC119	Human Values and Professional Ethics(Mandatory non-credit course)	MC	0	0	0	3	1	4	50		50	0
Total			13	1	12	9	21	56	460	390	850	20
Semester-II												
Course Code	Title of the course	Category	Periods						Sessionals Marks	Semesterend Exammarks	Total Marks	Credits
			L	T	P	E	O	Total				
MEC121	Engineering Mathematics - II	BS	2	1	0	2	4	9	40	60	100	3
MEC122	Communicative English	HS	3	0	0	0	2	5	40	60	100	3
MEC123	Problem solving with C	ES	3	0	0	0	2	5	40	60	100	3
MEC124	Basic Electronics Engineering	ES	3	0	0	1	3	7	40	60	100	3
MEC125	*Advanced Engineering Graphics	SC	1	0	2	2	4	10	50	50	100	2
MEC126	English Language Laboratory	HS	0	0	3	0	1	4	50	50	100	1.5
MEC127	Problem solving with C- lab.	ES	0	0	3	3	3	9	50	50	100	1.5
MEC128	Environmental studies (Mandatory non-credit course)	MC	0	0	0	3	3	6	50		50	0
Total			12	1	8	11	22	55	360	390	750	17

II Year Course Structure												
Semester-I												
Course Code	Title of the course	Category	Periods						Sessionals Marks	Semester end Exams marks	Total Marks	Credits
			L	T	P	E	O	Total				
MEC211	Engineering Mathematics - III	BS	2	1	0	2	4	9	40	60	100	3
MEC212	Material science & Metallurgy	PC	3	0	0	1	2	6	40	60	100	3
MEC213	Engineering Mechanics	PC	2	1	0	2	4	9	40	60	100	3
MEC214	Mechanics of solids	PC	2	1	0	2	4	9	40	60	100	3
MEC215	Basic Thermodynamics	PC	2	1	0	2	4	9	40	60	100	3
MEC216	Manufacturing Processes	PC	3	0	0	2	2	7	40	60	100	3
MEC217	Mechanics of solids-Lab	PC	0	0	3	0	1	4	50	50	100	1.5
MEC218	Manufacturing- Lab	PC	0	0	3	0	1	4	50	50	100	1.5
Total			14	4	6	11	22	57	340	460	800	21
Semester-II												
Course Code	Title of the course	Category	Periods						Sessionals Marks	Semester end Exams marks	Total Marks	Credits
			L	T	P	E	O	Total				
MEC 221	Engineering Mathematics - IV	BS	2	1	0	2	4	9	40	60	100	3
MEC 222	Basic Electrical Engineering	ES	2	1	0	1	3	7	40	60	100	3
MEC 223	Applied Thermal Engineering-I	PC	2	1	0	2	4	9	40	60	100	3
MEC 224	Kinematics of Machinery	PC	2	1	0	2	4	9	40	60	100	3
MEC 225	Metal cutting, Machine Tools & Metrology	PC	3	0	0	2	2	7	40	60	100	3
MEC 226	Computer Aided Modelling	SC	1	0	2	2	4	10	50	50	100	2
MEC 227	Machine Tools Lab	PC	0	0	3	0	1	4	50	50	100	1.5
MEC 228	**Basic Electrical & Electronics Engineering-Lab	ES	0	0	3	0	1	4	50	--	50	1.5
Total			12	4	8	11	23	59	350	400	750	20

III Year Course structure												
Semester-I												
CourseCode	Titleofthecourse	Category	Periods						SessionalsMarks	SemesterendExammarks	TotalMark s	Credits
			L	T	P	E	O	Total				
MEC 311	***Open Elective-I	OE	3	0	0	1	2	6	40	60	100	3
MEC 312	Humanities Elective	HS	3	0	0	1	2	6	40	60	100	3
MEC 313	Design Thinking	ES	2	0	2	1	2	6	40	60	100	3
MEC 314	Dynamics of Machinery	PC	2	1	0	2	4	9	40	60	100	3
MEC 315	Applied Thermal Engineering-II	PC	2	1	0	2	4	9	40	60	100	3
MEC 316	Design of Machine Elements-I	PC	2	1	0	2	4	9	40	60	100	3
MEC 317	Applied Mechanics-Lab	PC	0	0	3	0	1	4	50	50	100	1.5
MEC 318	Thermal Engineering Lab	PC	0	0	3	0	1	4	50	50	100	1.5
MEC 319	Quantitative Aptitude-I & Verbal Aptitude	HS	0	0	3	1	3	7	100	0	100	1.5
MEC 320	Industrial Training-I	PR	0	0	0	0	0	0	--	100	100	2
Total			15	3	9	10	23	60	440	560	1000	24.5

Semester-II												
CourseCode	Titleofthecourse	Category	Periods						SessionalsMarks	SemesterendExammarks	TotalMark s	Credits
			L	T	P	E	O	Total				
MEC 321	***Open Elective-II	OE	3	0	0	0	2	5	50	50	100	3
MEC 322	Professional Elective-I	PE	3	0	0	1	2	6	40	60	100	3
MEC 323	Professional Elective-II	PE	3	0	0	1	3	7	40	60	100	3
MEC 324	Finite Element Analysis	SC	2	0	0	2	4	10	40	60	100	2
MEC 325	Fluid Mechanics & Hydraulic Machinery	PC	2	1	0	2	3	8	40	60	100	3
MEC 326	Design of Machine Elements-II	PC	2	1	0	2	4	9	40	60	100	3
MEC 327	Fluid Mechanics & Hydraulic Machinery -Lab	PC	0	0	3	0	1	4	50	50	100	1.5
MEC 328	Computer Aided Design & Manufacturing Lab	SC	1	0	3	0	2	5	50	50	100	2.5
MEC 329	Quantitative Aptitude-II & Soft Skills	HS	0	0	3	2	3	8	100	0	100	1.5
Total			16	2	9	10	24	62	450	450	900	22.5

IV Year Course structure

Semester-I

Course Code	Titleofthecourse	Category	Periods						Sessionals Marks	SemesterendExam marks	TotalMarks	Credits
			L	T	P	E	O	Total				
MEC 411	***Open Elective-III/Emerging subject	OE	3	0	0	0	2	5	40	60	100	3
MEC 412	Professional Elective-III	PE	3	0	0	1	2	6	40	60	100	3
MEC 413	Professional Elective-IV	PE	3	0	0	1	3	7	40	60	100	3
MEC 414	Professional Elective-V	PE	3	0	0	1	3	7	40	60	100	3
MEC 415	Heat Transfer	PC	2	1	0	2	4	9	40	60	100	3
MEC 416	Metrology & Mechatronics-Lab	PC	0	0	3	0	1	4	50	50	100	1.5
MEC 417	Heat Transfer-Lab	PC	0	0	3	0	1	4	50	50	100	1.5
MEC 418	****Industrial Training-II	PR	0	0	0	0	0	0	--	100	100	2
MEC 419	Project Phase-I	PR	0	0	4	0	4	8	--	100	100	2
MEC 4110	Automotive Engineering	SC	2	0	0	2	4	10	40	60	100	2
Total			16	1	10	7	24	60	340	660	1000	24

Semester-II

Course Code	Titleofthecourse	Category	Periods						Sessional sMarks	Semesteren dExa	TotalMarks	Credits
			L	T	P	E	O	Total				
MEC 421	***Open Elective-IV/Emerging subject	OE	3	0	0	0	2	5	40	60	100	3
MEC 422	Project Phase-II/Industrial Internship	PR	0	0	16	0	16	32	100	100	200	8
Total			3	0	16	0	18	37	140	160	300	11

Professional Elective-I	Production Planning & Control	Gas Turbines & Jet Proplusions	Automation in manufacturing	Non-Destructive Testing
Professional Elective-II	Refrigeration & Air-conditioning	Power plant Engineering	Nano Technology	Quality & Reliability engineering
Professional Elective-III	Mechanical Measurements	Computatinal Fluid dynamics	Condition monitoring	Industrial tribology
Professional Elective-IV	Non-Conventional Energy Sources	Managerial Economics & Financial Accountancy	Unconventional machine process	Artificial intelligence
Professional Elective-V	Operations Research	Alternate fuels	Advanced mechanics of materials	Product Design& Manufacturing
Humanities Electives	Industrial Engineering Management	Stastical Quality Control	Enterprenuership development	Supply chain management

***Open Elective- III/Emerging subject	Mechatronics
***Open Elective- IV/Emerging subject	Robotics

Note: Open electives-I & II are offered by other departments. The CSE/IT departments are requested to offer PYTHON-programming & Data structures as open electives.

Note: In Open electives-III & IV/Emerging subjects -only emerging subjects will be offered by the parent department. The subjects could be Mechatronics, Robotics, Additive manufacturing, Condition monitoring etc. (will be decided by the department)

Honor subjects, Generalized Minor subjects and Specialized minor in Robotics

1. Honor subjects:

a. Manufacturing pool

- i. Micro Electro Mechanical Systems (MEMS)
- ii. Advanced Manufacturing Methods
- iii. Design for Manufacturing & Assembly
- iv. Machine Tool Design

b. Thermal Engineering pool

- i. Fuels and Combustion Thermodynamics
- ii. Energy Audit and Management
- iii. Advanced Technologies in Automotive Engines
- iv. Advanced Fluid Mechanics

c. Design pool

- i. Composite materials
- ii. Introduction to Fracture Mechanics
- iii. Mechanics of Machinery
- iv. Engineering Tribology

d. Industrial Engineering pool

- i. Work system Design
- ii. Manufacturing planning and control
- iii. Quality engineering and management
- iv. Inventory control and supply chain management

2. Generalized Minor subjects:

- a. Elements of Mechanical Engineering
- b. Principles of Manufacturing processes
- c. Fundamentals of Mechanical Design
- d. Operations Research
- e. Automobile Engineering
- f. Waste to energy conversion

3. Specialized minor in Robotics:

- a. Principles of Robotics
- b. Elements of Mechatronics
- c. Computer-Aided Manufacturing
- d. Autonomous Vehicles
- e. Pneumatics and Hydraulics
- f. Flexible Manufacture and System

Minor subjects offered by the department of Mechanical Engineering (R20)

1. Generalized Minor subjects:

- i. Elements of Mechanical Engineering
- ii. Principles of Manufacturing processes
- iii. Fundamentals of Mechanical Design
- iv. Operations Research
- v. Automobile Engineering
- vi. Waste to energy conversion

2. Specialized minor in Robotics:

- i. Principles of Robotics
- ii. Elements of Mechatronics
- iii. Computer-Aided Manufacturing
- iv. Autonomous Vehicles
- v. Pneumatics and Hydraulics
- vi. Flexible Manufacturing Systems

ENGINEERING MATHEMATICS-I
MATRIX ALGEBRA & MULTIVARIABLE CALCULUS

Common to all branches

Course Code - Category: MEC 111 - BS

Credits:3

L	T	P	E	O
3	0	0	1	6

Sessional Marks:40

End Exam: 3 Hours

End Exam Marks:60

Course Objective:

To provide the students with sufficient knowledge in calculus and matrix algebra, this can be used in their respective fields.

Course outcomes:

By the end of the semester, the student will be able to:	
CO1	Apply elementary transformations to reduce the matrix into the echelon form and normal form to determine its rank and interpret the various solutions of system of linear equations
CO2	Identify the special properties of a matrix such as the eigen value, eigen vector, employ orthogonal transformations to express the matrix into diagonal form, quadratic form and canonical form
CO3	Equip themselves familiar with the functions of several variables and mean value theorems
CO4	Evaluate double and triple integral techniques over a region in two dimensional and three dimensional geometry
CO5	Familiarize with special functions to evaluate some proper and improper integrals using beta and gamma functions

Unit - I: Linear Equations

10 Periods

Rank of matrix, normal form of a matrix, PAQ form, Gauss Jordan Method of finding the inverse, consistency of linear system of equations.

Learning outcome: At the end of this unit student will be able to

- Solve the system of equations using the rank.

Unit - II: Linear transformations and Quadratic forms

14 Periods

Linear transformations, orthogonal transformations, vectors (linearly independent & dependent), eigen values, eigen vectors, properties of eigen values, Cayley - Hamilton theorem (without proof), reduction to diagonal form, reduction of Quadratic form to Canonical form, nature of the Quadratic form.

Learning outcome: At the end of this unit, student will be able to

- Identify the special properties of a matrix such as the eigen values, eigen vectors, diagonal form and nature of the quadratic forms.

Unit - III: Single and Multivariable Calculus

12 Periods

Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem (All theorems without proof). Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, Taylor's series expansion of two variable function, maxima and minima of functions of two variables, method of Lagrange's multipliers.

Learning outcome: At the end of the unit, student will be able to

- Analyze the behavior of functions by using mean value theorems.
- Estimate the maxima and minima of multivariable functions.

Unit - IV: Multiple Integrals

14 Periods

Double integrals, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves, evaluation of triple integrals, volumes of solids, change of variables between Cartesian cylindrical and spherical polar coordinates, calculation of mass, center of gravity.

Learning outcome: At the end of the unit, the student will be able to

- Evaluate double integrals of functions of several variables in two dimensions using Cartesian and polar coordinates.
- Apply double and triple integration techniques in evaluating areas and volumes bounded by a region.

Unit - V: Special functions

10 Periods

Beta and Gamma functions and their properties, relation between Beta and Gamma functions, evaluation of double and triple integrals by using Beta and Gamma functions, error function.

Learning outcome: At the end of this unit, the student will be able to

- conclude the use of special functions in multiple integrals.

Textbooks:

1. **B. S. Grewal**, "*Higher Engineering Mathematics*", 44/e, Khanna Publishers, 2017.
2. **Erwin Kreyszig**, "*Advanced Engineering Mathematics*", 10/e, John Wiley & Sons, 2011.

References:

1. **N. P. Bali**, "*Engineering Mathematics*", Lakshmi Publications.
2. **George B. Thomas, Maurice D. Weir and Joel Hass**, "*Thomas Calculus*", 13/e, Pearson Publishers, 2013.
3. **H. K. Dass**, "*Advanced Engineering Mathematics*", S. Chand and company Pvt. Ltd.

ENGINEERING PHYSICS

(Common to all branches)

Course Code - Category: MEC 112 - BS

Credits:3

L T P E O
3 0 0 1 4

Sessional Marks:40

End Exam: 3 Hours

End Exam Marks:60

Course Objectives

- To impart knowledge in basic concepts of physics relevant to engineering applications
- To introduce advances in technology for engineering applications

Course Outcomes

The students will be able to

CO1	Interpret the relation between heat, work and entropy with thermodynamic laws.
CO2	Explain and analyze the relation between electric current and magnetic fields, production and applications of ultrasonics.
CO3	Apply the optical phenomena like Interference, Diffraction and Polarization to various fields.
CO4	Explain the working principle and applications of lasers and fiber optics.
CO5	Interpret the microscopic behavior of matter with quantum mechanics.

SYLLABUS

UNIT – I

10 periods

Thermodynamics:

Heat and work, first law of thermodynamics and its applications, reversible and irreversible processes, heat engine, Carnot cycle and its efficiency, Carnot's theorem, second law of thermodynamics, entropy – entropy change in reversible and irreversible processes, entropy and second law, entropy and disorder, entropy and probability, third law of thermodynamics.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the relation between heat and work.
- Recognize how much heat is converted into work.
- Identify the relation between entropy and different thermodynamic phenomena.

UNIT-II

10 periods

Electromagnetism:

Faraday's law of induction, Lenz's law, Integral and differential forms of Faraday's law, self-inductance, energy stored in electric and magnetic fields, Poynting vector, displacement current, Maxwell's equations in integral form (no derivation), wave equation, propagation of electromagnetic waves in free space.

Ultrasonics: Properties of ultrasonic waves, production of ultrasonic waves by magnetostriction and piezoelectric methods, applications of ultrasonics.

Learning Outcomes:**At the end of this unit the student will be able to**

- Explain how to generate electric current by electromagnetic induction Phenomena.
- Evaluate Maxwell's displacement current and correction in ampere's law.
- Assess electromagnetic wave propagation in free space and its power.
- Recognize the properties and production of ultrasonics.

Identify the use of ultrasonics in different fields

UNIT-III

10 periods

Optics**Interference:** Introduction, principle of superposition, coherence, Young's double slit experiment, conditions for interference, interference in thin films by reflection, wedge shaped film and Newton's rings**Diffraction:** Introduction, Fresnel and Fraunhofer diffraction, diffraction at a single slit**Polarisation:** Introduction, types of polarized light, double refraction in uniaxial crystals, Nicol's prism, quarter and half-wave plate, production and detection of plane, circular and elliptically polarized light.**Learning Outcomes:****At the end of this unit the student will be able to**

- Explain various types of coherent sources.
- Outline the conditions for sustained interference.
- Analyze the differences between interference and diffraction.
- Illustrate the concept of polarization of light and its applications.
- Classify the production and detection of different polarized light.

UNIT-IV

10 periods

Lasers: Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, semiconductor laser, applications of lasers**Fibre optics:** Introduction to optical fibers, principle of propagation of light in optical fibers,, acceptance angle and acceptance cone, numerical aperture, types of optical fibers, modes of propagation and refractive index profiles, attenuation in optical fibers, advantages of optical fibers in communications, fiber optics communication system, applications of optical fibers, fiber optic sensors**Learning Outcomes:****At the end of this unit the student will be able to**

- Explain the working principle and properties of lasers
- Analyze the production and applications of lasers.
- Explain the working principle of optical fibers and its classification based on refractive index profile and mode of propagation.
- Identify the applications of optical fibers in medical, communication and other fields.

Quantum mechanics:

Planck's hypothesis, wave-particle duality, introduction to quantum theory, de-Broglie concept of matter waves, Heisenberg's uncertainty principle, Schrodinger's time independent and time dependent wave equations, physical significance and properties of the wave function ψ , application of Schrodinger wave equation for a particle in one dimensional well – Eigen wave functions and energy Eigen values of the particle

Elements of Statistical mechanics: Elementary concepts of Maxwell-Boltzman, Bose-Einstein and Fermi-Dirac statistics (no derivation)

Learning Outcomes:

At the end of this unit the student will be able to

- Explain the dual nature of radiation and matter.
- Realize de Broglie concept of matter waves and Heisenberg uncertain principle.
- Identify Schrodinger wave equation to solve the problems.
- Explain the importance of fundamentals of statistical mechanics

Text Books :

1. **M.N.Avadhanulu & P.G.Kshirasagar**, "A Text Book of Engineering Physics" – IX Edition, S.Chand Publications, 2014.
2. **S.L.Gupta & Sanjeev Gupta**, "Modern Engineering Physics" -- Dhanpat Rai Publications, 2011.

Reference Books:

1. **V. Rajendran**, "Engineering Physics", McGrawHill Education Private Ltd, 2011.
2. **S.O.Pilai, Sivakami**, "Engineering Physics" – IV Edition, New Age International Publishers, 2011.
3. **Young & Freedman**, "University Physics" – XI Edition, Pearson Education, 2004.
4. **A.Marikani**, "Engineering Physics" - PHI Learning Private Limited, 2009.
5. **Resnick & Halliday**, "Physics Volume II" – VI Edition, WileyIndia Publications 2001.
6. **R K Gaur, S L Gupta**, "Engineering Physics" – VIII Edition, Dhanpat Rai Publications, 2001.
7. **D.K.Bhattacharya, Poonam Tandon**, "Engineering Physics" – Oxford University Press, 2010.

ENGINEERING CHEMISTRY

Common for all branches

Course Code - Category: MEC 113 - BS

Credits:3

L T P E O
3 0 0 1 4

Sessional Marks:40

End Exam: 3 Hours

End Exam Marks:60

Course Objectives:

- To familiarize Engineering Chemistry and its applications
- To provide knowledge on problem associated with impure water and various treatment technologies
- To train the students on the principles and applications of electrochemistry,
- To introduce nano, smart and composite materials

Course Outcomes:

By the end of the semester, the student will be able to:	
CO1	Identify the problems associated with raw water in various applications and can adopt suitable technologies for domestic and industrial feed waters.
CO2	Understand the concepts of electro chemistry for design of suitable batteries and solar energy in view of environmental protection.
CO3	Select and design of suitable materials to prevent corrosion and to protect various parts from corrosion.
CO4	Generalize the properties of semiconducting and ceramic materials, can select suitable materials for specific applications.
CO5	Analyze the importance of nano, composite and smart materials.

SYLLABUS

UNIT I

12 Periods

Water Chemistry: Introduction- Impurities in water; Hardness of water – types of Hardness, units and calcium carbonate equivalents, problems, disadvantages of hard water; Boiler troubles- Scale & Sludge formation, prevention- Internal treatment - (Phosphate, Carbonate and Calgon conditioning) ,Caustic embrittlement

Water treatment techniques: Softening of water by ion exchange method- Principle, Process, advantages; Desalination of water – Reverse Osmosis and Eelectrodialysis; WHO standards for drinking water, Municipal water treatment - Sedimentation, Coagulation, Chlorination-Break point chlorination.

Learning Outcomes:

At the end of this unit the student will be able to

- **List** the differences between temporary and permanent hardness of water (L1)
- **Illustrate** the problems associated with hard water (L2)
- **Explain** the principles of reverse osmosis, electro dialysis and municipal water treatment processes (L2)
- **Solve** problems associated with hard water - scale and sludge (L3)

UNIT-II

10 Periods

Electrochemical cells: Electrode potential, Nernst equation, reference electrodes-SHE and Calomel electrode, Electrochemical series, Electrochemical cell, Cell potential; Primary cells – Dry cell, alkaline battery, hydrogen-oxygen, methanol fuel cells – working of the cells; Secondary cells – lead acid, lithium ion batteries- working of the batteries including cell reactions.

Solar Energy: Photovoltaic cell -Working & applications, Photo galvanic cells with specific examples

Learning Outcomes:

At the end of this unit the student will be able to

- **Apply** Nernst equation for calculating electrode and cell potentials (L3)
- **Explain** the theory and construction of battery and fuel cells (L2)
- **Identify** the applications of solar energy (L2)
- **Construct** different cells (L3)

UNIT – III

10 Periods

Corrosion Chemistry: Definition, Theories of corrosion-Chemical corrosion, metal oxide formation, Pilling Bedworth rule, Electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion; Factors affecting corrosion

Prevention and control: Protection- cathodic protection, Corrosion inhibitors, electroplating of Copper and electroless plating of Nickel, organic coatings-paint and varnish

Learning Outcome:

At the end of this unit the student will be able to

- **Apply** Pilling Bedworth rule for corrosion and corrosion prevention (L3)
- **Demonstrate** the corrosion prevention methods and factors affecting corrosion (L2)
- **Develop** the corrosion resistant materials for industrial and marine applications (L5)
- **Identify** different organic coatings (L3)

UNIT IV

10 Periods

Semiconducting Materials: Band theory of solids – band diagrams for conductors, semiconductors and insulators, Role of doping on band structures. Organic semiconductors and applications.

Ceramic Materials: Cement – raw materials, Manufacturing process, Setting and hardening of cement (hydration and hydrolysis equations); Refractories- classification; engineering applications of ceramics

Learning Outcome:

At the end of this unit the student will be able to

- **Explain** the manufacturing of portland cement (L2)
- **Enumerate** the reactions at different temperatures in the manufacture of cement (L2)
- **Describe** the mechanism of conduction in conducting polymers (L2)
- **List out** the applications of ceramics (L2)

UNIT V

10 Periods

Nanomaterials: Introduction to Nanomaterial- nanoparticles, nanocluster, carbon nanotube (CNT); Chemical synthesis of nanomaterials- sol-gel method; Characterization- Principle and applications of Scanning electron microscope (SEM) and Transmission electron microscope (TEM).

Polymer Composites: Definition, constituents of composites, types - Fiber Reinforced Plastics, Particulate composites, Layer composites, engineering applications of composites;

Smart polymers: Introduction, types of smart polymers and applications

Learning Outcome:

At the end of this unit the student will be able to

- **Classify** nanomaterials (L2)
- **Explain** the synthesis and characterisation of nanomaterials (L2)
- **Explain** the different types of composites and their applications (L2)
- **Identify** different types of smart materials (L2)

Prescribed Text Book

1. **P.C. Jain and M. Jain** “*Engineering Chemistry*”, 16th edition, - DhanapathiRai& Sons, Delhi. 2015.
2. **S.S. Dara** “*A text book of Engineering Chemistry*”, 15th edition, S. Chand& Co. New Delhi, 2014.

Reference books

1. **O.G.Palanna** “*Engineering Chemistry*” Tata McGraw Hill Education pvt ltd, New Delhi, 2009.
2. **V.Raghavan**“ *A Material Science and Engineering*”, 5th edition, Printice Hall India Ltd, 2011.

BIOLOGY FOR ENGINEERS

Course Code - Category: MEC 114 - BS

Credits:3

L	T	P	E	O
3	0	0	1	3

Sessional marks:100

Course Objectives:

- To impart basic knowledge of living organisms and biomolecules.
- To understand the mechanism and applications of enzymes in various process Industries.
- To realize the importance of biology to various engineering disciplines.

Course Outcomes:

By the end of the course, student will be able to:	
CO1	Understand the fundamentals of Living things, their classification, and cell structure of living organisms
CO2	Understand and interpret the relationship between various Biomolecules
CO3	To have a basic knowledge on the importance and applications of various enzymes in relevant industries
CO4	Identifies and demonstrates the cell division, Mendel's laws and molecular basis of information transfer
CO5	Describes the basic principles of design in biological systems, perform the simple bio inspired design process algorithms, robotics relative to their biological analogs

Unit-I - Living world

9 Periods

Characteristics of living organisms, Cell Theory – Cellular basis of Life, Structure of Prokaryotic and Eukaryotic cell. Five Kingdom Classification (Major Groups & Principles of Classification with each kingdom, Microorganisms and their importance to mankind.

Learning Outcomes: At the end of the unit the student will be able to

- **summarize** the basis of life. (L2)
- **distinguish** prokaryotes from eukaryotes. (L3)
- **explain** the differences between biological organisms and manmade systems. (L2)
- **classify** organisms. (L2)

Unit-II- Biomolecules:

9Periods

Classification, Structure and Functions of Carbohydrates, Proteins, Nucleic acids(DNA, RNA), Lipids.

Learning Outcomes: At the end of the unit the student will be able to

- **explain** the relationship between the structure and function of Carbohydrates. (L2)
- **explain** the relationship between the structure and function of proteins. (L2)
- **interpret** the relationship between the structure and function of nucleic acids and lipids. (L2)

Unit-III – Enzymes and its Applications:**9 Periods**

Classification, Properties, Mechanism of enzyme action, and applications in various process Industries, Fermentation and different fermentative products like ethanol, penicillin and Biogas.

Learning Outcomes: At the end of the unit the student will be able to

- **list** different types of enzymes (L1)
- **summarize** the applications of enzymes in industry. (L2)
- **explain** the applications of fermentation in industry. (L2)
- **apply** the law of lock and key model on Mechanism of action (L2)

Unit-IV- Genetics and Molecular Biology:**9Periods**

Mendel's Laws of inheritance, DNA as a genetic material, Cell Division:- Mitosis and Meiosis, Central dogma – DNA Replication, Transcription, Translation, Concept of genetic code, Single Gene disorders in humans.

Learning Outcomes:

After completing this unit, the student will be able to

- **define** Mendel's laws. (L1)
- **demonstrate** DNA as a genetic material. (L2)
- **differentiate** mitosis and meiosis. (L3)
- **explain** the medical importance of gene disorders. (L2)

Unit- V- Bio-inspired Engineering: (Principles & applications):**9 Periods**

Introduction to biologically-inspired designs (BID for Biomedical and Non-biomedical applications) Human-organs-on-chips, Nanostructures for Drug Delivery , Genetic Algorithms, Artificial neural networks, environmental monitoring, Bio-filters, Bio-robotics, 3D Bio-printing.

Learning Outcomes:

After completing this unit, the student will be able to

- **explain** biologically- inspired designs. (L2)
- **apply** Artificial neural networks and Genetic Algorithms to biological systems.(L2)
- **explain** the importance of biology to engineering through Bio-robotics, 3D Bio-printing (L2)

Text Books:

1. **Dr. P.S. Verma, Dr. V.K. Agarwal** “*Cell Biology, Genetics, Molecular Biology, Evolution and Ecology*”– S. Chand Publications. (Unit 1&4)
2. **Widmaier E.P., Raff H., Strang K.T..Vander's** “*Human Physiology - The mechanism of body function with ARIS*” 12th ed. New York, N.Y.: McGraw-Hill. (Unit 5). 2011
3. **J.L.Jain, S.Jain And N.Jain** “*Fundamentals of biochemistry*”. - S.Chand Publishers. (Unit 2&3)

References:

1. **L.E.J.R. Casida** “*Industrial Microbiology*” New Age International Publisher.
2. **Lehninger, Nelson, Cox** “*Principles of Biochemistry*” CBS Publishers.
3. **W.M. Becker** “*The World of the cell*” Global Edition.

ENGINEERING GRAPHICS

(Common for all branches)

Course Code - Category: MEC 115 - ES

Credits:3.5

L T P E O
2 0 3 1 4

Sessional Marks:40

End Exam: 3 Hours

End Exam Marks:60

Course Objectives:

- The course is designed to introduce fundamentals of engineering drawing and apply the principles to draw engineering curves, orthographic projections and isometric projections.

Course Outcomes:

By the end of the course, the student will be able to:	
CO 1	Draw conic sections by different methods and construct cycloidal and involute curves.
CO 2	Project orthographically the points and lines in various positions.
CO 3	Produce orthographic projections of plane surfaces
CO 4	Draw orthographic projections of solids in various orientations.
CO 5	Construct isometric views and isometric projections of simple solids.

SYLLABUS

UNIT I

Introduction to Engineering drawing & basics of geometrical construction. General Construction of conic sections, Ellipse - concentric circle and arcs of circle method, Parabola- rectangle and tangential method Hyperbola - Rectangle hyperbola, Construction of cycloidal curves (cycloid, epicycloid, and hypocycloid), Involute(thread length equal to circumference/ perimeter) - circle and regular polygon.

UNIT II

Orthographic projections – projections of points – projections of straight lines (lines parallel to both HP&VP, lines parallel to one and inclined to other, lines inclined to both the planes)

UNIT III

Projections of regular polygon planes – inclined to one plane, inclined to both the planes.

UNIT IV

Projection of solids: Prisms – Cylinder– Pyramids &Cones –simple positions & axis inclined to one plane, inclined to both the planes.

UNIT V

Isometric projections –Isometric scale, Isometric view & projection of prisms, pyramids, cone, cylinder, sphere, and their combination.

TEXT BOOK:

- N. D. Bhatt “Engineering Drawing” Charotar Publishing House Pvt.Ltd, 53rd Edition : 2014

REFERENCE BOOKS:

- K. L. Narayana& P. Kanniah “Engineering Drawing”
- R. B. Choudary “Engineering Graphics with Auto CAD”
- TrymbakaMurty “Computer Aided Engineering Drawing”

ENGINEERING PHYSICS LAB

Common for all branches

Course Code - Category: MEC 116 - BS

Credits:1.5

L T P E O
0 0 3 0 1

Sessional Marks:50

End Exam: 3 Hours

End Exam Marks:50

Course Objectives

- To enable the students to acquire skill, technique and utilization of the Instruments

Course Outcomes

At the end of this course, the students will be able to	
CO1	Design and conduct experiments as well as to analyze and interpret data
CO2	Apply experimental skills to determine the physical quantities related to heat, electromagnetism and optics

List of experiment (any eight to ten experiments have to be completed)

- Determination of coefficient of thermal conductivity of a bad conductor- Lee's method.
- Determination of radius of curvature of a convex lens - Newton's rings.
- Determination of wavelengths of spectral lines in mercury spectrum-using diffraction grating in normal incidence position.
- Determination of Cauchy's constants of the material of the prism using spectrometer.
- Determination of thickness of a thin paper by forming parallel interference fringes-Wedge method.
- Study of variation of magnetic field along the axis of a current carrying circular coil – Stewart and Gee's apparatus.
- Calibration of a low-range voltmeter using potentiometer.
- Verification of laws of resistance and determination of specific resistance of wire by using Carey- Foster's bridge.
- Determination of refractive indices o-ray and e-ray in quartz crystal (double refraction)
- Determination of the frequency of an electrically maintained tuning fork - Melde's experiment.
- Determination of Rydberg constant using hydrogen discharge tube.
- Characteristics of photo cell and determination of Planck's constant –Photoelectric effect.
- Determination of e/m of an electron by Thomson's method
- Determination of band gap of semiconductor.

Learning Outcomes:

The students will be able to

- **Handle** optical instruments like microscope and spectrometer
- **Determine** thickness of a hair/paper with the concept of interference
- **Estimate** the wavelength and resolving power of different colors using diffraction grating
- **Plot** the intensity of the magnetic field of circular coil carrying current with varying distance
- **Determine** the band gap of a given semiconductor
- **Determine** thermal conductivity of good and bad conductors
- **Determine** resistance and resistivity of the given material
- **Determine** the accuracy of low range voltmeter using potentiometer
- **Evaluate** the refractive index using double refraction phenomena
- **Determine** frequency of electrical tuning fork

Prescribed Book

1. *“Physics Laboratory Manual”* Prepared by Department of Physics ANITS

Reference books

1. **D.P Siva Ramaiah and V. Krishna Murthy** *“Practical physics”* Maruti book Depot
2. **A.R Vegi** *“Comprehensive practical Physic”s* by Vegi Publishers Pvt.Ltd.

ENGINEERING CHEMISTRY LAB

Common for all branches

Course Code - Category: MEC 117 – BS

Credits:1.5

L T P E O
0 0 3 0 1

Sessional Marks:50

End Exam: 3 Hours

End Exam Marks:50

Course Objectives:

- To improve skills in analyzing samples through titration procedures
- To get an idea over instrumental methods of analysis for more accuracy

At the end of this course, the students will be able to	
CO1	Apply experimental skills in analysing samples through titration procedures
CO2	Select and use a suitable instrumental technique for the quantitative analysis for more accuracy

List of Experiments (any ten experiments)

1. i) Preparation of primary standard solution.
ii) Preparation and Standardization of Hydrochloric acid solution.
2. Determination of total Hardness present in the given water sample.
3. Estimation of Iron(II) by permanganate.
4. Estimation of amount of calcium present in the Portland cement by titrimetrically.
5. Estimation of amount of Zinc by EDTA.
6. Estimation of amount of Copper by using Sodium thiosulphate.
7. Determine the strength of acid (lead acid battery) by titrating with strong base using **pH meter**.
8. Estimate the individual strength of acids present in the acid mixture by titrating with strong base using **conductivity meter**.
9. Estimate the amount of Mohr's salt present in the given solution by titrating with potassium dichromate using **potentiometer**.
10. To determine the viscosity of liquid by Ostwald viscometre
11. **Spectrophotometric** estimation of Fe(III) by Potassium thiocyanate.

Demo Experiments

1. Thin layer chromatography and Gas chromatography
2. Preparation of Bakelite
3. Particle size distribution by PSD analyser(Demo-Outsource)
4. Elemental analysis by ICPMS (Demo-Outsource)
5. Introduction of Reaction colourimetry (for Chemical Engineering)

Learning Outcomes:

1. Measure the strength of an acid present in secondary batteries
2. Calculate the hardness of water sample
3. Determine the Potential and conductance of solutions
4. Analyse the cement for Iron and Calcium contents
5. Prepare polymer materials

Prescribed Books

1. **S.K. Bhasin and SudhaRani** “*Laboratory manual on Engineering chemistry*” third edition; DhanpatRai Publishing Company.

Reference Books

1. **S.S. Dara** “*Experiments and calculations in Engineering chemistry*” 9th edition; S. Chand & Company ltd.

ENGINEERING WORKSHOP

Common for all branches except for ECE

Course Code - Category: MEC 118 - ES

Credits:1.5

L T P E O
0 0 3 0 1

Sessional Marks:50

End Exam: 3 Hours

End Exam Marks:50

Course Objectives:

- To provide training and hands on experience to the students on basic Engineering related skills like carpentry, fitting, tin smithy, house wiring and soldering.

Course Outcomes:

By the end of the course, student will be able to:	
CO-1	Produce a variety of carpentry joints.
CO-2	Prepare simple fitting jobs.
CO-3	Fabricate simple jobs like tray,elbow etc. using sheet metal.
CO-4	Understand and build circuits for different types of applications like Stair case wiring, Go-down wiringetc.,.
CO-5	Assemble simple circuits on breadboard using soldering kit.

LIST OF EXPERIMENTS

Minimum of two exercises has to be conducted from each trade.

Trade:

Carpentry

- Cross Lap Joint
- Dovetail Joint
- Mortise and Tennon Joint
- Bridle Joint

Fitting

- V Fit
- Square Fit
- Half Round Fit
- Dovetail Fit

Tin Smithy

- Taper Tray
- Square Box without lid
- Elbow
- Funnel

House Wiring

- Parallel / Series Connection of three bulbs
- Stair Case wiring
- Godown wiring

Soldering

- LED bulb
- Dc motor with pot
- De soldering PCB

Reference book:

- S.K.Hajra Choudhury** "Elements of Workshop Technology" Vol I Manufacturing Processes, ISBN: 8185099146(2017)

Human Values & Professional Ethics

Common to all branches

Course Code - Category: MEC 119 - MC

Credits: 0

L	T	P	E	O
3	0	0	0	1

Sessional Marks:50

Course Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of others.
- To create awareness on assessment of safety and risk

Course outcomes:

By the end of the semester, the student will be able to:	
CO1	Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
CO2	Identify the multiple ethical interests at stake in a real-world situation or practice
CO3	Articulate what makes a particular course of action ethically defensible
CO4	Assess their own ethical values and the social context of problems
CO5	Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human
CO6	Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research

Unit I: HUMAN VALUES:

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others –Living Peacefully –Caring –Sharing –Honesty –Courage-Cooperation–Commitment – Empathy –Self Confidence Character –Spirituality-Case Study.

LEARNING OUTCOMES:

1. learn about morals, values & work ethics.
2. learn to respect others and develop civic virtue.
3. develop commitment
4. learn how to live peacefully

Unit II: ENGINEERING ETHICS:

Senses of „Engineering Ethics-Variety of moral issued –Types of inquiry –Moral dilemmas – Moral autonomy –Kohlberg’s theory-Gilligan’s theory-Consensus and controversy –Models of professional roles-Theories about right action-Self interest –Customs and religion –Uses of Ethical theories –Valuing time –Co operation –Commitment-Case Study

LEARNING OUTCOMES:

1. learn about the ethical responsibilities of the engineers.
2. create awareness about the customs and religions.
3. learn time management
4. learn about the different professional roles.

Unit III: ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering As Social Experimentation –Framing the problem –Determining the facts – Codes of Ethics –Clarifying Concepts –Application issues –Common Ground -General Principles –Utilitarian thinking respect for persons-Case study

LEARNING OUTCOMES:

1. demonstrate knowledge to become a social experimenter.
2. provide depth knowledge on framing of the problem and determining the facts.
3. provide depth knowledge on codes of ethics.
4. develop utilitarian thinking

UNIT IV: ENGINEERS RESPONSIBILITY FOR SAFETY AND RISK:

Safety and risk –Assessment of safety and risk –Risk benefit analysis and reducing risk- Safety and the Engineer-Designing for the safety-Intellectual Property rights(IPR)-.

LEARNING OUTCOMES:

1. create awareness about safety, risk & risk benefit analysis.
2. engineer's design practices for providing safety.
3. provide knowledge on Intellectual Property Rights.

UNIT V: GLOBAL ISSUES

Globalization –Cross culture issues-Environmental Ethics –Computer Ethics –Computers as the instrument of Unethical behavior –Computers as the object of Unethical acts – Autonomous Computers-Computer codes of Ethics –Weapons Development -Ethics and Research –Analyzing Ethical Problems in research- Case Study

LEARNING OUTCOMES:

1. Develop knowledge about global issues.
2. Create awareness on computer and environmental ethics
3. Analyze ethical problems in research.
4. Give a picture on weapons development.

Text Books:

1. **M.Govindarajan, S.Natarajanad, V.S.SenthilKumar** “*Engineering Ethics includes Human Values*” -PHI Learning Pvt. Ltd-2009
2. **Harris, Pritchard and Rabins** “*Engineering Ethics*”, CENGAGE Learning, India Edition, 2009.
3. **Mike W. Martin and Roland Schinzinger** “*Ethics in Engineering*” Tata McGraw-Hill–2003.
4. **Prof.A.R.Aryasri, DharanikotaSuyodhana** “*Professional Ethics and Morals*” Maruthi Publications.
5. **A.Alavudeen, R.KalilRahman and M.Jayakumaran** “*Professional Ethics and Human Values*” -LaxmiPublications.
6. **Prof.D.R.Kiran** “*Professional Ethics and Human Values*”
7. **PSR Murthy** “*Indian Culture, Values and Professional Ethics*” BS Publication

ENGINEERING MATHEMATICS-II
Ordinary Differential Equations & Numerical Methods
Common for all branches

Course Code - Category: MEC 121 - BS

Credits:3

L T P E O
3 0 0 1 4

Sessional Marks:40

End Exam: 3 Hours

End Exam Marks:60

Course Objective:

Create and analyze mathematical models using first and higher order differential equations to solve application problems such as electrical circuits, orthogonal trajectories and Newton's law of cooling and also familiarize the student in various topics in numerical analysis such as interpolation, numerical differentiation, integration and direct methods for solving linear system of equations.

Course outcome:

By the end of the semester, the student will be able to:	
CO1	Demonstrate solutions to first order differential equations by various methods and solve basic application problem related to electrical circuits, orthogonal trajectors and Newton's law of cooling.
CO2	Discriminate among the structure and procedure of solving a higher order differential equations with constant coefficients and variable coefficients
CO3	Apply various numerical methods to solve linear and non-linear equations
CO4	Familiar with numerical integration and differentiation
CO5	Understand Laplace transforms and its properties and finding the solution of ordinary differential equations

Unit - I: Ordinary Differential equations of first order and its applications

12 Periods

First order linear differential equations, Bernoulli's equations, exact differential equations, equations reducible to exact equations, orthogonal trajectories, simple electric circuits (L –R circuit problems), Newton's law of cooling.

Learning outcome: At the end of this unit, the student will be able to

- Solve the first order differential equations and solve basic application problems described by first order differential equations.

Unit - II: Higher order Linear Differential Equations and its applications **10 Periods**

Definitions, rules for finding the complementary function, rules for finding the particular integral, method of variation of parameters, equations reducible to linear equations with constant coefficient, Cauchy's homogeneous linear equation, Legendre's linear equation. Applications: L – C – R circuit problems.

Learning outcome: At the end of this unit, the student will be able to

- Solve the complete solution of linear differential equations with constant coefficient
- Solve basic application problems described by second order linear differential equations with constant coefficients.

Unit - III: Numerical solutions of algebraic and transcendental equations **10 Periods**

Solution of algebraic equation by Bisection method, Newton-Raphson, Regula-Falsi methods. Solution of simultaneous linear algebraic equations, Gauss elimination, Gauss Jordan, Gauss Seidel.

Learning outcome: At the end of this unit, the student will be able to

- Find numerical solution to a system of equations by using different methods.

Unit - IV: Interpolation, Numerical Differentiation & Integration **12 Periods**

Interpolation, Newton forward and backward interpolation formula, Lagrange's formula for unequal intervals. Numerical differentiation - Newton's forward and backward differences to compute first and second derivatives. Numerical integration - Trapezoidal rule, Simpson's one third rule and three eighth rules.

Learning outcome: At the end of this unit, the student will be able to

- Find derivative and integral of a function by using different numerical methods.

Unit - V: Laplace Transforms and its application **16 Periods**

Introduction, definitions, transforms of elementary functions, properties of Laplace transforms, transforms of periodic functions, transforms of derivatives, transforms of integrals, Multiplication by t, division by t, evaluation of integrals by Laplace transforms. Inverse Laplace transforms – other methods of finding inverse transforms (excluding residue method), Convolution theorem (without proof), application's to differential equations, unit step function (without proof) and unit Impulsive functions (without proof).

Learning outcome: At the end of this unit, the student will be able to

- Examine the properties of Laplace transformation.
- Apply the Laplace and inverse Laplace transformations for different types of functions.
- Evaluate ordinary differential equations by using Laplace transformation technique.

Textbooks:

1. **B. S. Grewal** "*Higher Engineering Mathematics*" 44/e, Khanna Publishers, 2017.
2. **Erwin Kreyszig** "*Advanced Engineering Mathematics*" 10/e, John Wiley & Sons, 2011.

References:

1. **R. K. Jain and S. R. K. Iyengar** "*Advanced Engineering Mathematics*" 3/e, Alpha Science International Ltd., 2002.
2. **George B. Thomas, Maurice D. Weir and Joel Hass, Thomas** "*Calculus*" 13/e, Pearson Publishers, 2013.

COMMUNICATIVE ENGLISH

Common for all branches

Course Code - Category: MEC 122 - HS

Credits:3

L T P E O
3 0 0 1 2

Sessional Marks:40

End Exam: 3 Hours

End Exam Marks:60

Prerequisites:

Basic English language skills- LSRW at (10+2) / Intermediate Level

Course Objectives

- To focus on appropriate reading strategies for comprehension of various forms of texts.
- To instruct effective strategies for good writing and exhibit the same in writing well organized passages, reports and other forms of business communication
- Provide knowledge of grammatical structures and vocabulary to be used appropriately in their writing.

Course Outcomes

By the end of the course, the student will be able to:	
CO1	Comprehend, interpret and analyze text and answer questions based on passages.
CO2	Demonstrate good writing skills for effective paraphrasing, argumentative essays and formal correspondence.
CO3	Construct grammatically correct sentences and apply proper vocabulary in speech and writing.

UNIT- I

10 Periods

Reading: 1. Skimming and Scanning to get the main idea of a text and look for specific information- On the Conduct of Life: *William Hazlitt* 2. If- *Rudyard Kipling* –CO1

Writing: Paragraph writing (specific topics) using suitable cohesive devices – Unity, logical order, coherence, opening and closing statements. CO2

Grammar: Clauses and Sentences: Sentence structures, use of phrases and clauses in sentences CO3

Vocabulary: The concept of word formation, Acquaintance with prefixes and suffixes CO3

UNIT –II

10 Periods

Reading: 1. Reading for inferential comprehension- The Brook: *Alfred Tennyson* 2. How I Became a Public Speaker: *George Bernard Shaw* CO1

Writing: Formal letter writing. Letters of complaint, enquiry, report, invite, placing orders, acknowledgment and follow-up letters. CO2

Grammar: Punctuation: importance of proper punctuation in texts, Articles CO3

Vocabulary: Word building using foreign roots CO3

UNIT – III

10 Periods

Reading: 1. Comprehend complex texts identifying the author's purpose-

The Death Trap: *Saki* 2. On Saving Time: *Seneca* **CO1**

Writing :: Reports (Structure and content of a project report) **CO2**

Grammar : Noun-Pronoun Agreement, Subject –Verb agreement, Tenses **CO3**

Vocabulary: Idiomatic expressions **CO3**

UNIT –IV

10 Periods

Reading: 1. Identifying claims, evidences, views, opinions and stance/position.-

Chindu Yellama 2. Muhammad Yunus **CO1**

Writing Skills: 1. Writing structured essays (persuasive and argumentative) using suitable claims and evidences **CO2**

Grammar: Misplaced Modifiers, adjectives, adverbs **CO3**

Vocabulary: Synonyms & Antonyms **CO3**

UNIT –V

12 Periods

Reading: Developing advanced reading skills for deeper understanding of the text

Politics and the English Language: *George Orwell* 2.The Dancer with a

White Parasol: *Ranjana Dave* **CO1**

Writing : Précis writing (Summarizing-identifying main idea and rephrasing the text), Applying for internship/Writing job applications: Resume and C.V with cover letter **CO2**

Grammar: Prepositions, correction of sentences. **CO3**

Vocabulary: Phrasal verbs **CO3**

Prescribed book:

Board of Editors “*Language and Life*” 1st edition, Oriental Black Swan 2018.

Reference Books:

1. **Sanjay Kumar and Pushpa lata** “*Communication skills*” Oxford University Press. 2011
2. **Meenakshi Raman and Sangeetha Sharma** “*Technical communication*” Oxford University Press.
3. **Kulbushan Kumar** “*Effective communication skills*” Khanna Publishing House, Delhi.

Problem Solving With C

(Common to all branches)

Course Code - Category : MEC 123 - ES

Credits: 3

L	T	P	E	O
3	0	0	1	3

Sessional Marks:40

End Exam: 3 Hours

End Exam Marks:60

Prerequisite: No specific prerequisites are needed

Course Objectives:

- This course aims to provide exposure to problem-solving through programming in C. It aims to train the student, the concepts of C-Programming Language. This course involves a lab component which is designed to give the student hands-on experience with the concepts.

Course Outcomes:

After completion of this course, a student will be able to:	
CO 1	Gain knowledge in problem solving and steps in Program development.
CO2	Apply the basic concepts of C
CO 3	Implement different operations on arrays and string to solve any given problem.
CO 4	Demonstrate pointers and modularization
CO 5	Apply structures and unions and Implement file Operations in C programming for any given

SYLLABUS

UNIT I

10 Periods

Introduction to Computer Problem-solving : Introduction ,The Problem-solving Aspect, Top-Down Design, Implementation of Algorithms, Program Verification (Text Book 3 Page 1-29 or Reference material 1)
Computer Science as a Career Path : Why Computer Science May be the Right Field for You, The College Experience: Computer Disciplines and Majors to Choose From Career Opportunities.
Electronic Computers Then and Now, Computer Hardware, Computer Software, The Software Development Method, Applying the Software Development Method, Professional Ethics for Computer Programmers. (Text Book 2 Page 1-39)
Computer Languages, Writing Editing compiling and linking programs, Program Execution, System Development, Flowcharting, Introduction to C Language – Background, C Programs, Identifiers, Types, Variables, Constants, Coding Constants, Formatted Input / Output. (Text Book 1)

Learning Outcomes : At the end of this Unit the student will be able

- To gain knowledge in the concepts of problem solving
- Identify the steps in Program development
- Learn number system.

UNIT II

10 Periods

Number systems-Binary, Decimal, Hexadecimal and Transformations, storing integers and floats. Program – expressions, precedence and Associativity, Side effects, evaluating expressions, mixed type expressions, statements.

Selection –Making Decisions – Logical data and operators, Bitwise Operators- logical bitwise operators, shift operators, bitwise use, Two way selection, Multi way selection

Repetition – concept of a loop, pretest and posttest loops, initialization and updating, event controlled and counter controlled loops, loops in C, loop examples, other statements related to looping, looping applications (Text Book 1)

Learning Outcomes : At the end of this Unit the student will be able to

- Apply decision making in c programming for problem solving
- Apply controlled structures in c programming for problem solving

UNIT III

10 Periods

Arrays – Concepts, using arrays in C, array applications, linear search, and Bubble sort, two – dimensional arrays, multidimensional arrays .

Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions (Text Book 1)

Learning Outcomes : At the end of this Unit the student will be able to

- Implement different operations on arrays
- Use string functions
- Apply string manipulation operations for problem solving.

UNIT IV

10 Periods

Functions-Designing Structured Programs, Functions in C, user defined functions, standard library functions, scope, Recursion

Storage classes-auto, register, static, extern

Pointers – Pointer Applications – Arrays and Pointers, pointer arithmetic and arrays, passing an array to a function, understanding complex declarations, memory allocation functions, array of pointers, programming application selection sort. (Text Book 1)

Learning Outcome : At the end of this Unit the student will be able to

- Know what a pointer is
- How to modularize a program
- Parameter passing techniques
- Write a recursive functions

UNIT V

10 Periods

Derived Types Enumerated, Structure and Union Types – The Type Definition (typedef), Enumerated types, Structures, accessing structures, Complex structures, arrays of structures, structures and functions ,unions

Text Files – Concept of a file, files and streams, input / output functions, formatting input/output functions, character input/output functions, character input/output examples

Binary files – classification of files, using binary files, standard library functions for files, converting file type, file program examples. (Text Book 1)

Learning Outcome : At the end of this Unit the student will be able to

- Write a structure and union
- Create and manage a file
- Use structure and union in files

Text Books:

- (1) **B. A. Forouzan and R. F. Gilberg** “*Cengage Learning , Computer Science: A Structured Programming Approach Using C*” Third Edition.
- (2) **Jeri R. Hanly , Elliot B .Koffman** , “*Problem solving and program Design in C*” , 7th Edition
- (3) **R.G.Dromey** , “*How to solve it by computer, Prentice-Hall International Series in Computer Science*” C.A.R. Hoare Series Editor

Reference Books:

- (1) “*An Introduction to Computer Science and problem solving*” - IT Department Material
- (2) “**Dietal & Deital**” , “*C How to Program 7/E*” ,PHI Publications
- (3) **Yashavant Kanetkar** , “*Let Us C*” , 16th Edition
- (4) **Brian W. Kernighan and Dennis M.Ritchie**, “*The C Programming Language*”, Prentice Hall of India

BASIC ELECTRONICS ENGINEERING

Course Code - Category: MEC 124 - ES

Credits:3

L T P E O
3 0 0 1 3

Sessional Marks:40

End Exam: 3 Hours

End Exam Marks:60

Prerequisites: Nil

COURSE OBJECTIVES:

This course is designed to introduce the principles of semiconductor devices, digital electronic circuits and instrumentation which enable the basic understanding of the operation of circuits containing diodes and transistors. In addition, basic logic circuits and instruments like DVM, DMM and CRO are introduced.

COURSE OUTCOMES:

After completion of the course the student will be able to	
CO1	Understand the behavior of PN diode under different biasing conditions and use zener diode as shunt regulator
CO2	Calculate the efficiency and ripple factor of half wave, Full wave center tapped and Bridge rectifiers
CO3	Obtain input and output characteristics of BJT in different configurations and identify the region of operation of transistor
CO4	Perform number conversions between different number systems and implement the Boolean functions simplified using Boolean algebra with basic gates and universal gates
CO5	Apply the knowledge of cathode ray oscilloscopes and understand the functioning, specification, applications of signal analyzing instruments

SYLLABUS

UNIT-I: SEMICONDUCTOR DIODES

9 periods

Intrinsic semiconductors, Doped semiconductors, drift current, Diffusion current, Einstein relationship, PN Junction: Physical structure, operation with open –circuit terminals. PN Junction with an applied voltage, the ideal diode: current voltage characteristics, Forward bias region, reverse bias region, breakdown region. Zener diode as a shunt regulator, LEDs.

UNIT-II: RECTIFIERS

9 periods

Half wave rectifier, Full wave center tapped and Bridge rectifiers, Rectifier- DC components, AC Components, Ripple factor, Transformer Utilization factor, Efficiency, PIV, and Regulation.

UNIT-III: BJT CHARACTERISTICS**9 periods**

Simplified structure and modes of operation, Active region, Saturation region, Cutoff region, circuit symbols and conventions, Transistor current components, Input and Output Characteristics of transistor in Common Base, Common Emitter, Common Collector Configurations, Punch through effect, BJT as an amplifier and as a switch.

UNIT-IV: DIGITAL LOGIC GATES**9 periods**

Number systems used in digital electronics: Decimal number system and Binary number system and their conversion, binary operations, use of complements, Hexadecimal number systems, Boolean algebra, Logic gates, realization of basic gates using NAND/NOR, SOP, POS, Implementation of logic expressions using logic gates.

UNIT-V: ELECTRONICS INSTRUMENTS**9 periods**

Basic Principle of indicating instruments – permanent magnet moving coil and moving iron instruments. DVM, DMM, CRO: Principles of CRT (Cathode Ray Tube), Deflection, Sensitivity, Applications of CRO - Voltage, Current and frequency measurements.

TEXT BOOKS:

1. **Sanjeev Gupta** “*Electronic Devices and Circuits*” Dhanpat Rai Publications, 2010.
2. **Jacob Millman, Christos halkias, Chetan D Prakash** “*Millman’s Integrated Electronics*” Tata McGraw-Hill, 2012

REFERENCE BOOKS:

2. **K Venkata Rao, K Rama Sudha** “*Electronic Devices and Circuits*” McGraw Hill Education 2015
3. **David A Bell** “*Electronic Devices and Circuits*” - Oxford
4. **S Salivahanan, N Suresh Kumar, A Vallav Raj** “*Electronic Devices and Circuits*” Tata McGraw-Hill
5. **Jacob Millman, Arvin Grabel** “*Micro Electronics*” Tata McGraw-Hill

ADVANCED ENGINEERING GRAPHICS

Course Code - Category: MEC 125 - ES

Credits: 2

L T P E O
1 0 2 2 4

Sessional Marks:50

End Exam: 3 Hours

End Exam Marks:50

Course Objectives:

The course is designed to familiarize the student with the fundamentals of **Computer Aided Drafting software** and applying it to draw orthographic projections of sectioned solids and development of their lateral surfaces. The course is also aimed at using software to draw orthographic projections of intersections of primitives, converting isometric to orthographic projections and vice versa. The course is also finally intended to impart the basics of machine drawing and using the software to draw screwed fastenings and further produce half and full sectional views of simple machine parts.

Course Outcomes:

By end of the course, the student will be able to:	
CO1	Draft simple 2D drawings with dimensions using CAD software.
CO2	Draw orthographic projections for sections of solids & further develop surfaces of regular and truncated solids using CAD software.
CO3	Draw orthographic projections for intersections of prisms, cylinders and cones using CAD software.
CO4	Draw orthographic projections from isometric projections and Vice-versa using CAD software.
CO5	Draw various screwed fastenings and further produce half and full sectional views of simple machine parts using CAD software.

Module-I

Computer Aided Drafting:

Introduction, Applications, CAD software- AutoCAD, GUI, function keys, Drawing entities, Drafting aids(limits, layers, dimensioning, object snap, zoom), modify commands, Block, WBlock and insert, List of commands, Setting Isometric mode, Isoplanes, isometric commands.

Weekly Exercises:

- Week 1:** a) Limits, command line, command list, function keys- Ortho, polar, Osnap, Otrack etc.
b) Draw lines using dynamic input, Ortho & Polar, Line divide, construction line.
c) drawings using coordinate system, arbitrary coordinate system.
d) Selection & Modify commands – offset, move, copy, rotate, trim, Scale.

- Week 2:** a) Layers, Match property, line types
b) Arcs and Circles
c) Fillet and Chamfer
d) Annotations and Dimensioning

- Week 3:** a) Symmetrical drawings using mirror
b) Rectangular Array
c) Polar and Path Array
d) Annotations and Dimensioning

- Week 4:** a) polygons
b) hatching
c) block, wblock, group, ungroup, explode
d) iso planes

Module-II

Sections and Development: section plane: auxiliary inclined plane, auxiliary vertical planes. Sections of prisms, pyramids, cone, cylinder in simple positions and true shape of sections. Development of prisms, pyramids, cone, cylinder.

Weekly Exercises:

- Week 1:** a) Prism cut by auxiliary inclined plane, true section, development of lateral surface
b) Prism cut by auxiliary vertical plane, true section, development of lateral surface
c) Cylinder cut by auxiliary inclined plane, true section, development of lateral surface
d) Cylinder cut by auxiliary vertical plane, true section, development of lateral surface
- Week 2:** a) Pyramid cut by auxiliary inclined plane, true section, development of lateral surface
b) Pyramid cut by auxiliary vertical plane, true section, development of lateral surface
c) Cone cut by auxiliary inclined plane, true section, development of lateral surface
d) Cone cut by auxiliary vertical plane, true section, development of lateral surface

Module-III

Intersection of surfaces: Intersection of square prisms face equally inclined to principle planes with their axis perpendicular (axis intersecting and offset), intersection of cylinders with their axis perpendicular (axis intersecting and offset), intersection of cone and cylinder with their axis perpendicular and intersecting.

Weekly Exercises:

- Week 1:** a) Intersection of two square prisms axis perpendicular and intersected, while their lateral faces are equally inclined to ground.
b) Intersection of two square prisms axis perpendicular and offset, while their lateral faces are equally inclined to ground.
- Week 2:** a) Intersection of two cylinders axis perpendicular and intersected.
b) Intersection of Vertical cone with horizontal cylinder axis perpendicular and offset.

Module-IV

Isometric Projections: Isometric projections, conversion of orthographic projection into isometric projection and vice-versa of simple machine parts.

Weekly Exercises:

- Week 1:** a) Isometric view to orthographic views
b) Orthographic Views to Isometric Views

Module-V:

Machine Drawing: Orthogonal views, Half sectional and full sectional views of machine parts. Screw Threads, Screw Fasteners, Locking arrangements, Foundation bolts and Riveted joints using standard Empirical formulae.

- Week 1:** a) Orthogonal Views of Machine Parts
b) Half Sectional Views of Machine Parts
c) Full Sectional Views of Machine parts
- Week 2:** a) Screw Threads
b) Screw Fasteners
c) Locking arrangements
- Week 3:** a) Foundation bolts
b) Riveted joints

TEXT BOOK:

1. **N. D. Bhatt** “*Engineering Drawing*” 53rd Edition Charotar Publishing House Pvt. Ltd., 2014
2. **N. D. Bhatt** “*Machine Drawing*” V. M. Panchal, Charotar Publishing House Pvt. Ltd

REFERENCE BOOKS:

1. **K. L. Narayana & P. Kanniah** “*Engineering Drawing*”
2. **R. B. Choudary** “*Engineering Graphics with Auto CAD*”
3. **Trymbaka Murty** “*Computer Aided Engineering Drawing*”
4. **K.L Narayana, P. Kannaiah and K. Venkata Reddy** “*Machine Drawing*” by, New age international Publishers.
5. Lab Manual for Advanced Engineering Graphics

WEB REFERENCES:

1. <http://www.rajaroy.co.in/p/machine-drawing.html>

Note: The exercises to be done each week shall be as per the internal lab manual

English Language Laboratory

Course Code - Category: MEC 126 – HS

Credits:1.5

L T P E O
0 0 3 0 1

Sessional Marks:50

End Exam: 3 Hours

End Exam Marks:50

Prerequisites:

Basic English language skills- LSRW at Intermediate Level

Course Objectives

1. To improve fluency in spoken English and to practice correct pronunciation.
2. To introduce the techniques of presentation skills
3. Help improve speaking skills through participation in activities such as role plays, discussions, and structured talks/ oral presentations

Course Outcomes

By the end of the course, the student will be able to:	
CO1	Speak English with proper pronunciation and intonation
CO2	Make effective oral presentations by interpreting and analysing data, pictures and videos and participate in Group Discussion on general topics
CO3	Make meaningful conversations and follow logical flow of thought; answer questions on key concepts after listening to extended passages.

Syllabus

Module- I

The sounds of English CO1

1. Practicing correct Pronunciation through IPA, Stress, Intonation, Rhythm

Module –II

Group Discussions CO2

1. Purpose, Different roles for participants, Etiquette in a structured GD - Practice GDs

Module –III

Interpersonal Skills CO3 (Role plays)

1. Introduction of self and others, making announcements
2. Getting Someone’s Attention, and Interrupting Conversations
3. Making Requests and Responding to them, asking for directions

Module –IV

Listening Skills CO3

1. Listening to unknown passages – for global understanding, identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

Module –V

Presentation skills CO2

1. Oral Presentations (JAMs) 2. Describing and analysing videos and pictures.3. Interpreting and analysing data from graphs and charts

Prescribed book:

Oriental Black Swan. “*Language and Life*” 1st edition, 2018 Board of Editors. .

Reference Books:

1. **J.K. Gangal.** “*A Practical Course in Effective English Speaking Skills*”. Prentice Hall India Learning Private Limited 2012.

Problem Solving with 'C'- Lab

(Common to all branches)

Course Code - Category: MEC 127 - ES

Credits:1.5

L T P E O
0 0 3 0 3

Sessional Marks:50

End Exam: 3 Hours

End Exam Marks:50

Prerequisite: Concepts of Problem Solving & Computer Programming in C

Course Objective:

- The course aims at translating given algorithms to a working and valid program

Course Outcomes:

After completion of this course, a student will be able to:	
CO1	Develop C programs using operators
CO2	Write C programs using conditional structures
CO3	Write C programs using iterative structure arrays and strings
CO4	Inscribe C programs that use Pointers to and functions
CO5	Develop a c program for implementing user defined types and file processing

SYLLABUS

MINIMUM SET OF SAMPLE PROGRAMS

1. CONVERTING MILES TO KILOMETERS

PROBLEM STATEMENT: Your summer surveying job requires you to study some maps that give distances in kilometers and some that use miles. You and your coworkers prefer to deal in metric measurements. Write a program that performs the necessary conversion.

Problem Input: miles /* the distance in miles*/

Problem Output: kms /* the distance in kilometers */

Relevant Formula: 1 mile = 1.609 kilometers

Design algorithm, flow chart, program using the above data requirements for the given problem.

Try the sample test cases given below :

SAMPLE TEST CASES	INPUT	OUPUT
Test case 1	10	16.09
Test case 2	2	3.218

2. SUPERMARKET COIN PROCESSOR

PROBLEM STATEMENT : You are drafting software for the machines placed at the front of supermarkets to convert change to personalized credit slips. In this draft, the user will manually enter the number of each kind of coin in the collection, but in the final version, these counts will be provided by code that interfaces with the counting devices in the machine.

Problem Inputs

```
char first, middle, last /* a customer's initials */
int dollars /* number of dollars */
int quarters /* number of quarters */
int dimes /* number of dimes */
int nickels /* number of nickels */
int pennies /* number of pennies */
```

Problem Outputs

```
int total_dollars /* total dollar value */
int change /* leftover change */
```

Additional Program Variables

```
int total_cents /* total value in cents */
```

Design algorithm, flow chart, program using the above data requirements for the given problem. Try the sample test cases given below :

TESTING TIP :

To test this program, try running it with a combination of coins that yield an exact dollar amount with no leftover change. For example, 1 dollar, 8 quarters, 0 dimes, 35 nickels, and 25 pennies should yield a value of 5 dollars and 0 cents. Then increase and decrease the quantity of pennies by 1 (26 and 24 pennies) to make sure that these cases are also handled properly.

SAMPLE CASES	TEST	INPUT	OUTPUT
Test case 1		Type in your 3 initials and press return> JRH JRH, please enter your coin information. Number of \$ coins > 2 Number of quarters > 14 Number of dimes > 12 Number of nickels > 25 Number of pennies > 131	JRH Coin Credit Dollars: 9 Change: 26 cents
Test case 2		Type in your 3 initials and press return> JRH JRH, please enter your coin information. Number of \$ coins > 3 Number of quarters > 12 Number of dimes > 14 Number of nickels > 50 Number of pennies > 175	JRH Coin Credit Dollars: 11 Change: 26 cents

3.WATER BILL PROBLEM

PROBLEM STATEMENT :Write a program that computes a customer’s water bill. The bill includes a \$35 water demand charge plus a consumption (use) charge of \$1.10 for every thousand gallons used. Consumption is figured from meter readings (in thousands of gallons) taken recently and at the end of the previous quarter. If the customer’s unpaid balance is greater than zero, a \$2 late charge is assessed as well.

Problem Constants

```
DEMAND_CHG 35.00 /* basic water demand charge */
PER_1000_CHG 1.10 /* charge per thousand gallons used */
LATE_CHG 2.00 /* surcharge on an unpaid balance */
```

Problem Inputs

```
int previous /* meter reading from previous quarter in thousands of gallons */
int current /* meter reading from current quarter */
double unpaid /* unpaid balance of previous bill */
```

Problem Outputs

```
double bill /* water bill */
double use_charge /* charge for actual water use */
double late_charge /* charge for nonpayment of part of previous balance */
```

Relevant Formulas

water bill = demand charge + use charge + unpaid balance+ applicable late charge

Design algorithm , flow chart ,program using the above data requirements for the given problem Try the sample test cases given below :

SAMPLE CASES	TEST	INPUT	OUPUT
Test case 1		This program figures a water bill based on the demand charge (\$35.00) and a \$1.10 per 1000 gallons use charge. A \$2.00 surcharge is added to accounts with an unpaid balance. Enter unpaid balance, previous and current meter readings on separate lines after the prompts. Press <return> or <enter> after typing each number. Enter unpaid balance> \$71.50 Enter previous meter reading> 4198 Enter current meter reading> 4238	Bill includes \$2.00 late charge on unpaid balance of \$71.50 Total due = \$152.50
Test case 2		This program figures a water bill based on the demand charge (\$35.00) and a \$1.10 per 1000 gallons use charge.	Bill includes \$2.00 late charge on unpaid balance of \$71.50 Total due = \$102.00

	<p>A \$2.00 surcharge is added to accounts with an unpaid balance.</p> <p>Enter unpaid balance, previous and current meter readings on separate lines after the prompts. Press <return> or <enter> after typing each number.</p> <p>Enter unpaid balance> \$51</p> <p>Enter previous meter reading> 4198</p> <p>Enter current meter reading> 4137</p>	
--	--	--

4. PRIME NUMBER

PROBLEM STATEMENT :Given a positive integer **N**, calculate the sum of all prime numbers between **1** and **N**(inclusive).

Input:

The first line of input contains an integer **T** denoting the number of test cases. **T** testcases follow. Each testcase contains one line of input containing **N**.

Output:

For each testcase, in a new line, print the sum of all prime numbers between 1 and **N**.

Constraints:

$$1 \leq T \leq 100$$

$$1 \leq N \leq 10^6$$

Design algorithm , flow chart ,program using the above data requirements for the given problem Try the sample test cases given below :

SAMPLE TEST CASES	INPUT	OUPUT
Test case 1	2 5 10	10 17
Test case 2	2 7 10	17 17

5. BUBBLE SORT

PROBLEM STATEMENT :The task is to complete bubble function which is used to implement Bubble Sort

Input:

First line of the input denotes the number of test cases '**T**'. First line of the test case is the size of array and second line consists of array elements.

Output:

Sorted array in increasing order is displayed to the user.

Constraints:

1 <=T<= 100

1 <=N<= 1000

1 <=arr[i]<= 1000

Design algorithm , flow chart ,program using the above data requirements for the given problem Try the sample test cases given below :

SAMPLE TEST CASES	INPUT	OUPUT
Test case 1	2 5 4 1 3 9 7 10 10 9 8 7 6 5 4 3 2 1	1 3 4 7 9 1 2 3 4 5 6 7 8 9 10
Test case 2	1 5 8 9 3 2 0	0 2 3 8 9

6. TEXT EDITOR

PROBLEM STATEMENT: Design and implement a program to perform editing operations on a line of text. Your editor should be able to locate a specified target substring, delete a substring, and insert a substring at a specified location. The editor should expect source strings of less than 80 characters.

Problem Constant MAX_LEN 100 /* maximum size of a string */

Problem Inputs

char source[MAX_LEN] /* source string */

char command /* edit command */

Problem Output

char source[MAX_LEN] /* modified source string */

Design algorithm , flow chart ,program using the above data requirements for the given problem Try the sample test cases given below :

SAMPLE TEST CASES	INPUT	OUPUT
Test case 1	Enter the source string: > Internet use is growing rapidly. Enter D(Delete), I(Insert), F(Find), or Q(Quit)> d String to delete> growing	New source: Internet use is rapidly
Test case 2	Enter D(Delete), I(Insert), F(Find), or Q(Quit)> F String to find>.	'!' found at position 23

7. ARITHMETIC WITH COMMON FRACTIONS

PROBLEM STATEMENT: You are working problems in which you must display your results as integer ratios; therefore, you need to be able to perform computations with common fractions and get results that are common fractions in reduced form. You want to write a program that will allow you to add, subtract, multiply, and divide several pairs of common fractions.

Design algorithm, flow chart, program using the above data requirements for the given problem

Try the sample test cases given below :

SAMPLE TEST CASES	INPUT 1	OUPUT
Test case 1	Enter a common fraction as two integers separated by a slash > 3/-4	Input invalid—denominator must be positive
Test case 2	Enter a common fraction as two integers separated by a slash > 3/4 Enter an arithmetic operator (+, -, *, or /) > + Enter a common fraction as two integers separated by a slash > 5/8 Entering find_gcd with n1 = 44, n2 = 32 Do another problem? (y/n) > n	gcd of 44 and 32? > 4 find_gcd returning 4 3/4 + 5/8 = 11/8

8. FACTORIAL OF A NUMBER

PROBLEM STATEMENT: Find factorial of a given number n.

Design algorithm, flow chart, program using the above data requirements for the given problem Try the sample test cases given below :

SAMPLE TEST CASES	INPUT 1	OUPUT
Test case 1	Enter a number to find factorial > 2	Factorial of 2 is 4
Test case 2	Enter a number to find factorial > 3	Factorial of 3 is 6

9. COLLECTING AREA FOR SOLAR-HEATED HOUSE – FILES AND FUNCTIONS

PROBLEM STATEMENT : An architect needs a program that can estimate the appropriate size for the collecting area of a solar-heated house. Determining collecting area size requires consideration of several factors, including the average number of heating degree days for the coldest month of a year (the product of the average difference between inside and outside temperatures and the number of days in the month), the heating requirement per square foot of floor space, the floor space, and the efficiency of the collection method. The program will have access to two data files. File hdd.txt contains numbers representing the average heating degree days in the construction location for each of 12 months. File solar.txt contains the average solar insolation (rate in BTU/day at which

solar radiation falls on one square foot of a given location)for each month. The first entry in each file represents data for January, the second,data for February, and so on.

Problem Inputs

Average heating degree days file

Average solar insolation file

heat_deg_days /* average heating degree days for coldest month */

coldest_mon /* coldest month (number 1 .. 12) */

solar_insol /* average daily solar insolation (BTU/ft^2)for coldest month */

heating_req /* BTU/degree day ft^2 for planned type construction*/

efficiency /* % of solar insolation converted to usable heat */

floor_space /* square feet */

Program Variables

energy_resrc /* usable solar energy available in coldest month (BTUs obtained from 1 ft^2 of collecting area) */

Problem Outputs

heat_loss /* BTUs of heat lost by structure in coldest month */

collect_area /* approximate size (ft^2) of collecting area needed*/

The formula for approximating the desired collecting area (A) is :

A= heat loss / energy resource

Design algorithm , flow chart ,program using the above data requirements for the given problem

Try the sample test cases given below :

SAMPLE TEST CASES	INPUT	OUPUT
Test case 1	What is the approximate heating requirement (BTU / degree day ft^2) of this type of construction? =>9 What percent of solar insolation will be converted to usable heat? => 60 What is the floor space (ft^2)? => 1200	To replace heat loss of 11350800 BTU in the coldest month (month 12) with available solar insolation of 500 BTU / ft^2 / day, and an efficiency of 60 percent, use a solar collecting area of 1221 ft^2.
Test case 2	What is the approximate heating requirement (BTU / degree day ft^2) of this type of construction? =>10 What percent of solar insolation will be converted to usable heat? => 60 What is the floor space (ft^2)? => 1200	To replace heat loss of 12612000 BTU in the coldest month (month 12) with available solar insolation of 500 BTU / ft^2 / day, and an efficiency of 60 percent, use a solar collecting area of 1221 ft^2.

Q10. UNIVERSAL MEASUREMENT CONVERSION

PROBLEM STATEMENT: Design a program that takes a measurement in one unit (e.g., 4.5 quarts) and converts it to another unit (e.g., liters). For example, this conversion request 450 km miles would result in this program output Attempting conversion of 450.0000 km to miles . . . 450.0000km = 279.6247 miles . The program should produce an error message if a conversion between two units of different classes (e.g., liquid volume to distance) is requested. The program should take a database of conversion information from an input file before accepting conversion problems entered interactively by the user. The user should be able to specify units either by name (e.g., kilograms) or by abbreviation (e.g., kg).

Structured Data Type

unit_t members :

```
name    /* character string such as "milligrams"    */
abbrev  /* shorter character string such as "mg"     */
class   /* character string "liquid_volume", "distance", or "mass" */
standard /* number of standard units that are equivalent to this unit */
```

Problem Constants

```
NAME_LEN   30 /* storage allocated for a unit name    */
ABBREV_LEN 15  /* storage allocated for a unit abbreviation */
CLASS_LEN  20 /* storage allocated for a measurement class */
MAX_UNITS  20 /* maximum number of different units handled */
```

Problem Inputs

```
unit_t units[MAX_UNITS] /* array representing unit conversion factors database */
double quantity         /* value to convert */
char old_units[NAME_LEN] /* name or abbreviation of units to be converted */
char new_units[NAME_LEN] /* name or abbreviation of units to convert to */
```

Problem Output

Message giving conversion.

Data file units.txt:

```
miles      mi      distance  1609.3
kilometers km      distance  1000
yards      yd      distance  0.9144
meters     m       distance  1
quartsqtliquid_volume 0.94635
liters     l       liquid_volume 1
gallons   gal     liquid_volume 3.7854
milliliters ml     liquid_volume 0.001
kilograms kg      mass 1
grams     g       mass 0.001
slugs     mass    0.14594
poundslb  mass    0.43592
```

Design algorithm , flow chart ,program using the above data requirements for the given problem

Try the sample test cases given below :

SAMPLE TEST CASES	INPUT 1	OUPUT
Test case 1	Enter a conversion problem or q to quit. To convert 25 kilometers to miles, you would enter > 25 kilometers miles or, alternatively, > 25 km mi	>450 km miles Attempting conversion of 450.0000 km to miles ... 450.0000km = 279.6247 miles
Test case 2	Enter a conversion problem or q to quit. > 2.5 qt l Attempting conversion of 2.5000 qt to l ... 2.5000qt = 2.3659 l Enter a conversion problem or q to quit.	> 100 meters gallons Attempting conversion of 100.0000 meters to gallons ... Cannot convert meters (distance) to gallons (liquid_volume)

ADDITIONAL PROGRAMS

Problem solving programs:

- Chocolate feast** : Little Bob loves chocolates, and goes to a store with \$N in his pocket. The price of each chocolate is \$C. The store offers a discount: for every M wrappers he gives to the store, he gets one chocolate for free. How many chocolates does Bob get to eat? Note : Evaluate the number of wraps after each step. Do this until you have enough wraps to buy new chocolates.
- Angry Professor** :The professor is. Given the arrival time of each student, your task is to find out if the class gets cancelled or conducting a course on Discrete Mathematics to a class of N students. He is angry at the lack of their discipline, and he decides to cancel the class if there are less than K students present after the class startsnot.
- Divisible Sum Pairs** : You are given an array of n integers and a positive integer, k. Find and print the number of (i,j) pairs where $i < j$ and $a_i + a_j$ is evenly divisible by k.
- Sherlock And Valid String**: A "valid" string is a string S such that for all distinct characters in S each such character occurs the same number of times in S. Note :The logic of the solution is as follows: count the character counts for each character. Note : if they are all equal – it means that all characters occur exactly N times and there is no removal needed .if 2 or more have less or more characters – there is no way to fix the string in just 1 removal . if exactly 1 char has a different count than all other characters – remove this char completely and S is fixed.
- Ice Cream Parlor** :Sunny and Johnny together have M dollars they want to spend on ice cream. The parlor offers N flavors, and they want to choose two flavors so that they end up spending the whole amount. You are given the cost of these flavors. The cost of the ith flavor is denoted by c_i . You have to display the indices of the two flavors whose sum is M.
- 'Missing Numbers'** :Numeros, the Artist, had two lists A and B, such that B was a permutation of A. Numeros was very proud of these lists. Unfortunately, while transporting

them from one exhibition to another, some numbers from A got left out. Can you find the numbers missing?

7. **Alternating Characters:** John likes strings in which consecutive characters are different. For example, he likes ABABA, while he doesn't like ABAA. Given a string containing characters A and B only, he wants to change it into a string he likes. To do this, he is allowed to delete the characters in the string.
8. **Game Of Thrones :** I : Dothraki are planning an attack to usurp King Robert's throne. King Robert learns of this conspiracy from Raven and plans to lock the single door through which the enemy can enter his kingdom door. But, to lock the door he needs a key that is an anagram of a palindrome. He starts to go through his box of strings, checking to see if they can be rearranged into a palindrome. For example, given the string $s=[aabbccdd]$ one way it can be arranged into a palindrome is $abcdcda$.
9. **Life and everything :** Your program is to use the brute-force approach in order to find the Answer to Life, the Universe, and Everything. More precisely... rewrite small numbers from input to output. Stop processing input after reading in the number 42. All numbers at input are integers of one or two digits.
input: 1 2 23 22 42
output: 1 2 23 22
10. **Filling Jars :** Animesh has N empty candy jars, numbered from 1 to N, with infinite capacity. He performs M operations. Each operation is described by 3 integers a, b and k. Here, a and b are indices of the jars, and k is the number of candies to be added inside each jar whose index lies between a and b (both inclusive). Can you tell the average number of candies after M operations?

Reference Books:

- (1) Jeri R. Hanly , Elliot B .Koffman , Problem solving and program Design in C , 7th Edition
- (2) Computer Science: A Structured Programming Approach Using C, B. A. Forouzan and R. F. Gilberg, Third Edition, Cengage Learning.
- (3) Dietal&Deital , C How to Program 7/E ,PHI Publications

Web References :

- <https://www.spoj.com/>
- <https://projecteuler.net/>
- <https://www.hackerearth.com/practice/>
- <https://www.codechef.com/>
- <https://onlinecourses.nptel.ac.in/>

Instructions to the instructor:

This lab course consists of two set of programs

- 1) Minimum set of sample programs
- 2) Additional set of programs

Minimum set of sample programs are designed unit wise covering all the topics in the theory .
Additional set of programs are designed basing on problem solving

Sessional marks : 50 marks

- 1) Daily Evaluation (Includes Record, Observation & regular performance) – 30 marks
- 2) Attendance – 5 marks
- 3) Internal Exam – 10 marks
- 4) Viva Voce – 5 marks

Daily Evaluation (30 marks)

- Every Student must execute minimum set of sample programs to secure 60% of marks in Daily Evaluation i.e. 18 Marks and to appear in external examination.
- In addition to that if a student finishes the minimum set and 5 programs from additional set of programs would secure 80% of marks in Daily Evaluation i.e. 24 Marks.
- If a student finishes all the programs in both the set s will secure 100% of marks in Daily Evaluation

Internal Exam (10 marks)

- Every student is given 4 questions in the internal exam out of which the difficulty level of 2 questions is easy / medium and 2 questions of difficulty level is high
- Each easy / medium level question carries 20% of marks and difficulty level question carries 30% of marks

External Exam (50 marks)

- Viva voce – 10 marks
- Write up + Execution – 40 marks

Write up + Execution (40 marks)

- Every student is given 4 questions in the external exam out of which the difficulty level of 2 questions is easy / medium and 2 questions of difficulty level is high
- Each easy / medium level question carries 30% of marks and difficulty level question carries 20% of marks.

ENVIRONMENTAL SCIENCE
Mandatory (Non Credit) course for all branches

Course Code - Category: MEC 128 - MC

Credits:0

L **T** **P** **E** **O**
3 **0** **0** **0** **1**

Sessional Marks:50

COURSE OBJECTIVE:

- To Make the students get awareness on environment
- To understand the importance of protecting natural resources, ecosystems for future generations
- To know about the causes of pollution due to the day to day activities of human life
- To get an idea about the measures for sustainable development

Course Outcomes:

By the end of the semester, the student will be able to:	
CO1	Identify the characteristics of various natural resources and can implement the conservation practices
CO2	Realize the importance of Ecosystem and Biodiversity for maintaining ecological balance
CO3	Classify, analyze various pollutants and can develop methods for solving problems related to environment
CO4	Get awareness on various environmental laws and methods for sustainable development of environment
CO5	Understand the impact of population growth on human health and environment

SYLLABUS

UNIT I

INTRODUCTION TO ENVIRONMENT AND NATURAL RESOURCES 8 Periods

Introduction: Definition, Multidisciplinary nature of environmental studies, Scope and Importance of Environmental Sciences, Need for public awareness.

Natural Resources: Renewable and Non-Renewable resources- Forest resources-use and overexploitation, deforestation, Water resources- aquifers, dams and benefits, conflicts over water; Food resources- effects of modern agriculture practices, Energy resources-conventional and non conventional energy resources.

LEARNING OUTCOMES

- Students will be able to know the scope and importance of environment.
- Students will be able to explain natural resources and their associated problems.
- Students will be able to articulate basic understanding of effects of modern agriculture practices on environment.

- Students will be able to recognise the importance of alternative sources of energy.

UNIT- II

ECOSYSTEM & BIO DIVERSITY

8 Periods

Ecosystem: Concept of an ecosystem-structure and function of an ecosystem Food chains, food webs and ecological pyramids, Energy flow in an ecosystem, Ecosystem regulation, Ecological succession.

Biodiversity: Definition, types, India as a Mega diversity Nation, Values of biodiversity, Hot spots of biodiversity, Threats to biodiversity, Endangered and endemic species, Conservation of biodiversity.

LEARNING OUTCOMES

- Students will get a clear picture on structure and functions of ecosystems.
- Students will be able to explain the energy and matter flow in ecosystems.
- Students will be able to identify the threats to biodiversity and conservation methods to protect biodiversity.
- Students will be able to understand the importance of endemic species.

UNIT -III

ENVIRONMENTAL POLLUTION AND WASTE MANAGEMENT

8 Periods

Pollution: Sources, effects and control measures of Air pollution, Noise Pollution, Water Pollution, Soil Pollution, Radio Active Pollution; Climate Change, Ozone depletion, Acid rains –causes and adverse effects.

Solid waste management: Sources and effects of municipal waste, bio-medical waste, Industrial waste, e-waste, Process of waste management-composting, sanitary landfills, incineration. Green Chemistry concepts,

LEARNING OUTCOMES

- Students will be able to understand sources, effects and control measures of various types of pollutions.
- Students will be able to understand about solid waste management.
- Students will explain the ill effects of climatic change.

UNIT- IV

SOCIAL ISSUES AND ENVIRONMENTAL LEGISLATIONS

8 Periods

Social Issues and the Environment: Sustainable development, Environmental Impact Assessment, Rain water harvesting, water shed management. Resettlement and rehabilitation of people, Environmental ethics.

Legislational Acts: Importance of Environmental legislation, Air (Prevention and Control of Pollution) act, Water (Prevention and control of Pollution) act, Wildlife Protection act, Forest Conservation act

LEARNING OUTCOMES

- Students will be able to know the measures to achieve sustainable development.
- Students will have knowledge about watershed management and environmental ethics

- Students will be able to explain the enforcement of Environmental legislations.

UNIT- V

HUMAN POPULATION AND THE ENVIRONMENT

5 Periods

Human population and environment- Population growth, Population explosion; Family Welfare Programmes; Role of information technology on environment and human health; Value Education – HIV/AIDS – Women and Child Welfare

FIELD WORK/PROJECT: Visit to a local area to document environmental problem;

LEARNING OUTCOMES

- Students will know the impacts of population on human health and environment.
- Students will understand the role of IT on Environment.
- Students will be able to prepare a detailed report on a particular environmental issue.

AWARENESS AND OTHER ACTIVITIES

1. Planting trees
2. Listing out water bodies and discuss the problems associated with it
3. Poster making of ecological pyramids and food chain and food web of different ecosystems like forest, grassland and aquatic system
4. Prepare list of endangered endemic and extinct species
5. Preparation of models
6. Cleanliness drive (Swatch Bharath)
7. Group discussion about waste management
8. Slogan making

Prescribed Book

1. **Anubha Kaushik & C.P.Kaushik**, “*Perspectives of Environmental Studies*” by 5th edition New Age International Publications, 2015.
2. **Erach Bharucha** *Text book of “Environmental Studies for Undergraduate Courses”*, universities Press Commission, 2013.
3. **Palaniswamy**- “*Environmental Studies*”, 2nd edition, Pearson education 2015.

Reference Books

1. **S. Deswal, A. Deswal**, “*Basic course in Environmental studies*”, 2nd edition, Dhanpatrai Publications, 2008.