Syllabus of I & II Semesters B.E./B.Tech.

Common to all Engineering Branches
(With effect from 2014-15)

Visvesvaraya Technological University, Belgaum
ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ

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Regulations Governing

THE DEGREE OF BACHELOR OF ENGINEERING / TECHNOLOGY

OB 1 **TITLE AND DURATION OF THE COURSE**

OB 1.1 The course shall be called the degree course in Bachelor of Engineering / Technology, abbreviated as B.E. / B.Tech.

OB 1.2 The course shall be of four academic years duration divided into eight semesters, each semester having duration of 16 weeks. For evening courses the contact hours are to be satisfied by working extra on afternoons of Saturdays and Sundays.

OB 1.3 The calendar of events in respect of the course shall be fixed by the University from time to time.

OB 1.4 The examination in all the subjects shall be conducted at the end of each semester for all the eight semesters.

OB 2 **ELIGIBILITY FOR ADMISSION**
(The Government orders issued from time to time in this regard shall prevail.)

OB 2.1 Admission to I year/ I semester Bachelor Degree in Engineering/ Technology shall be open for the candidates who have passed the second year Pre-University or XII standard or equivalent examination recognized by the University.

OB 2.2 In addition to OB 2.1, the candidate shall have secured not less than forty five percent (45%) marks in the aggregate with Physics and Mathematics as compulsory subjects, along with one of the following subjects, namely, Chemistry, Bio-Technology, Computer Science, Biology and Electronics.

Provided that, the minimum marks for the purpose of eligibility shall be forty percent (40%) in optional subjects in case of candidates belonging to SC/ST and OBC candidates from Karnataka.

Provided that, the candidate shall have studied and passed English as one of the subjects.

OB 2.3 (a) Admission to II year/ III semester Bachelor Degree in Engineering/ Technology (Lateral Entry) shall be open to the candidates who are holders of a diploma or equivalent qualification as recognized by University who have secured not less than forty five percentage (45%) marks in the final year examination (fifth and sixth semesters) in the appropriate branch of engineering.

Provided that, in case of SC/ST and OBC candidates from Karnataka, the minimum marks for eligibility shall be forty percent (40%).

Provided further that, all the candidates seeking lateral entry shall also clear prescribed bridge courses as specified by the University.

OB 2.3 (b) Admission to Evening Course shall be open to a candidate

i) who on the first day of the term notified by the University for the year of admission has not less than one-year professional experience in the branch of engineering / technology, in which the candidate holds a diploma, after passing diploma course.

Explanation: Professional experience means employment on regular basis

a. in Government, Government undertaking, Public Sector undertaking, Corporations or
b. in a private company registered under the Directorate of Industries and Commerce or the Directorate of Small Scale Industries or
c. in Government, Government recognized institutions as technical staff.

Provided that the period of apprenticeship undergone shall also be treated as professional experience, if sponsored by the Board of Apprenticeship Training, Southern Region Chennai or by any Government, Government undertaking or Public Sector undertaking.

Provided further that employment shall be in an establishment situated within the urban agglomeration of city in which the professional institution is situated.

OB 2.4 Those candidates who have passed a qualifying examination other than the PUC II examination of the Pre-University Education Board of Karnataka, or Engineering Diploma Examinations of the Board of Technical Education of Karnataka, have to obtain eligibility certificate for seeking admission to B.E./B.Tech. Degree course from Visvesvaraya Technological University, Belgaum, or from the Principal of concerned Engineering College of Karnataka State.

OB 3 ATTENDANCE REQUIREMENT

OB 3.1 Each semester is considered as a unit and the candidate has to put in a minimum attendance of 85% in each subject with a provision of condonation of 10% of the attendance by the Vice-Chancellor on the specific recommendation of the Principal of the college where the candidate is studying, showing some reasonable cause such as medical grounds, participation in University level sports, cultural activities, seminars, workshops and paper presentation, etc.

OB 3.2 The basis for the calculation of the attendance shall be the period prescribed by the University by its calendar of events. For the first semester students, the same is reckoned from the date of admission to the course as per CET allotment.

OB 3.3 The students shall be informed about their attendance position periodically by the colleges so that the students shall be cautioned to make up the shortage. The Principals of the affiliated Colleges shall submit the list of students who have been detained for shortage of attendance by the end of the semester to the Registrar (Evaluation) with a copy to the Registrar.
Provided that mere omission by the college to inform the student about the shortage of attendance shall not entitle him to appear for examination.

OB 3.4 A Candidate having shortage of attendance in one or more subjects shall have to repeat the whole semester and such candidates shall not be permitted to take admission to next higher semester.
Such students shall take readmission to the same semester in the subsequent academic year.

OB 3.5 Temporary Discontinuation of course:
A student, who wishes to temporarily discontinue the course and continue subsequently, has to obtain prior permission from the University by applying through the Principal. Such students have to take readmission to the same semester/year in the subsequent academic year. However, the candidate shall complete the course as per OB 6.2.

OB 4 INTERNAL ASSESSMENT MARKS

OB 4.1 There shall be a maximum of 25 Internal Assessment Marks in each theory or practical papers. For seminars, the Internal Assessment marks shall be 50.

OB 4.2 The Internal Assessment marks in a theory subject shall be based on two tests generally conducted at the end of 8 and 12 weeks of each semester. An additional test may be conducted for desirous students before the end of the semester to give an opportunity to such students to improve their Internal Assessment Marks, subject to the provisions of OB 4.13. The test shall be answered in Blue Books with pages serially numbered. These blue books shall be kept in the custody of the Principal of the College until one month from the date of announcement of the result by the University. These shall be made available to University authorities for verification as per the directions of the Registrar (Evaluation)/ Registrar.

OB 4.3 Average of the better marks obtained from any two tests shall be the Internal Assessment Marks for the relevant subject.

OB 4.4 If a candidate remains absent for all the Internal Assessment tests conducted, the Internal Assessment Marks shall be marked as A for the subject against the University Seat Number (USN) of the candidate in the marks sheet submitted to the University by the Principal of the College.

OB 4.5 In the case of a Practical, the IA marks shall be based on the laboratory journals/reports and one practical test.

OB 4.6 i) The IA marks for I year Computer Aided Engineering / Drawing:

a) 15 marks for class work (sketching and Computer Aided Engineering drawing).

b) 10 marks for test in the same pattern as that of the main examination (better of the two tests)

ii) The IA marks for other Drawings and Design Drawings offered by Various branches shall be based on the evaluation of the sheets and one test in the ratio 60:40.

OB 4.7 The IA marks in the case of Project and seminar in the final year shall be based on the evaluation at the end of 8th semester by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of who shall be the project / seminar guide.

OB 4.8 The final list, incorporating corrections (if any) of IA marks awarded to the students in the Theory / Practical / Project work / Seminar, shall be displayed on the notice board of the college at least seven days before the closure of the semester and a certified copy of the same shall be sent by the Principals to the University Examination Section within the stipulated date. Every page of the IA marks sheets shall bear the signature of the concerned Teacher/Teachers, Head of the Department and Principal.

OB 4.9 Any corrections or over writing of IA marks shall bear the signature(s) of concerned Teacher(s) and in such cases the Head of the Department shall on every sheet indicate the number of corrections and attest it with his signature.

OB4.10 (a) A candidate failing to secure a minimum of 50% of the IA marks (12/25) in Practical, 50% of marks in project work, shall not be eligible for the practical / project in the University examination.

OB4.10 (b) For seminars, the minimum requirement of IA marks shall be 40% of the maximum.

OB 4.11 Such candidates as mentioned in OB 4.10, shall repeat the laboratory work/project work during the subsequent semester(s) and secure at least the minimum marks prescribed.

OB 4.12 For theory subjects, there shall not be any minimum requirements of IA marks.

OB 4.13 Improvement of IA marks shall not be allowed

a. In theory subjects and

b. in Laboratory / Workshop / Seminar where the candidate has already secured the minimum required marks.

OB 4.14 IA marks of those candidates to whom OB 4.11 is applicable, shall be sent separately to the Registrar (Evaluation).

OB 4.15 IA marks shall reach the University before the commencement of examination. After the submission of Internal Assessment marks to the University, any request for change of IA marks shall not be considered under any circumstances.

OB 5 ELIGIBILITY FOR PASSING

OB 5.1 (a) For a pass in a theory subject/drawing, the candidate shall secure minimum of 35% of the maximum marks prescribed in the University examination and 40% of marks in the aggregate inclusive of the IA marks.

OB 5.1 (b) For a pass in a Practical/Project/Viva-voce examination, a candidate shall secure a minimum of 40% of the maximum marks prescribed for the University Examination in the relevant Practical/Project/Viva-voce.

OB 5.1 (c) For a pass in Seminar, a candidate shall secure a minimum of 40% of the maximum marks prescribed.

OB 5.2 The candidates who do not satisfy the condition OB 5.1 shall be deemed to have failed in that subject and may reappear for the University examination in the subsequent examinations. However, the IA marks awarded to the candidate/s at first attempt in the concerned theory subject will be carried forward. In case of Practicals/Projects/Seminar revised marks will be taken as per regulations OB 4.10 (a & b) and OB 4.11.

OB 5.3 The candidate who passes a subject of a semester as per OB 5.1 is not allowed to appear for the same again, unless he/she opts for rejection of results as per OB 5.4, 5.5, 5.6, 5.7 & 5.8.

OB 5.4 A candidate may at his desire reject his total performance of a semester (including IA marks) or he may reject the result of his performance in University examination of a semester only.

Provided that the rejection is permitted only once during the entire course of study.

OB 5.5 The candidate who desires to reject the performance as per OB 5.4 shall reject performance in all the subjects of the semester, irrespective of whether the candidate has passed or failed in any subject. However, the rejection of performance of 8th semester project results shall not be permitted.

OB 5.6 A candidate who desires to reject the total performance of the semester including Internal Assessment, has to take readmission for the relevant semester. Application for such readmission shall be sent to the Registrar, through the Principal of College within 30 days from the date of the announcement of the results. Late submission of application shall not be accepted for any reasons. Readmission to First semester in such cases will not be considered as fresh admission i.e., the candidate will continue to have the same University Seat Number, which was allotted earlier.

OB 5.7 The candidate, who desires to reject only the results of University examination of a semester and does not desire readmission, shall be permitted to re-appear for examinations of all the subjects of the semester in the subsequent examinations. However, the IA marks obtained by the candidate in the rejected semester shall be retained. Applications for such rejection shall be sent to the Registrar (Evaluation) through the Principal of the College within 30 days from the date of announcement of the results. Late submission of applications shall not be accepted for any reasons.

If the rejection of the University examination results of the semester happens to be of an odd semester, the candidate shall be allowed to take admission to the immediate next even semester. However, if the rejection of the University result is of even semester, the candidate shall not be allowed to take admission to the next odd semester.

OB 5.8 Such candidates who opt for rejection at final year are eligible for the award of class and distinction at the B.E./ B.Tech., degree level, but are not eligible for the award of ranks.

OB 5.9 A candidate shall be declared to have completed the course of B.E./B.Tech. degree, provided the candidate has undergone the stipulated course work in all eight semesters as per the regulations.

OB 6 MAXIMUM DURATION FOR COURSE COMPLETION:

OB 6.1 A candidate who has not obtained the eligibility for third semester after a period of three academic years from the date of first admission shall discontinue the course. However, the candidate is eligible for readmission for first year B.E./B.Tech. in respective College of the University and he/ she shall be allotted a University Seat Number (USN) without any change in the year of admission in the USN but the serial number of the candidate shall start with six hundred (6XX) series in the same branch. (Amended and approved in 52nd E.C. Res. No. 2.4)

OB 6.2 The candidate shall complete the course within a period of eight academic years from the date of first admission, failing which he/she has to discontinue the course.

Provided that the candidates admitted under lateral entry scheme shall complete the course within a period of six academic years from the date of first admission, failing which he / she has to discontinue the course.

(Amended and approved in 74th E.C. Res. No. 6.1 dated 12-8-2008)

OB 7 PROMOTION AND ELIGIBILITY FOR THE EXAMINATIONS

OB 7.1 There shall not be any restriction for promotion from odd semester to the next even semester, provided the candidate has fulfilled the attendance requirement.

OB 7.2 A candidate is eligible for promotion from even semester to the next odd semester (i.e. to the next academic year) if the candidate has not failed in more than four heads of passing of the immediately preceding two semesters and has passed in all the subjects of all the still lower semester examinations. A theory or practical shall be treated as a head of passing.

Illustrations

a. A candidate seeking eligibility to 3rd semester should not have failed in more than 4 heads of passing of first and second semesters taken together.
b. A candidate seeking eligibility to 5th semester should have passed in all the subjects of 1st and 2nd semesters and should not have failed in more than 4 heads of passing of third and fourth semesters taken together.
c. A candidate seeking eligibility to 7th semester should have passed in all the subjects up to 4th semester and should not have failed in more than 4 heads of passing of 5th and 6th semesters taken together.

OB 8 ELECTIVES

OB 8.1 A candidate shall take one elective in 6th semester from 'Group A', two electives in 7th semester (one each from groups 'B' and 'C') and two electives in 8th semester (one each from groups 'D' and 'E'). There shall be a minimum of three electives are to be listed in every group.

OB 8.2 The minimum number of students to be registered for an Elective to be offered shall be not less than ten.

OB 8.3 A candidate shall exercise his option in respect of electives and register for the same at the beginning of concerned semester. The candidate may be permitted to opt for change of elective subject within 15 days from the date of commencement of the semester as per the calendar of the University.

OB 9 SEMINAR AND PROJECT

OB 9.1 Seminar topic shall be selected from the emerging technical areas only.

OB 9.2 Project work at 8th semester shall be completed batch wise, each batch consisting of a maximum of four candidates.

OB 9.3 Viva-Voce examination in project work shall be conducted batch-wise.

OB 10 AWARD OF CLASS AT SEMESTER LEVEL

OB 10.1 For the award of First Class with Distinction in a semester, the candidate shall have secured not less than 70% marks in aggregate in the first attempt and shall have passed in all subjects in one or more attempts.

OB 10.2 For the award of First Class in a semester examination, the candidate shall have securing not less than 60% but less than 70% marks in aggregate in first attempt and shall have passed in all subjects in one or more attempts.

OB 10.3 A candidate who secures in a semester less than 60% of marks in aggregate in first attempt and passes in all the subjects in one or more attempts, shall be declared to have passed the semester examination in only Second Class.

OB 11 AWARD OF CLASS AT DEGREE LEVEL

OB 11.1 The Bachelor Degree in Engineering/Technology shall be awarded to the candidates who have passed all the stipulated examinations from 1st to 8th semesters. However, declaration of the class of the degree shall be based on the performance of the candidate in first attempt from 5th to 8th semester examinations taken together.

OB 11.2 A candidate who has passed in all subjects of 1st to 8th semester securing not less than 70% marks in the first attempt of 5th to 8th semesters taken together shall be declared to be eligible for the award of the B.E. / B.Tech. degree in first class with distinction.

OB 11.3 A candidate who has passed in all subjects of 1st to 8th semester securing not less than 60% but less than 70% of marks in aggregate in the first attempt in 5th to 8th semester examinations taken together shall be declared to be eligible for the award of the B.E./ B.Tech. degree in First Class.

OB 11.4 A candidate who has passed in all subjects of 1st to 8th semester securing less than 60% in aggregate in the first attempt in 5th to 8th semesters shall be declared to be eligible for the award of the B.E. / B.Tech. degree in Second Class.

OB 11.5 The marks secured by the candidate in a semester examination after rejecting the results shall also be taken as first attempt marks and shall be considered for the award of class of the Semester/ Degree but not for award of rank.

OB 12 AWARD OF PRIZES, MEDALS & RANKS

OB 12.1 For the award of Prizes and Medals, the conditions stipulated by the Donor may be considered subject to the provisions of the statutes framed by the University for such awards.

OB 12.2 For award of ranks in a branch, a minimum of 10 candidates should have appeared in the 8th semester examination. The total number of ranks awarded shall be 10% of total number of candidates appeared in 8th semester or 10 whichever is less in that branch.

OB 12.3 For award of rank in a branch of Engineering / Technology, the aggregate marks secured by the candidate from 5th semester to 8th semester shall be considered. A candidate shall be eligible for a rank at the time of award of degree in each branch of Engineering / Technology, provided the candidate

a. Has passed 1st to 8th semester in all the subjects in first attempt only

b. Has not repeated/rejected any of the lower semesters.

OB 13 TRANSFER OF STUDENTS

OB 13.1 Transfer of students from one College to another College within Karnataka State is permitted only at the beginning of third, fifth, and seventh semesters, subject to availability of seats within the permitted intake in respective Colleges and subject to the prior approval of the University and the provisions of OB 7.2.

In the case of candidates from Universities other than VTU they should have passed in all the subjects of 1st and 2nd semesters for admission to 3rd semester and all the subjects of 1st to 4th semesters for admission to 5th semester and all the subjects of 1st to 6th semesters for admission to 7th semester.

The candidates seeking admission from Universities other than VTU shall have to

a) apply for establishment of equivalence with prescribed fees as notified by VTU and

b) obtain No Objection for admission from the University before commencement of term as notified by VTU

OB 13.2 Transfer of students within the College from one branch to another branch at 3rd semester shall be permitted with the prior approval of the VTU and subject to the provisions made by the Government of Karnataka/ AICTE in this behalf.

OB 13.3 The University may prescribe fee for administrative purpose (for updating of the records), which shall be notified from time to time, for transfer from one college to another (Change of College) or within the College (change of branch).

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VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
SCHEME OF TEACHING AND EXAMINATION

I SEMESTER B.E./B.Tech.

PHYSICS GROUP

Sl. No.	Subject Code	Subject	Teaching Department	Board	Theory /Lab/ Drawing (Hrs/ Week)	Examination Marks		
						Th./Pr.	I.A.	Total
1	14MAT11	Engineering Maths-I	Maths	Basic Sc.	4 (T)	100	25	125
2	14PHY12	Engineering Physics	Physics	Basic Sc.	4 (T)	100	25	125
3	14CIV13	Elements of Civil Engg. & Engineering Mechanics	Civil Engg.	Civil Engg.	4 (T)	100	25	125
4	14EME14	Elements of Mechanical Engg.	Mech. Engg.	Mech. Engg.	4 (T)	100	25	125
5	14ELE15	Basic Electrical Engg.	E & E	E & E	4 (T)	100	25	125
6	14WSL16	Workshop Practice	Mech., Auto, IP, IEM, Mfg. Engg.	Mech. Engg.	3 (L)	50	25	75
7	14PHYL17	Engg. Physics Lab	Physics	Basic Sc.	3 (L)	50	25	75
8	14CIP18	*Constitution of India & Professional Ethics	Any Department		2 (T)	50	25	75
9		Language (Kan.)	Humanities		2 (T)	---	---	---
				Total	**30**	**600	**175	**775**

II SEMESTER B.E./B.Tech.

PHYSICS GROUP

Sl. No.	Subject Code	Subject	Teaching Department	Board	Theory /Lab/ Drawing (Hrs/ Week)	Examination Marks		
						Th./Pr.	I.A.	Total
1	14MAT21	Engineering Maths-II	Maths	Basic Sc.	4 (T)	100	25	125
2	14PHY22	Engineering Physics	Physics	Basic Sc.	4 (T)	100	25	125
3	14CIV23	Elements of Civil Engg. & Engineering Mechanics	Civil Engg.	Civil Engg.	4 (T)	100	25	125
4	14EME24	Elements of Mechanical Engg.	Mech. Engg.	Mech. Engg.	4 (T)	100	25	125
5	14ELE25	Basic Electrical Engg.	E & E	E & E	4 (T)	100	25	125
6	14WSL26	Workshop Practice	Mech./IP/Auto/ Mfg.Engg./ IEM	Mech. Engg.	3 (L)	50	25	75
7	14PHYL27	Engg. Physics Lab	Physics	Basic Sc.	3 (L)	50	25	75
8	14CIP28	*Constitution of India & Professional Ethics	Any Department	Civil	2 (T)	50	25	75
9		Language (Kan.)	Humanities		2 (T)	---	---	---
				Total	**30**	**600	**175	**775**

I SEMESTER B.E./B.Tech.

CHEMISTRY GROUP

Sl. No.	Subject Code	Subject	Teaching Department	Board	Theory /Lab/ Drawing (Hrs/ Week)	Examination Marks		
						Th./Pr.	I.A.	Total
1	14MAT11	Engineering Maths-I	Maths	Basic Sc.	4 (T)	100	25	125
2	14CHE12	Engineering Chemistry	Chemistry	Basic Sc.	4 (T)	100	25	125
3	14PCD13	Programming in C & Data Structures	Any Engineering Department	CSE	4 (T)	100	25	125
4	14CED14	Computer Aided Engineering Drawing	Mech./IP/Auto/ Mfg.Engg./ IEM	Mech. Engg.	6 (2T + 4L)	100	25	125
5	14ELN15	Basic Electronics	E & C / E & E / TC / IT	E & C	4 (T)	100	25	125
6	14CPL16	Computer Programming Lab	Any Engineering Department	CSE	3 (L)	50	25	75
7	14CHEL17	Engg. Chemistry Lab	Chemistry	Basic Sc.	3 (L)	50	25	75
8	14CIV18	*Environmental Studies	Civil / Environmental	Civil	2 (T)	50	25	75
9		Language (Eng.)	Humanities		2 (T)	---	---	---
				Total	**32**	****600**	****175**	**775**

II SEMESTER B.E./B.Tech.

CHEMISTRY GROUP

Sl. No.	Subject Code	Subject	Teaching Department	Board	Theory /Lab/ Drawing (Hrs/ Week)	Examination Marks		
						Th./Pr.	I.A.	Total
1	14MAT21	Engineering Maths-II	Maths	Basic Sc.	4 (T)	100	25	125
2	14CHE22	Engineering Chemistry	Chemistry	Basic Sc.	4 (T)	100	25	125
3	14PCD23	Programming in C & Data Structures	Any Engineering Department	CSE	4 (T)	100	25	125
4	14CED24	Computer Aided Engineering Drawing	Mech./IP/Auto/ Mfg.Engg./ IEM	Mech. Engg.	6 (2T + 4L)	100	25	125
5	14ELN25	Basic Electronics	E & C/ E & E / TC / IT	E & C	4 (T)	100	25	125
6	14CPL26	Computer Programming Lab	Any Engineering Department	CSE	3 (L)	50	25	75
7	14CHEL27	Engg. Chemistry Lab	Chemistry	Basic Sc.	3 (3)	50	25	75
8	14CIV28	*Environmental Studies	Civil / Environmental	Civil	2 (T)	50	25	75
9		Language (Eng.)	Humanities		2 (T)	---	---	---
				Total	**32**	****600**	****175**	**775**

*** CIP/Env.Engg. : Question Papers will be of Objective Type. Students have to pass the subject compulsorily, however marks will not be considered for awarding class / rank.**

****Excluding Environmental Studies/Constitution of India & Professional Ethics**

Language (Kan./Eng.) – Audit Course

ENGINEERING MATHEMATICS - I

Subject Code :	**14MAT11**	**IA Marks :**	**25**
Hours/Week :	**04**	**Exam. Hours :**	**03**
Total Hours :	**50**	**Exam. Marks :**	**100**

Course Objectives :

To enable students to apply knowledge of Mathematics in various engineering fields by making them to learn the following:

- n^{th} derivatives of product of two functions and polar curves.
- Partial derivatives, indeterminate form and jacobian.
- Vectors and Curve tracing.
- Reduction formulae; First order differential equations.
- Solution of system of equations and quadratic forms.

Module – 1

Differential Calculus - 1 :

Determination of n^{th} order derivatives of Standard functions - Problems. Leibnitz's theorem (without proof) - problems.

Polar Curves - angle between the radius vector and tangent, angle between two curves, Pedal equation for polar curves. Derivative of arc length - Cartesian, Parametric and Polar forms (without proof) - problems. Curvature and Radius of Curvature – Cartesian, Parametric, Polar and Pedal forms and problems. **10 Hours**

Module – 2

Differential Calculus - 2 :

Taylor's and Maclaurin's theorems for function of one variable(statement only)- problems. Evaluation of Indeterminate forms.

Partial derivatives – Definition and simple problems, Euler's theorem – problems, total derivatives, partial differentiation of composite functions, Jacobians-definition and problems, extreme values of functions of two variables. **10 Hours**

Module – 3

Vector Calculus :

Derivative of vector valued functions, Velocity, Acceleration and related

problems, Scalar and Vector point functions, Gradient, Divergence, Curl, Solenoidal and Irrotational vector fields. Vector identities - div (ϕA), curl (ϕA), curl (grad ϕ), div (curl A).

Differentiation under integral sign using Leibnitz rule with constant and variable limits.

Curve Tracing - General rules to trace Cartesian, polar and parametric curves. **10 Hours**

Module – 4

Integral Calculus :

Reduction formulae $\int Sin^n x dx, \int Cos^n x dx, \int Sin^m x Cos^n x dx$ (m and n are positive integers), evaluation of these integrals with standard limits (0 to $\pi/2$) and problems.

Differential Equations :

Solution of first order and first degree differential equations – Exact, reducible to exact and Bernoulli's differential equations.

Applications – orthogonal trajectories, Newton's law of cooling, flow of electricity, laws of decay and growth. **10 Hours**

Module – 5

Linear Algebra :

Rank of a matrix by elementary transformations, solution of system of linear equations - Gauss-elimination method, Gauss-Seidel method and L-U decomposition method.

Linear transformation, diagonalisation of a square matrix, Quadratic forms, reduction to Canonical form by orthogonal transformation, Rayleigh's power method to find the largest Eigen value and the corresponding Eigen vector. **10 Hours**

Course Outcomes :

On completion of this course, students are able to

- Use partial derivatives to calculate rates of change of multivariate functions.
- Analyze position, velocity, and acceleration in two or three dimensions using the calculus of vector valued functions.
- Trace the curves which are useful in applications of integration in finding the length, area and volume.
- Recognize and solve first-order ordinary differential equations, model simple electrical circuits, projectile motion and Newton's law of cooling and laws of decay and growth, and

- Use matrices, determinants and techniques for solving systems of linear equations in the different areas of Linear Algebra.

Scheme of examination :

- **Two full questions (with a maximum of four sub questions) of twenty marks each to be set from each module. Each question should cover all contents of the respective module.**
- **Students have to answer five full questions choosing one full question from each module.**

Text Books :

1. B.S. Grewal, **"Higher Engineering Mathematics"**, Khanna publishers, 42nd edition, 2013.
2. Erwin Kreyszig, **"Advanced Engineering Mathematics"**-Vol-I & II, Wiley, 2013

Reference Books :

1. B.V. Ramana, **"Higher Engineering Mathematics"**, Tata Mc Graw-Hill, 2006
2. N.P.Bali and Manish Goyal, **"A text book of Engineering mathematics"**, Laxmi publications, latest edition.
3. H.K.Dass and Er. RajnishVerma, **"Higher Engineerig Mathematics"**, S.Chand publishing, 1st edition, 2011.

ENGINEERING PHYSICS

Subject Code :	**14PHY12/14PHY22**	**IA Marks**	**: 25**
Hours/Week :	**04**	**Exam. Hours**	**: 03**
Total Hours :	**50**	**Exam. Marks**	**: 100**

Course Objectives :

The Objective of this course is to make students learn and understand basic concepts and principles of physics to analyze practical engineering problems and apply its solutions effectively and meaningfully. To understand building up of models, design issues, practical oriented skills and problem solving challenges are the great task of the course. Knowledge about shock waves and practical applications is the prime motto to introduce new technology at the initial stage of Engineering.

Module – 1

Modern Physics and Quantum Mechanics :

Black body radiation spectrum, Assumptions of quantum theory of radiation, Plank's law, Weins law and Rayleigh Jeans law, for shorter and longer wavelength limits.Wave Particle dualism, deBroglie hypothesis. Compton Effect and its Physical significance. Matter waves and their Characteristic properties, Phase velocity and group velocity. Relation between phase velocity and group velocity, Relation between group velocity and particle velocity.

Heisenberg's uncertainty principle and its application, (Non-existence of electron in nucleus).Wave function, Properties and physical significance of wave function, Probability density and Normalization of wave function. Setting up of one dimensional time independent Schrodinger wave equation. Eigen values and Eigen functions. Application of Schrodinger wave equation. Energy Eigen values and Eigen functions for a particle in a potential well of infinite depth and for free particle. **10 Hours**

Module – 2

Electrical Properties of Materials :

Free–electron concept (Drift velocity, Thermal velocity, Mean collision time, Mean free path, relaxation time). Failure of classical free electron theory. Quantum free electron theory, Assumptions, Fermi factor, density of states (qualitative only), Fermi–Dirac Statistics. Expression for electrical conductivity based on quantum free electron theory, Merits of quantum free electron theory.

Conductivity of Semi conducting materials, Concentration of electrons and holes in intrinsic semiconductors, law of mass action. Fermi level in an intrinsic Semiconductor. Hall effect, Hall coefficient

Temperature dependence of resistivity in metals and superconducting materials. Effect of magnetic field (Meissner effect). Type-I and Type-II superconductors–Temperature dependence of critical field. BCS theory (qualitative). High temperature superconductors. Applications of superconductors –. Maglev vehicles. **10 Hours**

Module – 3

Lasers and Optical Fibers :

Einstein's coefficients (expression for energy density). Requisites of a Laser system. Condition for laser action. Principle, Construction and working of CO_2 laser and semiconductor Laser. Applications of Laser – Laser welding, cutting and drilling. Measurement of atmospheric pollutants. Holography– Principle of Recording and reconstruction of images, applications of holography.

Propagation mechanism in optical fibers. Angle of acceptance. Numerical aperture. Types of optical fibers and modes of propagation. Attenuation, Block diagram discussion of point to point communication, applications.

10 Hours

Module – 4

Crystal Structure :

Space lattice, Bravais lattice–Unit cell, primitive cell. Lattice parameters. Crystal systems. Direction and planes in a crystal. Miller indices. Expression for inter – planar spacing. Co-ordination number. Atomic packing factors(SC, FCC, BCC). Bragg's law, Determination of crystal structure using Bragg's X–ray difractometer. Polymarphism and Allotropy. Crystal Structure of Diamond, qualitative discussion of Pervoskites. Principle and working of Liquid Crystal display. **10 Hours**

Module – 5

Shock waves and Science of Nano Materials :

Definition of Mach number, distinctions between- acoustic, ultrasonic, subsonic and supersonic waves. Description of a shock wave and its applications. Basics of conservation of mass, momentum and energy - derivation of normal shock relationships using simple basic conservation

equations (Rankine-Hugonit equations). Methods of creating shock waves in the laboratory using a shock tube, description of hand operated Reddy shock tube and its characteristics. Experimental analysis of the performance characteristics of Reddy shock tube.

Introduction to Nano Science, Density of states in 1D, 2D and 3D structures. Synthesis : Top–down and Bottom–up approach, Ball Milling and Sol–Gel methods.

CNT – Properties, synthesis: Arc discharge, Pyrolysis methods, Applications. Scanning Electron microscope: Principle, working and applications.

10 Hours

Course Outcomes :

On Completion of this course, students are able to

- Learn and understand more about basic principles and to develop problem solving skills and implementation in technology.
- Gain Knowledge about Modern physics and quantum mechanics will update the basic concepts to implement the skills.
- Study of material properties and their applications is the prime role to understand and use in engineering applications and studies.
- Study Lasers and Optical fibers and its applications are to import knowledge and to develop skills and to use modern instruments in the engineering applications.
- Understand Crystal structure and applications are to boost the technical skills and its applications.
- Expose shock waves concept and its applications will bring latest technology to the students at the first year level to develop research orientation programs at higher semester level and
- Understand basic concepts of nanoscience and technology.

Scheme of examination :

- **Two full questions (with a maximum of four sub questions) of twenty marks each to be set from each module. Each question should cover all contents of the respective module.**
- **Students have to answer five full questions choosing one full question from each module**

Text Books :

1. Wiley precise Text, **"Engineering Physics"**, Wiley India Private Ltd., New Delhi. Book series – 2014,
2. Dr.M.N. Avadhanulu, Dr.P.G.Kshirsagar, **"Text Book of Engineering Physics"**, S Chand Publishing, New Delhi – 2012.

Reference Books :

1. Wiley precise Text, **"Engineering Physics"**, Wiley India Private Ltd., New Delhi. Book series – 2014,
2. S.O.Pillai, **"Solid State Physics"**, New Age International. Sixth Edition
3. Chintoo S.Kumar , K.Takayana and K.P.J.Reddy,**"Shock waves made simple"**, Willey India Pvt. Ltd. New Delhi,2014
4. A. Marikani, **"Engineering Physics"**, PHI Learning Private Limited, Delhi–2013
5. Prof. S. P. Basavaraju, **"Engineering Physics"**, Subhas Stores, Bangalore–2
6. V. Rajendran, **"Engineering Physics"**, Tata Mc.Graw Hill Company Ltd., New Delhi - 2012
7. S.Mani Naidu,**"Engineering Physics"**, Pearson India Limited – 2014.

ENGINEERING CHEMISTRY

Sub. Code : 14CHE12/14CHE22	**I.A. Marks : 25**
Hours/ week : 04	**Exam. Hours : 03**
Total Hours : 50	**Exam. Marks : 100**

Course Objectives :

To provide students with knowledge of engineering chemistry for building technical competence in industries, research and development in the following fields

- Electrochemistry & Battery Technology.
- Corrosion & Metal Finishing.
- Fuels & Solar energy.
- Polymers.
- Water Technology & Nano Materials.

Module – 1

Electrochemistry and Battery Technology :

Electrochemistry: Introduction, Derivation of Nernst equation for electrode potential. Types of electrodes: metal-metal ion, metal-metal salt ion, gas, amalgam, redox & ion selective. Reference electrodes: Introduction; construction, working and applications of calomel and Ag / AgCl electrodes. Measurement of standard electrode potential using calomel electrode. Construction and working of glass electrode, determination of pH using glass electrode. Concentration cells: Electrode & Electrolyte, numerical problems on electrolyte concentration cells.

Battery Technology : Introduction, classification - primary, secondary and reserve batteries. Characteristics - cell potential, current, capacity, electricity storage density, energy efficiency, cycle life and shelf life. Construction, working and applications of Zinc-Air, Nickel- metal hydride batteries. Lithium batteries: Introduction, Li-MnO_2 and Li-ion batteries.

Fuel Cells: Introduction, difference between conventional cell and fuel cell, limitations & advantages. Classification of fuel cells based on temperature, fuel and electrolyte; construction & working of methanol-oxygen fuel cell with H_2SO_4 electrolyte. **10 Hours**

Module – 2

Corrosion and Metal Finishing :

Corrosion : Introduction, electrochemical theory of corrosion, galvanic series.

Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, polarization of anodic & cathodic regions, nature of metal, nature of corrosion product, nature of medium – pH, conductivity, and temperature. Types of corrosion- Differential metal , differential aeration(Pitting and water line) and stress (caustic embrittlement in boilers).Corrosion control: Design and selection of materials, inorganic coatings-Anodizing of Al and phosphating, metal coatings-Galvanization and Tinning. Cathodic protection (sacrificial anodic and impressed current methods).

Metal Finishing: Introduction, Technological importance. Electroplating: Introduction, principles governing-Polarization, decomposition potential and overvoltage. Factors influencing the nature of electro deposit-current density, concentration of metal salt, metal ion & electrolyte; pH, temperature & throwing power of plating bath, additives-complexing agents, brighteners, levellers, structure modifiers & wetting agents. Electroplating of chromium and gold (acidic cyanide bath). Electro less plating: Introduction, distinction between electroplating and electro less plating, electro less plating of copper & manufacture of double sided Printed Circuit Board with copper.

10 Hours

Module – 3

Fuels and Solar Energy :

Fuels: Introduction, classification, calorific value- gross and net calorific values, determination of calorific value of fuel using bomb calorimeter, numerical problems. Cracking: Introduction, fluidized catalytic cracking, synthesis of petrol by Fishcher-Tropsch process, reformation of petrol, octane and cetane numbers. Gasoline and diesel knocking and their mechanism, anti knocking agents, unleaded petrol, power alcohol, biodiesel & biogas.

Solar Energy: Introduction, utilization and conversion, photovoltaic cells-importance, construction and working. Design: modules, panels & arrays. Advantages & disadvantages of PV cells. Silicon-physical & chemical properties relevant to photovoltaics, production of solar grade silicon(union carbide process), doping of silicon-diffusion technique (n&p types) and purification of silicon(zone refining). **10 Hours**

Module – 4

Polymers :

Introduction, types of polymerization: addition and condensation, mechanism of polymerization- free radical mechanism taking vinyl chloride as an example. Molecular weight of polymers: number average and weight average,

numerical problems. Glass transition temperature (Tg): Factors influencing Tg-Flexibility, inter molecular forces, molecular mass, branching & cross linking, and stereo regularity. Significance of Tg. Structure property relationship: crystallinity, tensile strength, elasticity, plastic deformation & chemical resistivity. Synthesis, properties and applications of PMMA (plexi glass), Teflon, Polyurethane and polycarbonate. Elastomers: Introduction, synthesis, properties and applications of Silicone rubber. Adhesives: Introduction, synthesis, properties and applications of epoxy resin. Polymer Composites: Introduction, synthesis, properties and applications of kevlar and carbon fiber. Conducting polymers: Introduction, mechanism of conduction in Polyaniline and applications of conducting polyaniline.

10 Hours

Module – 5

Water Technology and Nanomaterials :

Water Technology: Introduction, sources and impurities of water; boiler feed water, boiler troubles with disadvantages -scale and sludge formation, priming and foaming, boiler corrosion(due to dissolved O_2, CO_2 and $MgCl_2$). Determination of DO, BOD and COD, numerical problems. Sewage treatment: Primary, secondary (activated sludge method) and tertiary methods. Softening of water by ion exchange process. Desalination of sea water by reverse osmosis & electrodialysis (ion selective)..

Nano Materials : Introduction, properties (size dependent). Synthesis-bottom up approach (sol-gel, precipitation, gas condensation, chemical vapour condensation, hydro thermal & thermolysis processes). Nano scale materials-nano crystals & clusters, nano crystalline, fullerenes, carbon nano tubes, nano wires, nano rods, dendrimers & nano composites. **10 Hours**

Course Outcomes :

On completion of this course, students will have knowledge in:

- Types of electrodes, electrochemical and concentration cells. Classical & modern batteries and fuel cells.
- Causes & effects of corrosion of metals and control of corrosion. Modification of surface properties of metals to develop resistance to corrosion, wear, tear, impact etc. by electroplating and electro less plating.
- Production & consumption of energy for industrialization of country and living standards of people. Utilization of solar energy for different useful forms of energy.
- Replacement of conventional materials by polymers for various applications.
- Boiler troubles; sewage treatment and desalination of sea water, and

- Over viewing of synthesis, properties and applications of nanomaterials.

Scheme of examination :

- **Two full questions (with a maximum of four sub questions) of twenty marks each to be set from each module. Each question should cover all contents of the respective module.**
- **Students have to answer five full questions choosing one full question from each module.**

Text Books :

1. B.S.Jai Prakash, R.Venugopal, Sivakumaraiah & Pushpa Iyengar., **"Chemistry for Engineering Students"**, Subhash Publications, Bangalore.
2. R.V.Gadag & A.Nityananda Shetty., **"Engineering Chemistry"**, I K International Publishing House Private Ltd. New Delhi.
3. P.C.Jain & Monica Jain.,**"Engineering Chemistry"**, Dhanpat Rai Publications, New Delhi.

Reference Books :

1. O.G.Palanna,**"Engineering Chemistry"**,Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint.
2. G.A.Ozin & A.C. Arsenault, **"Nanochemistry A Chemical Approach to Nanomaterials"**, RSC publishing, 2005.
3. **"Wiley Engineering Chemistry"**, Wiley India Pvt. Ltd. New Delhi. Second Edition.
4. V.R.Gowariker, N.V.Viswanathan & J.Sreedhar., **"Polymer Science"**, Wiley-Eastern Ltd.
5. M.G.Fontana., **"Corrosion Engineering"**, Tata McGraw Hill Publishing Pvt. Ltd. New Delhi.

ELEMENTS OF CIVIL ENGINEERING AND MECHANICS

Subject Code :	**14CV13/23**	**IA Marks**	**: 25**
Hours/Week :	**04**	**Exam. Hours**	**: 03**
Total Hours :	**50**	**Exam. Marks**	**: 100**

Course Objectives :

The objectives of this course is to make students to learn basics of civil engineering concepts and infrastructure development, solve problems involving Forces, loads & moments and know their applications in allied subjects. It is a pre-requisite for several course envolving Forces, Moments, Centroids moments, Centroids, Moment of inertia & Kinematics.

Module – 1

Introduction to Civil Engineering &Engineering Mechanics :

Introduction to Civil Engineering,

Scope of different fields of Civil Engineering - Surveying, Building Materials, Construction Technology, Geotechnical Engineering, Structural Engineering, Hydraulics, Water Resources and Irrigation Engineering, Transportation Engineering, Environmental Engineering.

Infrastructure: Types of infrastructure, Role of Civil Engineer in the Infrastructural Development, Effect of the infrastructural facilities on socio-economic development of a country.

Roads: Classification of Roads and their functions, Comparison of Flexible and Rigid Pavements (Advantages and Limitations)

Bridges: Types of Bridges and Culverts, RCC, Steel and Composite Bridges

Dams: Different types of Dams based on Material, Structural behavior and functionality with simple sketches.

Introduction to Engineering Mechanics :

Basic idealizations - Particle, Continuum and Rigid body; Force and its characteristics, types of forces, Classification of force systems; Principle of physical independence of forces, Principle of superposition of forces, Principle of transmissibility of forces; Newton's laws of motion, Introduction to SI units. Couple, Moment of a couple, Characteristics of couple, Moment of a force, Equivalent force - Couple system; Numerical problems on moment of forces and couples, on equivalent force - couple system. **10 Hours**

Module – 2

Analysis of Force Systems- Concurrent & Non Concurrent System :
Concurrent Force System :
Composition of forces - Definition of Resultant; Composition of coplanar - concurrent force system, Parallelogram Law of forces, Principle of resolved parts; Numerical problems on composition of coplanar concurrent force systems.
Non Concurrent Force System :
Composition of coplanar - non-concurrent force system, Varignon's principle of moments; Numerical problems on composition of coplanarnon-concurrent Force system. **10 Hours**

Module – 3

Equilibrium of Forces and Friction :
Equilibrium of Concurrent and Non-concurrent Forces :
Equilibrium of forces - Definition of Equilibrant; Conditions of static equilibrium for different force systems, Lami's theorem; Numerical problems on equilibrium of coplanar – concurrent and non-concurrent force systems.
Support Reaction :
Types of Loads and Supports, statically determinate beams, Numerical problems on support reactions for statically determinate beams with Point load (Normal and inclined) and uniformly distributed loads.
Friction :
Definitions: Types of friction, Laws of static friction, Limiting friction, Angle of friction, angle of repose; Impending motion on horizontal and inclined planes;
Numerical Problems on single and two blocks on inclined planes. Numerical problems on Ladder and Wedge friction. **10 Hours**

Module – 4

Centroid and Moment of Inertia of Engineering Sections Centroids :
Introduction to the concept, centroid of line and area, centroid of basic geometrical figures, computing centroid for composite lines and Engineering composite sections – T, L, I and Z & full quadrant Circular sections and their built up sections, Numerical problems
Moment of Inertia :
Introduction to the concept, Radius of gyration, Parallel axis theorem, Perpendicular axis theorem, Moment of Inertia of basic planar figures,

computing moment of Inertia for Engineering composite sections – T, L, I and Z & full quadrant Circular sections and their built up sections, Numerical problems **10 Hours**

Module – 5

Kinematics :
Definitions – Displacement – Average velocity – Instantaneous velocity – Speed – Acceleration - Average acceleration – Variable acceleration – Acceleration due to gravity – Newton's Laws of Motion, Rectilinear Motion– Numerical problems.
Curvilinear Motion – Super elevation – Projectile Motion – Relative motion – Numerical problems.
Motion under gravity – Numerical problems. **10 Hours**

Course Outcomes :
After successful completion of the course, the student will be able to,
- Know basics of Civil Engineering, its scope of study, knowledge about Roads, Bridges and Dams.
- Comprehend the action of Forces, Moments and other loads on systems of rigid bodies
- Compute the reactive forces and the effects that develop as a result of the external loads
- Express the relationship between the motion of bodies and
- Equiped to pursue studies in allied courses in Mechanics.

Scheme of examination :
- **Two full questions (with a maximum of four sub questions) of twenty marks each to be set from each module. Each question should cover all contents of the respective module.**
- **Students have to answer five full questions choosing one full question from each module.**

Text Books :
1. M.N.Shesha Prakash and Ganesh.B.Mogaveer, **"Elements of Civil Engineering and Engineering Mechanics"**, PHI Learning, 3rd Revised edition (2014)
2. A.Nelson, **"Engineering Mechanics-Statics and Dynamics"**, Tata McGraw Hill Education Private Ltd, New Delhi, 2009

3. S.S. Bhavikatti, **"Elements of Civil Engineering"**, New Age International Publisher, New Delhi, 3rd edition 2009.

Reference Books :

1. S.Timoshenko, D.H.Young and J.V.Rao, **"Engineering Mechanics"**, TATA McGraw-Hill Book Company, New Delhi
2. Beer FP and Johnston ER, **"Mechanics for Engineers- Dynamics and Statics"**, 3rd SI Metric edition, Tata McGraw Hill. - 2008
3. Shames IH, **"Engineering Mechanics–Statics & Dynamics"**, PHI–2009

PROGRAMMING IN C AND DATA STRUCTURES

Subject Code :	**14PCD13/14PCD23**	**IA Marks**	**: 25**
Hours/Week :	**04**	**Exam. Hours**	**: 03**
Total Hours :	**50**	**Exam. Marks**	**: 100**

Course Objectives :

The objectives of this course are to make students to learn basic principles of Problem solving, implementing through C programming language and to design & develop programming skills, and to know about data structures and their applications.

Module – 1

Introduction To C Language : Pseudo code solution to problem, Basic concepts in a C program, Declaration, Assignment & Print statements, Types of operators and expressions etc, Programming examples and exercise. Text 1: Chapter 2.Text 2: 1.1, 1.2, 1.3. **10 Hours**

Module – 2

Branching and Looping : Two way selection (if, if-else, nested if-else, cascaded if-else), switch statement, ternary operator? Go to, Loops (For, while-do, do-while) in C, break and continue, Programming examples and exercises. Text 1: Chapter 3. Text 2: 4.4. **10 Hours**

Module – 3

Functions, Arrays and Strings:

Arrays and Strings : Using an array, Using arrays with Functions, Multi-Dimensional arrays. String: Declaring, Initializing, Printing and reading strings, string manipulation functions, String input and output functions, array of strings, Programming examples and Exercises.

Text 1: 5.7, Text 2: 7.3, 7.4, chapter 9

Functions : Functions in C, Argument Passing – call by value, call by reference, Functions and program structure, location of functions, void and parameter less Functions, Recursion, Programming examples and exercises. Text 1: 1.7, 1.8, Chapter 4. Text 2: 5.1 to 5.4. **10 Hours**

Module – 4

Structures and File Management : Basic of structures, structures and Functions, Array of structures, structure Data types, type definition, Defining, opening and closing of files, Input and output operations, Programming examples and exercises.
Text 1: 6.1 to 6.3. Text 2: 10.1 to 10.4, Chapter 11. **10 Hours**

Module – 5

Pointers and Preprocessors : Pointers and address, pointers and functions (call by reference) arguments, pointers and arrays, address arithmetic, character pointer and functions, pointers to pointer ,Initialization of pointer arrays, Dynamic memory allocations methods, Introduction to Preprocessors, compiler control Directives, Programming examples and exercises.
Text 1: 5.1 to 5.6, 5.8. Text 2: 12.2, 12.3, 13.1 to 13.7.
Introduction to Data Structures : Primitive and non primitive data types, Abstract data types, Definition and applications of Stacks, Queues, Linked Lists and Trees.
Text 2: 14.1, 14.2, 14.11, 14.12, 14.13, 14.15, 14.16, 14.17, 15.1. **10 Hours**

Course Outcomes :
On completion of this course, students are able to
- Achieve Knowledge of design and development of problem solving skills.
- Understand the basic principles of Programming in C language
- Design and develop modular programming skills.
- Effective utilization of memory using pointer technology, and
- Understands the basic concepts of pointers and data structures.

Scheme of examination :
- **Two full questions (with a maximum of four sub questions) of twenty marks each to be set from each module. Each question should cover all contents of the respective module.**
- **Students have to answer five full questions choosing one full question from each module**

Text Books :
1. Brian W. Kernighan and Dennis M. Ritchie, **"The C Programming Language"**, 2nd Edition, PHI, 2012.

2. Jacqueline Jones & Keith Harrow, **"Problem Solving with C"**, 1st Edition, Pearson 2011.

Reference Books :
1. Vikas Gupta, **"Computer Concepts and C Programming"**, Dreamtech Press 2013.
2. R. S.Bichkar, Programming with C, University Press, 2012.
3. V. Rajaraman, **"Computer Programming in C"**, PHI, 2013.

ELEMENTS OF MECHANICAL ENGINEERING

Subject Code :	**14EME14/14 EME 24**	**IA Marks**	**: 25**
Hours/Week :	**04**	**Exam. Hours**	**: 03**
Total Hours :	**50**	**Exam. Marks**	**: 100**

Course Objectives :
Students belonging to all branches of Engineering are made to learn certain fundamental topics related to mechanical engineering so that they will have a minimum understanding of mechanical systems, equipment and process.

Module – 1

Energy Resources : Non-renewable and renewable energy resources, **Petroleum based** solid, liquid and gaseous fuels, Calorific values of fuels, Combustion and combustion products of fuels, **Solar Power :** Solar Radiation, Solar constant (definition only), Solar Thermal energy harvesting, ex: liquid flat plate collectors, solar ponds (principle of operation only), Solar photovoltaic principle.**Wind Power :** principle of operation of a typical windmill. **Hydro Power :** Principles of electric power generation from hydropowerplants, **Nuclear Power :** Principles of Nuclear power plants, **Bio Fuels :** introduction to bio fuels, examples of various biofuels used in engineering applications, Comparison of biofuels with petroleum fuels in terms of calorific value and emission. **Steam Formation and Properties :** Classification of boilers, Lancashire boiler, Babcock and Wilcox boiler, boiler mountings and accessories (No sketches for mountings and accessories), wet steam, saturated and superheated steam, specific volume, enthalpy and internal energy. (No numerical problems in this module) **10 Hours**

Module – 2

Turbines and IC Engines and Pumps Steam turbines : Classification, Principle of operation of Impulse and reaction turbines, Delaval's turbine, Parson's turbine. (No compounding of turbines).
Gas turbines : Classification, Working principles and Operations of Open cycle and closed cycle gas turbines.
Water turbines : Classification, Principles and operations of Pelton wheel, Francis turbine and Kaplan turbine
Internal Combustion Engines : Classification, I.C. Engines parts, 2 Stroke and 4 stroke Petrol engines, 4 stroke diesel engines. P-V diagrams of Otto

and Diesel cycles. Problems on indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency, and specific fuel consumption, [numericals on IC Engines]. **10 Hours**

Module – 3

Machine Tools and Automation Machine Tools Operations :
Turning, facing, knurling, Thread cutting, Taper Turning by swivelling the compound rest, Drilling, Boring, Reaming, Tapping, Counter Sinking, Counter Boring, -Plane milling, End milling, Slot milling. (No sketches of Machine tools, sketches to be used only for explaining operations. Students to be shown the available machine tools in the Machine Shop of the college before explaining the operations)
Robotics and Automation :
Robotics : Introduction, classification based on robots configuration; Polar, cylindrical, Cartesian Coordinate and spherical. Application, Advantages, and disadvantages
Automation : Definition, types –Fixed, Programmable & Flexible automation, NC/ CNC machines: Basic elements with simple block diagrams, advantages and disadvantages. **10 Hours**

Module – 4

Engineering materials and joining processes :
Engineering Materials :
Types and applications of Ferrous & Nonferrous metals and alloys,
Composites : Introduction: Definition, Classification and applications (Air craft and Automobiles)
Soldering, Brazing and Welding :
Definitions, classification and method of soldering, Brazing and welding. Differences between soldering, Brazing and Welding. Description of Electric Arc Welding and Oxy-Acetylene Welding. **10 Hours**

Module – 5

Refrigeration, Air-Conditioning :
Refrigerants : properties of refrigerants, list of commonly used refrigerants. Refrigeration –
Definitions – Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, Relative COP, unit of Refrigeration. Principle and working of vapor

compression refrigeration and vapour absorption refrigeration: Principles and applications of air conditioners, Room air conditioner. **10 Hours**

Course Outcomes :

Students shall demonstrate knowledge associated with,

1. Various Energy sources, Boilers, Prime movers such as turbines and IC engines, refrigeration and air-conditioning systems
2. Metal removal process using Lathe, drilling, Milling Robotics and Automation.
3. Fair understanding of application and usage of various engineering materials.

Scheme of examination :

- **Two full questions (with a maximum of four sub questions) of twenty marks each to be set from each module. Each question should cover all the contents of the respective module.**
- **Students have to answer five full questions choosing one full question from each module**

Text Books :

1. V.K.Manglik, **"Elements of Mechanical Engineering"**, PHI Publications, 2013. (Module-1,2,4,5)
2. Mikell P.Groover, **"Automation, Production Systems & CIM"**, 3rd Edition, PHI (Module -3)
3. K.R.Gopalkrishna, **"A text Book of Elements of Mechanical Engineering"**- Subhash Publishers, Bangalore. (Module -1,2,3,4,5)

Reference Books :

1. S.TrymbakaMurthy, **"A Text Book of Elements of Mechanical Engineering"**, 4th Edition 2006, Universities Press (India) Pvt Ltd, Hyderabad.
2. K.P.Roy, S.K.Hajra Choudhury, Nirjhar Roy, **"Elements of Mechanical Engineering"**, Media Promoters & Publishers Pvt Ltd,Mumbai,7th Edition,2012
3. Pravin Kumar, **"Basic Mechanical Engineering"**, 2013 Edition, Pearson.

COMPUTER AIDED ENGINEERING DRAWING

Subject Code :	**14CDE14/14CDE24**	**IA Marks**	**: 25**
Hours/Week :	**06**	**Exam. Hours**	**: 03**
	(Instruction 2Hrs. + Sketching & Practice 4 Hrs.)		
Total Hours :	**56**	**Exam. Marks**	**: 100**

Course Objectives :

The main objectives of this course are to impart knowledge on:

1. Fundamentals of engineering drawing and usage of CAD software
2. Students of all branches of Engineering are trained to solve Engineering problems enabling them to understand Engineering applications.

Module – 1

Introduction to Computer Aided Sketching :

Introduction, Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line conventions, material conventions and lettering. **12 Hours**

Module – 2

Orthographic Projections :

Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (No application problems).

Orthographic Projections of Plane Surfaces (First Angle Projection Only) :

Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different

positions by change of position method only (No problems on punched plates and composite plates). **24 Hours**

Module – 3

Projections of Solids (First Angle Projection only) :
Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions (No problems on octahedrons and combination solid) **24 Hours**

Module – 4

Sections and Development of Lateral Surfaces of Solids :
Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. (No problems on sections of solids)
Development of lateral surfaces of above solids, their frustums and truncations. (No problems on lateral surfaces of trays, tetrahedrons, spheres and transition pieces) **12 Hours**

Module – 5

Isometric Projection (Using Isometric Scale Only) :
Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids (Maximum of three solids). **12 Hours**

Course Outcomes :
After studying this course,
1. Students will be able to demonstrate the usage of CAD software.
2. Students will be able to visualize and draw Orthographic projections, Sections of solids and Isometric views of solids.
3. Students are evaluated for their ability in applying various concepts to solve practical problems related to engineering drawing.

Conducting classes :
Classes may be conducted in two slots/ week of 3 hours each (Instruction 1 hr. + Sketching & Practice 2 hr.)

Scheme of Evaluation for Internal Assessment (25 Marks) :
1. 15 Marks for Class work (Sketching & Computer Aided Engineering drawing printouts in A4 size sheets).
2. 10 Marks for test in the same pattern as that of the main examination. (Better of the two Tests).

All the solutions must be valued on the spot by examining the sketches, display and the hard copies. All the sketches including the computer printouts must be submitted and they must be preserved for one year.

Scheme of Examination :
1. Module -1 is only for practice and Internal Assessment and not for examination.
2. Question paper for each batch of students will be sent online by VTU and has to be downloaded before the commencement of Examination of each batch. The answer sheets will have to be jointly evaluated by the Internal & External examiners.
3. A maximum of **THREE** questions will be set as per the following pattern *(No mixing of questions from different Modules).*

Q. No.	From Chapters	Marks Allotted
1	Module 2	30
2	Module 3	40
3	Module 4 or Module 5	30
	Total	**100**

Scheme of Evaluation :

Q. No.	Solutions & Sketching on graph book	Computer display & printout	Total Marks
1	10 Marks	20 Marks	30
2	15 Marks	25 Marks	40
3	15 Marks	15 Marks	30
Total	**40 Marks**	**60 Marks**	**100**

Students have to submit the computer printouts and the sketches drawn on the graph sheets at the end of the examination. Both Internal & External examiners have to jointly evaluate the solutions (sketches) and computer display & printouts of each student for 100 marks (40 marks for solutions & sketches + 60 marks for computer display and printouts) and

submit the marks list along with the solution (sketches) on graph sheets & computer printouts in separate covers.

4. Each batch must consist of a minimum of 10 students and a maximum of 12 students.
5. Examination can be conducted in parallel batches, if necessary.

Text Books :

1. N.D.Bhatt & V.M.Panchal, "**Engineering Drawing",** 48th edition, 2005-Charotar Publishing House, Gujarat.

Reference Books :

1. S. Trymbaka Murthy, "**Computer Aided Engineering Drawing",** Universities Press(India) Pvt. Ltd., Hyderabad, 4th Edition.
2. K.R. Gopalakrishna, "**Engineering Graphics",** 32nd edition, Subash Publishers Bangalore, 2005.
3. Luzadder Warren J., Duff John M., "**Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production",** Eastern Economy Edition, Prentice-Hall of India Pvt. Ltd., New Delhi, 2005.
4. Prof. M. H. Annaiah, "**Computer Aided Engineering drawing"** New Age International Publisher, New Delhi. 2009.

Note :

Software Packages : Students should be taught and make familier with software packages such as, Autodesk Auto CAD 2014 (Freely downloadable). Solid Works or other similar packages

BASIC ELECTRICAL ENGINEERING

Subject Code :	**14ELE15/14ELE25**	**IA Marks**	**: 25**
Hours/Week :	**04**	**Exam. Hours**	**: 03**
Total Hours :	**50**	**Exam. Marks**	**: 100**

Course Objectives :

- Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context.
- Provide working knowledge for the analysis of basic D.C. and A.C. circuits used in electrical and electronic devices.
- Develop selection skill to identify the type of generators or motors required for particular application.
- Highlight the importance of transformers in transmission and distribution of electric power.
- Emphasize the effects of electric shock and precautionary measures.
- Improve the ability to function on multi-disciplinary teams.

Module – 1

1a. D.C.Circuits : Ohm's Law and Kirchhoff's Laws, analysis of series, parallel and series- parallel circuits excited by independent voltage sources. Power and Energy. Illustrative examples.

1b. Electromagnetism : Review of field around a conductor, coil, magnetic flux and flux density, magnetomotive force and magnetic field intensity, reluctance and permeability, definition of magnetic circuit and basic analogy between electric and magnetic circuits. **5 Hours**

Electromagnetic induction : Definition of Electromagnetic Induction, Faradays Laws, Fleming's right hand rule, Lenz's Law, Statically and dynamically induced emf. Concept of self-inductance, mutual inductance and coefficient of coupling. Energy stored in magnetic field. Illustrative examples. Force on current carrying conductor placed in a magnetic field, Fleming's left hand rule. **5 Hours**

Module – 2

2a. D.C.Machines : Working principle of D.C.Machine as a generator and a motor. Types and constructional features. Types of armature windings, Emf equation of generator, relation between induced emf and

terminal voltage with an enumeration of brush contact drop and drop due to armature reaction. Illustrative examples, neglecting armature reaction.
Operation of D.C. motor, Back emf and its significance, torque equation. Types of D.C. motors, characteristics and applications. Necessity of a starter for D.C. motor. Illustrative examples on back emf and torque. **7 Hours**

2b. Measuring Instruments : Construction and Principle of operation of dynamometer type wattmeterand single phase induction type energy meter. **3 Hours**

Module – 3

3a. Single-phase A.C. Circuits : Generation of sinusoidal voltage, frequency of generated voltage, definition and numerical values of average value, root mean square value, form factor and peak factor of sinusoidally varying voltage and current, phasor representation of alternating quantities. Analysis, with phasor diagrams, of R, L, C, R-L, R-C and R-L-C circuits and, parallel and series- parallel circuits. Real power, reactive power, apparent power and power factor. Illustrative examples. **7 Hours**

3b. Domestic Wiring : Service mains, meter board and distribution board. Brief discussion on concealed conduit wiring. Two-way and three-way control. Elementary discussion on Circuit protective devices: fuse and Miniature Circuit Breaker (MCB's). Electric shock, precautions against shock –Earthing, Earth leakage circuit breaker (ELCB) and Residual current circuit breaker (RCCB). **3 Hours**

Module – 4

4a. Three Phase Circuits : Necessity and advantages of three phase systems, generation of three phase power. Definition of Phase sequence, balanced supply and balanced load. Relationship between line and phase values of balanced star and delta connections. Power in balanced three-phase circuits, measurement of power by two-wattmeter method. Determination power factor using wattmeter readings. Illustrative examples. **6 Hours**

4b. Three PhaseSynchronous Generators : Principle of operation, Types and constructional features, Advantages of rotating field type alternator, Synchronous speed, Frequency of generated voltage,Emf equation. Concept of winding factor (excluding the derivation of distribution and pitch factors). Illustrative examples on emf equation. **4 Hours**

Module – 5

5a. Single Phase Transformers : Necessity of transformer, Principle of operation and construction of single-phase transformers (core and shell types). Emf equation, losses, variation losses with respect to load, efficiency, Condition for maximum efficiency, Voltage regulation and its significance (Open Circuit and Short circuit tests, equivalent circuit and phasor diagrams are excluded). Illustrative problems on emf equation and efficiency only. **6 Hours**

5b. Three Phase Induction Motors : Principle of operation, Concept and production of rotating magnetic field, Synchronous speed, rotor speed, Slip, Frequency of the rotor induced emf, Types and Constructional features. Slip and its significance. Applications of squirrel - cage and slip - ring motors. Necessity of a starter, starting of motor using stars-delta starter. Illustrative examples on slip calculations. **4 Hours**

Course Outcomes :

After studying this course, students will be able to:

- Understand electrical circuit concepts
- Understand electromagnetic and electromagnetic induction
- Understand DC Machines
- Understand single and three phase circuits, and
- Understand generators and motors.

Scheme of examination :

- **Two full questions (with a maximum of four sub questions) of twenty marks each to be set from each module. Each question should cover all contents of the respective module.**
- **Students have to answer five full questions choosing one full question from each module**

Text Books :

1. D.C. Kulshreshtha, **"Basic Electrical Engineering",** TMH, Revised First Edition.
2. E.Hughes, **"Electrical Technology",** International Students 9th Edition, Pearson, 2005.
3. Rajendra Prasad, **"Fundamentals of Electrical Engineering",** PHI, Third Edition, 2014.

Reference Books :

1. AbhijitChakrabarti, Chandan Kumar Chanda, Sudiptanath, **"Basic Electrical Engineering",** TMH, First Edition.
2. B.L.Theraja, **"Fundamentals of Electrical Engineering and Electronics"**, S.Chand & Company Ltd, Reprint Edition 2013.

BASIC ELECTRONICS

Sub Code	**:**	**14ELN15 / 14ELN25**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam. Hours**	**:**	**03**
Total Hrs.	**:**	**50**	**Exam. Marks**	**:**	**100**

Course Objectives :

The course objective is to make students of all the branches of Engineering to understand the efficacy of Electronic principles which are pervasive in engineering applications.

Module – 1

Semiconductor Diodes and Applications (Text-1) : p-n junction diode, Characteristics and Parameters, Diode approximations, DC load line analysis, Half-wave rectifier, Two-diode Full-wave rectifier, Bridge rectifier, Capacitor filter circuit, Zener diode voltage regulators: Regulator circuit with no load, Loaded Regulator, Series and Shunt diode Clipping Circuits, Clamping Circuits: Negative and Positive Clamping Circuits, Numerical examples as applicable. **6 Hours**

Bipolar Junction Transistors : BJT operation, BJT Voltages and Currents, BJT amplification, Common Base, Common Emitter and Common Collector Characteristics, Numerical examples as applicable. **4 Hours**

Module – 2

BJT Biasing (Text-1) : DC Load line and Bias Point, Base Bias, Voltage divider Bias, Numerical examples as applicable. **4 Hours**

Introduction to Operational Amplifiers (Text-2) : Ideal OPAMP, Inverting and Non Inverting OPAMP circuits, OPAMP applications: voltage follower, addition, subtraction, integration, differentiation; Numerical examples as applicable. **6 Hours**

Module – 3

Digital Electronics (Text-2) : Introduction, Switching and Logic Levels, Digital Waveform (Sections 9.1to 9.3). Number Systems: Decimal Number System, Binary Number System, Converting Decimal to Binary, Hexadecimal

Number System: Converting Binary to Hexadecimal, Hexadecimal to Binary, Converting Hexadecimal to Decimal, Converting Decimal to Hexadecimal, Octal Numbers: Binary to Octal Conversion. Complement of Binary Numbers. Boolean Algebra Theorems, De Morgan's theorem. Digital Circuits: Logic gates, NOT Gate, AND Gate, OR Gate, XOR Gate, NAND Gate, NOR Gate, X-NOR Gate. Algebraic Simplification, NAND and NOR Implementation (Sections 11.7 and 11.8): NAND Implementation, NOR Implementation. Half adder, Full adder. **10 Hours**

Module – 4

Flip-Flops (Text-2) : Introduction to Flip-Flops (Section 12.1), NAND Gate Latch/ NOR Gate Latch, RS Flip-Flop, Gated Flip-Flops: Clocked RS Flip-Flop (Sections 12.3 to 12.5). **2 Hours**

Microprocessors and Microcontrollers : (Ref.1 and Ref.2)**:** Introduction to Microprocessors, 8085 Microprocessor Architecture and working. Introduction to Microcontrollers, 8051 Microcontroller Architecture and working. **4 Hours**

Transducers (Text-2) : Introduction, Passive Electrical Transducers, Resistive Transducers, Resistance Thermometers, Thermistor. Linear Variable Differential Transformer (LVDT). Active Electrical Transducers, Piezoelectric Transducer, Photoelectric Transducer. **4 Hours**

Module – 5

Communication Systems (Text-2) : Introduction, Elements of Communication Systems, Modulation: Amplitude Modulation, Spectrum Power, AM Detection (Demodulation), Frequency and Phase Modulation. Amplitude and Frequency Modulation: A comparison. **6 Hours**

Telephone Systems and Optical Fibre Communication : Telephone Systems, Principle of operations of Mobile phone, ISDN, Block diagram of Optical Fibre Communication, Principle. Advantages of Optical Fibre communication, Applications of Optical Fibre communication. **4 Hours**

Course Outcomes :

After studying this course, students will be able to:

- Appreciate the significance of electronics in different applications,

- Understand the applications of diode in rectifiers, filter circuits and wave shaping,
- Design simple circuits like amplifiers (inverting and non inverting), comparators, adders, integrator and differentiator using OPAMPS,
- Understand the different building blocks in digital electronics using logic gates and implement simple logic function using basic universal gates.
- Understand the basic architecture and functioning of microprocessor and microcontrollers
- Understand the functioning of a communication system and different modulation technologies, and
- Understand the basic principles of different types of Transuducers.

Scheme of examination :

- **Two full questions (with a maximum of four sub questions) of twenty marks each to be set from each module. Each question should cover all contents of the respective module.**
- **Students have to answer five full questions choosing one full question from each module**

Text Books :

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

Reference Books :

1. R.S.Goankar, **"Microprocessor Architecture, Programming and Applications with 8085"**, 6th Edition, Prentice Hall, 2013
2. MuhammadAli Mazidi, **"The 8051 Microcontroller and Embedded. Systems. Using Assembly and C."** Second Edition, 2011.

WORKSHOP PRACTICE LAB

Subject Code :	**14WSL16/14WSL26**	**IA Marks**	**: 25**
Hours/Week :	**03**	**Exam. Hours**	**: 03**
Total Hours :	**42**	**Exam. Marks**	**: 50**

Course Objectives :

Students belonging to all branches of Engineering are trained in understanding fundamental metal removing process like fitting and joining processes like welding and soldering.

1. **Demonstration and use of Hand Tools :** V-block, Marking Gauge, Files, Hack Saw, Drills, Taps. Two Models showing the joints using the above tools.
2. **Welding :** Study of electric arc welding tools &equipments,Models:Butt Joint,Lap Joint,T-joint & L-joint.
3. **Sheet Metal & Soldering Work :** Development & Soldering of the models: Frustum of cone, Prism(Hexagon & Pentagon),Truncated Square Pyramid.
4. Study & Demonstration of power tools in Mechanical Engineering.

Course Outcomes :

Students will demonstrate the knowledge and the skills acquired with respect to

1. The metal removal process by fitting practice and preparation of joints using appropriate fitting tools.
2. Preparation of welded joints.
3. Development of surfaces and forming models by soldering work.

Scheme of Examination :

Fitting/Sheet Metal Work : 30 marks (50% of the batch to be given fitting and remaining 50% to be given Sheet Metal work including soldering.)
Welding : 10 marks
Viva Voce : 10 marks Total marks : 50 marks

Reference Books :

1. S.K. Hajra Choudhury, A. K. Hajra Choudhury, **"Elements of Workshop Technology"**, Vol I:Manufacturing Processes, 15th Edition Reprinted 2013,Media Promoters & Publishers Pvt Ltd., Mumbai.

Note : ***No mini drafters and drawing boards required. Drawings (Developments) can be done on sketch sheets using scale, pencil and Geometrical Instruments.***

COMPUTER PROGRAMMING LABORATORY

Subject Code :	**14CPL16/14CPL26**	**IA Marks**	**: 25**
Hours/Week :	**03**	**Exam. Hours**	**: 03**
Total Hours :	**42**	**Exam. Marks**	**: 50**

Demonstration of Personal Computer and Its Accessories
Demonstration and Explanation on Disassembly and Assembly of a Personal Computer by the faculty-in-charge. Students have to prepare a write-up on the same and include it in the Lab record and evaluated.

Laboratory Session-1 : Write-up on Functional block diagram of Computer, CPU, Buses, Mother Board, Chip sets, Operating System & types of OS, Basics of Networking & Topology and NIC.

Laboratory Session-2 : Write-up on RAM, SDRAM, FLASH memory, Hard disks, Optical media, CD-ROM/R/RW, DVDs, Flash drives, Keyboard, Mouse, Printers and Plotters. Introduction to flowchart, algorithm and pseudo code.

Note: These **TWO Laboratory sessions** are used to fill the gap between theory classes and practical sessions. Both sessions are evaluated as lab experiments.

Laboratory Experiments

Implement the programs with WINDOWS / LINUX platform using appropriate C compiler.

1. Design and develop a flowchart or an algorithm that takes three coefficients (***a***, ***b***, and ***c***) of a Quadratic equation ($ax^2+bx+c=0$) as input and compute all possible roots. Implement a C program for the developed flowchart/algorithm and execute the same to output the possible roots for a given set of coefficients with appropriate messages.
2. Design and develop an algorithm to find the ***reverse*** of an integer number **NUM** and check whether it is PALINDROME or NOT. Implement a C program for the developed algorithm that takes an integer number as input and output the reverse of the same with suitable messages. Ex: Num: **2014**, Reverse: **4102**, Not a Palindrome

3a. Design and develop a flowchart to find the square root of a given number ***N***. Implement a C program for the same and execute for all

possible inputs with appropriate messages. Note: **Don't use library function *sqrt(n)*.**

3b. Design and develop a C program to read a ***year*** as an input and find whether it is ***leap year*** or not. Also consider end of the centuries.

4. Design and develop an algorithm to evaluate polynomial $\mathbf{f(x) = a_4x^4 + a_3x^3 + a_2x^2 + a_1x + a_0}$, for a given value of ***x*** and its coefficients using Horner's method. Implement a C program for the same and execute the program with different set of values of coefficients and ***x.***

5. Draw the flowchart and Write a C Program to compute **Sin(x)** using Taylor series approximation given by $\mathbf{Sin(x) = x - (x^3/3!) + (x^5/5!) - (x^7/7!) + \ldots\ldots}$

6. Compare your result with the built- in Library function. Print both the results with appropriate messages.

7. Develop an algorithm, implement and execute a C program that reads ***N*** integer numbers and arrange them in ascending order using ***Bubble Sort***.

8. Develop, implement and execute a C program that reads two matrices ***A*** (**m x n**) and ***B*** (**p x q**) and Compute product of matrices ***A*** and ***B***. Read matrix ***A*** and matrix ***B*** in row major order and in column major order respectively. Print both the input matrices and resultant matrix with suitable headings and output should be in matrix format only. Program must check the compatibility of orders of the matrices for multiplication. Report appropriate message in case of incompatibility.

9. Develop, implement and execute a C program to search a Name in a list of names using ***Binary searching*** Technique.

10. Write and execute a C program that,
    i. Implements string copy operation ***STRCOPY*** (str1, str2) that copiesa string *str1* to another string *str2* without using library function.
    ii. Read a *sentence* and print frequency of vowels and total count of consonants.

11. a. Design and develop a C function ***RightShift****(x ,n)* that takes two integers *x* and *n* as input and returns value of the integer *x* rotated to the right by *n* positions. Assume the integers are unsigned. Write a C program that invokes this function with different values for *x* and *n* and tabulate the results with suitable headings.

b. Design and develop a C function ***isprime*** (num) that accepts an integer argument and returns 1 if the argument is prime, a 0 otherwise. Write a C program that invokes this function to generate prime numbers between the given range.

Draw the flowchart and write a ***recursive*** **C** function to find the factorial of a number, ***n*!**, defined by *fact*(*n*)=1, if *n*=0. Otherwise *fact* (*n*) =*n***fact* (*n*-1). Using this function, write a C program to compute the binomial coefficient ^nC_r. Tabulate the results for different values of ***n*** and ***r*** with suitable messages.

12. Given two university information files "**studentname.txt**" and "**usn.txt**" that contains students Name and USN respectively. Write a C program to create a new file called "**output.txt**" and copy the content of files "studentname.txt" and "usn.txt" into output file in the sequence shown below. Display the contents of output file "output.txt" on to the screen.

Student Name	USN	← Heading
Name 1	USN1	
Name 2	USN2	
….	….	
….	….	

13. Write a C program to maintain a record of **n** student details using an array of structures with four fields (Roll number, Name, Marks, and Grade). Assume appropriate data type for each field. Print the marks of the student, given the student name as input.

14. Write a C program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of **n** real numbers.

Reference Book :

1. Reema Thareja, **"Computer Fundamentals and Programming in C"**, Oxford Press, 2012.

Practical Examination Procedure :

1. All laboratory experiments (Fourteen) are to be included for practical examination.
2. Students are allowed to pick one experiment from the lot.
3. Strictly follow the instructions as printed on the cover page of answer script for breakup of marks
4. **Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.**

ENGINEERING PHYSICS LAB

Subject Code :	**14PHYL17/14PHYL27**	**IA Marks**	**: 25**
Hours/Week :	**03**	**Exam. Hours**	**: 03**
Total Hours :	**42**	**Exam. Marks**	**: 50**

Course Objectives :

- The Objective of this course is to make the students gain practical knowledge to co-relate with the theoretical studies. To achieve perfectness in experimental skills and the study of practical applications will bring more confidence and ability to develop and fabricate engineering and technical equipments.
- Design of circuits using new technology and latest components and to develop practical applications of engineering materials and use of principle in the right way to implement the modern technology.

List of experiments :

1. Black Box to determine unknown L, C and R.
2. Series and parallel LCR Circuits (Determination of resonant frequency and quality factor)
3. I–V Characteristics of Zener Diode. (determination of knee voltage, zener voltage and forward resistance)
4. Characteristics of Transistor (Study of Input and Output characteristics and calculation of input resistance, output resistance and amplification factor)
5. Photo Diode Characteristics (Study of I–V characteristics in reverse bias and variation of photocurrent as a function of reverse voltage and intensity).
6. Dielectric constant (Measurement of dielectric constant).
7. Diffraction (Measurement of wavelength of laser source using diffraction grating).
8. Torsional pendulum (Determination of M.I. of wire and Rigidity modulus).
9. Determination of Fermi energy. (Measurement of Fermi energy in copper).
10. Uniform Bending Experiment (Determination of Youngs modulus of material bar).
11. Newtons Rings, (Determination of radius of curvature of plano convex lens).
12. Verification of Stefan's Law.

Course Outcomes :

On Completion of this course, students are able to –

- Develop skills to impart practical knowledge in real time solution.
- Understand principle, concept, working and application of new technology and comparison of results with theoretical calculations.
- Design new instruments with practical knowledge.
- Gain knowledge of new concept in the solution of practical oriented problems and to understand more deep knowledge about the solution to theoretical problems.
- Understand measurement technology, usage of new instruments and real time applications in engineering studies.

Note : 1) All the above twelve experiments are to be conducted
2) Two experiments are to be performed by the students in the examination.

ENGINEERING CHEMISTRY LABORATORY

Subject Code :	**14CHEL17/14CHEL27**	**IA Marks :**	**25**
Hours/Week :	**03**	**Exam. Hours :**	**03**
Total Hours :	**42**	**Exam. Marks :**	**50**

Course Objectives :

To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence

Instrumental Experiments :

1. Estimation of FAS potentiometrically using standard $K_2Cr_2O_7$ solution.
2. Estimation of Copper colorimetrically.
3. Estimation of Acids in acid mixture conductometrically.
4. Determination of pKa of weak acid using pH meter.
5. Determination of Viscosity co-efficient of a liquid using Ostwald's viscometer.
6. Estimation of Sodium and Potassium in the given sample of water using Flame Photometer.

Volumetric Experiments :

1. Estimation of Total hardness of water by EDTA complexometric method.
2. Estimation of CaO in cement by rapid EDTA method.
3. Determination of percentage of Copper in brass solution using standard sodium thiosulphate solution.
4. Estimation of Iron in haematite ore solution using $K_2Cr_2O_7$ solution by external indicator method.
5. Estimation of Alkalinity (OH^-, CO_3^{--} & HCO_3^-) of water using standard HCl solution.
6. Determination of COD of waste water.

Course Outcomes :

On completion of this course, students will have the knowledge in,

- Handling different types of instruments for analysis of materials using small quantities of materials involved for quick and accurate results, and
- Carrying out different types of titrations for estimation of concerned in materials using comparatively more quantities of materials involved for good results.

Reference Books :

1. G.H.Jeffery, J.Bassett, J.Mendham and R.C.Denney, **"Vogel's Text Book of Quantitative Chemical Analysis"**
2. O.P.Vermani & Narula, **"Theory and Practice in Applied Chemistry"**, New Age International Publisers.
3. Gary D. Christian, **"Analytical chemistry**", 6th Edition, Wiley India.

Scheme of Examination :

- One instrumental and another volumetric experiments shall be set.
- Different experiments shall be set under instrumental and a common experiment under volumetric.

CONSTITUTION OF INDIA & PROFESSIONAL ETHICS

Subject Code :	**14CIP18/14CIP28**	**IA Marks :**	**25**
Hours/Week :	**02**	**Exam. Hours :**	**02**
Total Hours :	**25**	**Exam. Marks :**	**50**

Course Objectives :

1. To provide basic information about Indian constitution.
2. To identify individual role and ethical responsibility towards society.

Module – 1

Introduction to the Constitution of India, The Making of the Constitution and Sailent features of the Constitution. **2 Hours**

Preamble to the Indian Constitution Fundamental Rights & its limitations. **3 Hours**

Module – 2

Directive Principles of State Policy & Relevance of Directive Principles State Policy Fundamental Duties. **2 Hours**

Union Executives – President, Prime Minister Parliament Supreme Court of India. **3 Hours**

Module – 3

State Executives – Governor Chief Minister, State Legislature High Court of State. **2 Hours**

Electoral Process in India, Amendment Procedures, 42nd, 44th, 74th, 76th, 86th &91st Amendments. **3 Hours**

Module – 4

Special Provision for SC & ST Special Provision for Women, Children & Backward Classes Emergency Provisions. **3 Hours**

Powers and functions of Municipalities, Panchyats and Co - Operative Societies. **2 Hours**

Module – 5

Scope & Aims of Engineering Ethics, Responsibility of Engineers Impediments to Responsibility. **2 Hours**

Risks, Safety and liability of Engineers, Honesty, Integrity & Reliability in Engineering. **3 Hours**

Course Outcomes :

After study of the course, the students are able to

- Have general knowledge and legal literacy and thereby to take up competitive examinations
- Understand state and central policies, fundamental duties
- Understand Electoral Process, special provisions
- Understand powers and functions of Muncipalities, Panchayats and Co-operative Societies, and
- Understand Engineering ethics and responsibilities of Engineers.

Text Books :

1. Durga Das Basu: **"Introduction to the Constitution on India",** (Students Edn.) Prentice –Hall EEE, 19th / 20th Edn., 2001
2. Charles E. Haries, Michael S Pritchard and Michael J. Robins **"Engineering Ethics"** Thompson Asia, 2003-08-05.

Reference Books :

1. M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.
2. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, **"Engineering Ethics",** Prentice –Hall of India Pvt. Ltd. New Delhi, 2004
3. Brij Kishore Sharma,**"Introduction to the Constitution of India"**, PHI Learning Pvt. Ltd., New Delhi, 2011.

ENVIRONMENTAL STUDIES

Subject Code :	**14CIV18/14CIV28**	**IA Marks**	**: 25**
Hours/Week :	**02**	**Exam. Hours**	**: 02**
Total Hours :	**25**	**Exam. Marks**	**: 50**

Course Objectives :

1. Recognize major concepts in environmental sciences and demonstrate in-depth understanding of the environment.
2. Develop analytical skills, critical thinking, and demonstrate problem-solving skills using scientific techniques.
3. Demonstrate the knowledge and training for entering graduate or professional schools, or the job market.

Module – 1

Introduction : Environment - Components of Environment Ecosystem: Types & Structure of Ecosystem, Balanced ecosystem Human Activities – Food, Shelter, And Economic & Social Security. **2 Hours**

Impacts of Agriculture & Housing Impacts of Industry, Mining & Transportation Environmental Impact Assessment, Sustainable Development. **3 Hours**

Module – 2

Natural Resources, Water resources : Availability & Quality aspects, Water borne diseases & water induced diseases, Fluoride problem in drinking water Mineral resources, Forest Wealth Material Cycles – Carbon Cycle, Nitrogen Cycle & Sulphur Cycle. **2 Hours**

Energy : Different types of energy, Conventional sources & Non Conventional sources of energy Solar energy, Hydro electric energy, Wind Energy, Nuclear energy, Biomass & Biogas Fossil Fuels, Hydrogen as an alternative energy. **3 Hours**

Module – 3

Environmental Pollution : Water Pollution, Noise pollution, Land Pollution, Public Health Aspects. **2 Hours**

Global Environmental Issues : Population Growth, Urbanization, Land Management, Water & Waste Water Management. **3 Hours**

Module – 4

Air Pollution & Automobile Pollution : Definition, Effects – Global Warming, Acid rain & Ozone layer depletion, controlling measures. **3 Hours**

Solid Waste Management, E - Waste Management & Biomedical Waste Management - Sources, Characteristics & Disposal methods. **2 Hours**

Module – 5

Introduction to GIS & Remote sensing, Applications of GIS & Remote Sensing in Environmental Engineering Practices. **2 Hours**

Environmental Acts & Regulations, Role of government, Legal aspects, Role of Non-governmental Organizations (NGOs) , Environmental Education & Women Education. **3 Hours**

Course Outcomes :

Students will be able to,

1. Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale,
2. Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment,
3. Demonstrate ecology knowledge of a complex relationship between predators, prey, and the plant community,
4. Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues

Text Books :

1. Benny Joseph (2005), **"Environmental Studies"**, Tata McGraw – Hill Publishing Company Limited.
2. R.J.Ranjit Daniels and Jagadish Krishnaswamy, (2009), **"Environmental Studies",** Wiley India Private Ltd., New Delhi.
3. R Rajagopalan, **"Environmental Studies – From Crisis to Cure**", Oxford University Press, 2005,
4. Aloka Debi, **"Environmental Science and Engineering",** Universities Press (India) Pvt. Ltd. 2012.

Reference Books :

1. Raman Sivakumar, **"Principals of Environmental Science and Engineering",** Second Edition, Cengage learning Singapore, 2005

2. P. Meenakshi, **"Elements of Environmental Science and Engineering",** Prentice Hall of India Private Limited, New Delhi, 2006
3. S.M. Prakash, **"Environmental Studies",** Elite Publishers Mangalore, 2007
4. Erach Bharucha, **"Text Book of Environmental Studies"**, for UGC, University press, 2005
5. G.Tyler Miller Jr., **"Environmental Science – working with the Earth"**, Tenth Edition, Thomson Brooks /Cole, 2004
6. G.Tyler Miller Jr., **"Environmental Science – working with the Earth"**, Eleventh Edition, Thomson Brooks /Cole, 2006
7. Dr.Pratiba Sing, Dr.AnoopSingh and Dr.Piyush Malaviya, **"Text Book of Environmental and Ecology"**, Acme Learning Pvt. Ltd. New Delhi.

ENGINEERING MATHEMATICS-II

Subject Code :	**14MAT21**	**IA Marks**	**: 25**
Hours/Week :	**04**	**Exam. Hours**	**: 03**
Total Hours :	**50**	**Exam. Marks**	**: 100**

Course Objectives :

To enable students to apply knowledge of Mathe-matics in various engineering fields by making them to learn the following'

- Ordinary differential equations
- Partial differential equations
- Double and triple integration
- Curvilinear co-ordinates
- Laplace transform

Module – 1

Differential equations - 1 :

Linear differential equations with constant coefficients : Solutions of second and higher order differential equations - inverse differential operator method, method of undetermined coefficients and method of variation of parameters. **10 Hours**

Module – 2

Differential equations - 2 :

Solutions of simultaneous differential equations of first order.

Linear differential equations with variable coefficients : Solution of Cauchy's and Legendre's linear differential equations.

Nonlinear differential equations : Equations solvable for p, equations solvable for y, equations solvable for x, general and singular solutions, Clairauit's equations and equations reducible to Clairauit's form. **10 Hours**

Module – 3

Partial Differential equations :

Formulation of PDE by elimination of arbitrary constants/functions, solution of non-homogeneous PDE by direct integration, solution of homogeneous PDE involving derivative with respect to one independent variable only.

Derivation of one dimensional heat and wave equations and their solutions by variable separable method.

Double and triple integrals :
Evaluation of double integrals. Evaluation by changing the order of integration and changing into polar coordinates. Evaluation of triple integrals. **10 Hours**

Module – 4

Integral Calculus :
Application of double and triple integrals to find area and volume. Beta and Gamma functions, definitions, Relation between beta and gamma functions and simple problems.

Curvilinear coordinates :
Orthogonal curvilinear coordinates - Definition, unit vectors and scale factors. Expressions for gradient, divergence and curl. Cylindrical and spherical coordinate systems. **10 Hours**

Module – 5

Laplace Transform :
Definition and Laplace transforms of elementary functions. Laplace transforms of $e^{at} f(t), t^n f(t) and \frac{f(t)}{t}$ (without proof), periodic functions, unit-step function and Impulse function - problems

Inverse Laplace Transform :
Inverse Laplace Transform - problems, Convolution theorem and problems, solution of linear differential equations using Laplace Transforms.
10 Hours

Course Outcomes :
On completion of this course, students are able to,
- Use ordinary differential equations to model engineering phenomena such as electrical circuits, forced oscillation of mass spring and elementary heat transfer.
- Use partial differential equations to model problems in fluid mechanics, electromagnetic theory and heat transfer.
- Evaluate double and triple integrals to find area , volume, mass and moment of inertia of plane and solid region.
- Use curl and divergence of a vector function in three dimensions, as well as apply the Green's Theorem, Divergence Theorem and Stokes' theorem in various applications like electricity, magnetism and fluid flow.

- Use Laplace transforms to determine general or complete solutions to linear ODE

Scheme of examination :
- **Two full questions (with a maximum of four sub questions) of twenty marks each to be set from each module. Each question should cover all the contents of the respective module.**
- **Students have to answer five full questions choosing one full question from each module**

Text Books :
1. B.S.Grewal, **"Higher Engineering Mathematics",** Khanna publishers, 42nd edition, 2013.
2. Ervin Kreyszig, **"Advanced Engineering Mathematics"** - Vol-I & II, Wiley, 2013

Reference Books :
1. B.V.Ramana **"Higher Engineering M athematics"** Tata Mc Graw-Hill, 2006
2. N.P.Bali and Manish Goyal,**"A text book of Engineering mathematics"**, Laxmi publications, latest edition
3. H.K.Dass and Er.Rajnish Verma,**"Higher Engineerig Mathematics"**, S.Chand publishing, 1st edition, 2011.

FUNCTIONAL ENGLISH

Introduction	Importance of Languages	
Grammer	Parts of Speech, Usage of Preposition and Article, Punctuation	5 Hours
Tenses & Degrees of Comparison		3 Hours
Transformation of Sentences	Active-Passive, Affirmative-Negative, Exclamatory-Assertive, Interrogative-Assertive, Kinds of sentences	5 Hours
Direct-Indirect Speech		5 Hours
Vocabulary Usage	Homonyms, Correcting Spelling, One-word equivalents	7 Hours
Precis Writing		3 Hours
Essay/Report Writing		5 Hours
Letter Writing	Personal, Official, Applications	5 Hours
Idioms & Phrases	Meaning & Usage in sentences	5 Hours
Comprehension	Of an unseen passage	2 Hours
Elaboration	Expansion of ideas, proverbs	2 Hours
Presentation	Preparation of materials and presentation – step	3 Hours

Suggested Text Books :

1) SLN Sharma & K Shankaranarayana **"Basic Grammar"**, Navakarnataka Publications.
2) Jones **"New International Business English"**, published by Cambridge University Press.

Reference Books :

1) G. Sankaran, **"English Rank Scorer"**, Addone Publishing group, Thiruvanantapuram, Kerala
2) Wren & Martin **"English Grammar"**.John Seely, **"Oxford Guide to Speaking and Writing**", 2000

KANNADA KALI

Lesson 1 : Introducing each other – 1. Personal Pronouns, Possessive forms, Interrogative words.
Lesson 2 : Introducing each other – 2. Personal Pronouns, Possessive forms, Yes/No Type Interrogation
Lesson 3 : About Ramanaya. Possessive forms of nons, dubitive question, Relative nouns
Lesson 4 : Enquiring about a room for rent. Qualitative and quantitative adjectives.
Lesson 5 : Enquiring about the college. Predicative forms, locative case.
Lesson 6 : In a hotelDative case defective verbs.
Lesson 7 : Vegetable market. Numeral, plurals.
Lesson 8 : Planning for a picnic. Imperative, Permissive, hortative.
Lesson 9 : Conversation between Doctor and the patient.Verb- iru, negation – illa, non – past tense.
Lesson 10 : Doctors advise to Patient. Potential forms, no–past continuous.
Lesson 11 : Discussing about a film. Past tense, negation.
Lesson 12 : About Brindavan Garden. Past tense negation.
Lesson 13 : About routine activities of a student. Verbal Participle, reflexive form, negation.
Lesson 14 : Telephone conversation. Past and present perfect past continuous and their negation.
Lesson 15 : About Halebid, Belur. Relative participle, negation.
Lesson 16 : Discussing about examination and future plan. Simple conditional and negative
Lesson 17 : Karnataka (Lesson for reading)
Lesson 18 : Kannada Bhaashe (Lesson for reading)
Lesson 19 : Mana taruva Sangati alla (Lesson for reading)
Lesson 20 : bEku bEDagaLu (lesson for reading)

ಕನ್ನಡ ಮನಸು

1) ಶ್ರಾವಣ (ಕವನ) ದ.ರಾ.ಬೇಂದ್ರೆ
2) ಡಾ. ವಿಶ್ವೇಶ್ವರಯ್ಯ ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ (ವ್ಯಕ್ತಿಚಿತ್ರ) ಎ.ಎನ್. ಮೂರ್ತಿರಾವ್
3) ದೋಣಿ ಹರಿಗೋಲುಗಳಲ್ಲಿ (ಪ್ರವಾಸ ಕಥನ) ಶಿವರಾಮ ಕಾರಂತ
4) ಅಣ್ಣಪ್ಪನ ರೇಷ್ಮೆ ಕಾಯಿಲೆ (ಪ್ರಬಂಧ) ಕುವೆಂಪು
5) ನಮ್ಮ ಎಮ್ಮೆಗೆ ಮಾತು ತಿಳಿಯುವುದೇ (ವಿನೋದ) ಗೋರೂರು ರಾಮಸ್ವಾಮಿ ಅಯ್ಯಂಗಾರ್
6) ಆನೆಹಳ್ಳದಲ್ಲಿ ಹುಡುಗಿಯರು(ವಿಜ್ಞಾನ ಲೇಖನ) ಬಿ.ಜಿ.ಎಲ್ ಸ್ವಾಮಿ
7) ಬೆಡ್ ನಂ. ಏಳು (ಕತೆ) ತ್ರಿವೇಣಿ
8) ರೊಟ್ಟಿ ಮತ್ತು ಕೋವಿ (ಕವನ) ಸು.ರಂ.ಎಕ್ಕುಂಡಿ
9) ಗುಬ್ಬಚ್ಚಿ ಗೂಡು (ಅಂಕಂ ಬರಹ) ಲಂಕೇಶ್
10) ಚೀಂಕ್ರ ಮೇಸ್ತ್ರಿ ಮತ್ತು ಹಾವುಮೀನು (ಪರಿಸರ ಲೇಖನ) ಕೆ.ಪೂರ್ಣಚಂದ್ರ ತೇಜಸ್ವಿ
11) ಗಾಂಧಿ (ಕತೆ) ಬೆಸಗರಹಳ್ಳಿ ರಾಮಣ್ಣ
12) ಬೆಳ್ಚಿಯ ಹಾಡು (ಕವನ) ಸಿದ್ಧಲಿಂಗಯ್ಯ
13) ಎಲ್ಲ ಹುಡುಗಿಯರ ಕನಸು (ಕವನ) ಸವಿತಾ ನಾಗಭೂಷಣ
14) ನೀರು (ಕತೆ) ಬಸವರಾಜ ಕುಕ್ಕರಹಳ್ಳಿ
15) ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ ಸ್ವರೂಪ (ಪರಿಚಯ ಲೇಖನ) ರಹಮತ ತರೀಕೆರೆ
16) ತಂತ್ರಜ್ಞಾನ ಕಲಿಕೆಯಲ್ಲಿ ಭಾಷೆ (ತಂತ್ರಜ್ಞಾನ ಬರಹ) ಎಸ್.ಸುಂದರ್
17) ಕೊಣವೇಗೌಡ (ಕಾವ್ಯ) ಜಾನಪದ