COURSE STRUCTURE
B. TECH – Electrical and Electronics Engineering

REGULATIONS: MLR20

I YEAR I SEMESTER

Induction program for Three weeks

Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A5BS01	Calculus and Applications	BSC	3	1	0	4	30	70	100
A5BS11	Chemistry	BSC	4	0	0	4	30	70	100
A5CS01	Programming for Problem Solving	ESC	3	0	0	3	30	70	100
A5HS01	English	HSMC	2	0	0	2	30	70	100
A5CS02	Programming for Problem Solving Laboratory	ESC	0	0	4	2	30	70	100
A5BS12	Chemistry Laboratory	BSC	0	0	3	1.5	30	70	100
A5HS02	English Language Communication Skills Laboratory	HSMC	0	0	3	1.5	30	70	100
A5HS03	Social Innovation	HSMC	0	0	2	1	30	70	100
	TOTAL		**12**	**01**	**11**	**19**	**240**	**560**	**800**

Mandatory Course (Non-Credit)

Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
A5MC04	Technical Seminar-I		0	0	2	0	30	70	100

I YEAR II SEMESTER

Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A5BS03	Integral Calculus and Transforms	BSC	3	1	0	4	30	70	100
A5BS08	Applied Physics	BSC	3	1	0	4	30	70	100
A5EE01	Basic Electrical Engineering	ESC	3	1	0	4	30	70	100
A5ES02	Engineering Graphics and Design	ESC	1	0	4	3	30	70	100
A5BS10	Applied Physics Laboratory	BSC	0	0	3	1.5	30	70	100
A5EE02	Basic Electrical Engineering Laboratory	ESC	0	0	3	1.5	30	70	100
A5AE64	Workshop Practices	ESC	0	0	2	1	30	70	100
A5HS04	Engineering Exploration	HSMC	0	0	2	1	30	70	100
	TOTAL		**11**	**03**	**16**	**20**	**240**	**560**	**800**

Mandatory Course (Non-Credit)

Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
A5MC05	Technical Seminar-II		0	0	2	0	30	70	100

I B.Tech I Semester (ECE/EEE)

CALCULUS AND APPLICATIONS

Course Code:	Category	Hours / Week			Credits	Maximum Marks		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
A5BS01	**BSC**	3	1	-	4	25	75	100
Contact Classes: 40	**Tutorial Classes: 08**	**Practical Classes:--**				**Total Classes: 48**		

COURSE OBJECTIVES:

To learn
1. Concept of Rank of a matrix, Consistency and solving system of linear equations.
2. The concept of differential equations and solvethem using appropriate methods.
3. Usage of the appropriate test to find the convergence and divergence of the given series.
4. Evaluation of length, areas& volumes of different curves of revolution.
5. The partial derivatives of several variable functions.

COURSE OUTCOMES:

Upon successful completion of the course, the student is able to
1. Solve the system of linear equations using rank of the matrices.
2. Identify the different types of differential equations and solve them using appropriate methods.
3. Apply the appropriate test to find the convergence and divergence of the given series.
4. Evaluate the improper integrals using beta and gamma functions.
5. Find the Maxima and Minima of several variable functions.

UNIT-I	THEORY OF MATRICES	Classes: 10

Finding rank of a matrix by reducing to Echelon form,Consistency of system of linear equations (homogeneous and non-homogeneous) using the rank of a matrix, Eigen values and Eigen vectors and its properties(with out proof),Cayley-Hamilton theorem (Statement and verification)-Finding inverse and powers of a matrix by Cayley-Hamilton theorem, Diagonalisation of matrices.

UNIT-II	ORDINARY DIFFERENTIAL EQUATIONS	Classes: 10

Introduction- Exact and reducible to Exact differential equations -Equations not of first degree: Equations solvable for p-equations, solvable for y- equations and solvable for x and Clairaut's type. Linear differential equations of second and higher order with constant coefficients - Non-Homogeneous term of the type $Q(x) = e^{ax}$, Sin ax, Cosax, $e^{ax}v(x)$, $x^nv(x)$ - Method of variation of parameters.

UNIT-III	SEQUENCES AND SERIES	Classes: 08

Basic definitions of Sequences and series – Convergence and divergence –Comparison Test- Ratio Test – Raabe's Test-Integral Test – Cauchy's n^{th} root Test –Absolute and Conditional convergence – Power Series.

UNIT-IV	BETA GAMMA FUNCTIONS AND APPLICATIONS OF DEFINITE INTEGTALS	Classes: 10

Beta- Gamma   Functions and their Properties-Relation between them- Evaluation of improper integrals using Gamma and Beta functions.
Application of definite integrals: Lengths, evaluate surface areas and volumes of revolution of curves (only in Cartesian co-ordinates).

UNIT-V	**CALCULUS OF SEVERAL VARIABLES**	**Classes: 10**

Limit, Continuity - Partial derivative- Partial derivatives of higher order -Total derivative –
Chain rule, Jacobians -functional dependence & independence.
Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints)

Text Books:

1. Ervin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna publishers, 36th Edition, 2010.

Reference Books:

1. G.B.Thomas, calculus and analytical geometry,9th Edition, Pearson Reprint 2006.
2. N.P Bali and Manish Goyal ,A Text of Engineering Mathematics,Laxmi publications,2008.
3. E.L.Ince, Ordinary differential Equations,Dover publications,1958.

Web references:

1. https://www.efunda.com/math/math_home/math.cfm
2. https://www.ocw.mit.edu/resources/#Mathematics
3. https://www.sosmath.com/
4. https://www.mathworld.wolfram.com/

E -Text Books:

1.https://www.e-booksdirectory.com/details.php?ebook=10166
2. https://www.e-booksdirectory.com/details.php?ebook=10166

MOOCS Course:

1. https://swayam.gov.in/
2. https://onlinecourses.nptel.ac.in/

CHEMISTRY

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
A5BS11	**BS**	5	1	-	3	25	75	100

Contact Classes: 52	Tutorial Classes: 13	Practical Classes: 00	Total Classes: 65

OBJECTIVES:
Student will be able to:

I.   Bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfectengineer.

II.   To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.

III.   To acquire the knowledge of electrochemistry, corrosion and water treatment which are essential for the Engineers and inindustry.

IV.   To acquire the skills pertaining to spectroscopy and to apply them for medical and other fields.

V.   To impart the knowledge of stereochemistry and synthetic aspects useful for understanding reactionpathways.

UNIT-I	MOLECULAR STRUCTURE AND THEORIES OF BONDING	Classes: 10

omic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N_2, O_2 and F_2 molecules. π molecular orbitals of butadiene and benzene.
Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d- orbitals in Tetrahedral, Octahedral and square planar geometries. Band structure of solids and effect of doping on conductance.

UNIT-II	WATER AND ITS TREATMENT	Classes: 12

Introduction – hardness of water – Causes of hardness - Types of hardness: temporary and permanent – expression and units of hardness – Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonization. Boiler feed water and its treatment – Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water – Ion exchange process. Desalination of water – Reverse osmosis. Numerical problems.

UNIT-III	ELECTROCHEMISTRY AND CORROSION	Classes: 12

Electro chemical cells – electrode potential, standard electrode potential, types of electrodes – calomel, Quinhydrone and glass electrode. Nernst equation Determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Numerical problems. Potentiometric titrations. Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery).
Corrosion:Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection– Sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings –Hot dipping , metal cladding and electro

plating(copper plating).

UNIT-IV	STEREOCHEMISTRY, REACTION MECHANISM AND SYNTHESIS OF DRUG MOLECULES	Classes: 10

Introduction to representation of 3-dimensional structures, Structural and stereoisomers, configurations, symmetry and chirality. Enantiomers, diastereomers, optical activity and Absolute configuration. Conformation alanalysis of n- butane. Substitution reactions: Nucleophilic substitution reactions: Mechanism of SN1, SN2 reactions. Electrophilic and nucleophilic addition reactions: Addition of HBrto propene. Markownikoff and anti Markownikoff's additions. Grignard additions on carbonyl compounds. Elimination reactions: Dehydro halogenation of alkylhalides. Saytzeff rule. Oxidation reactions: Oxidation of alcohols using KMnO4 and chromic acid. Reduction reactions: reduction of carbonyl compounds using LiAlH4 & NaBH4. Hydroboration of olefins. Structure, synthesis and pharmaceutical applications of Aspirin.

UNIT-V	SPECTROSCOPIC TECHNIQUES AND APPLICATIONS	Classes:8

Principles of spectroscopy, selection rules and applications of electronic spectroscopy, vibrational and rotational spectroscopy. Basic concepts of Nuclear magnetic resonance Spectroscopy, chemical shift. Introduction to Magnetic resonance imaging. Fluorescence and its applications in medicine.

Text Books:

1. Engineering Chemistry 14th edition by P.C.Jain&M.Jain; DhanpatRai Publishing Company (P) Ltd., New Delhi.
2. Fundamentals of Molecular Spectroscopy 5th edition by C.N. BanwellMc.Graw-Hills book company.

Reference Books:

1. Organic Chemistry 7th Edition, Robert Thornton Morrison, Robert Neilson Boyd, SaibalKantiBhattacharjee Pearson Education Singapore Pvt.Ltd.
2. Engineering Chemistry (NPTEL Web-book), 11thedition by B.L. Tembe, Kamaluddin and M.S. Krishnan.
3. Physical Chemistry 11thedition by P.W. Atkins OUP Oxford.

Web References:

1. https://www.scribd.com/document/23180395/Engineering-Chemistry-Unit-I-Water-Treatment
2. https://chem.libretexts.org/Core/Inorganic_Chemistry/Descriptive_Chemistry/Periodic_Trends_of_Elemental_Properties/Periodic_Properties_of_the_Elements
3. https://www.khanacademy.org/science/biology/chemistry--of-life/chemical-bonds-and-reactions/v/intermolecular-forces-and-molecular-bonds
4. https://study.com/academy/lesson/the-relationship-between-free-energy-and-the-equilibrium-constant.html

E-Text Books:

1. http://www.freebookcentre.net/Chemistry/Chemistry-Books-Online.html
2. https://www.sdu.dk/en/om_sdu/institutter_centre/fysik_kemi_og_farmaci

MOOC Course

1. http://nptel.ac.in/courses/122101001/34
2. https://ocw.mit.edu/courses/chemistry/

Course Outcomes:

The basic concepts included in this course will help the student to gain:

1. The knowledge of atomic, molecular and electronic changes, band theory related to conductivity.

2. The required principles and concepts of electrochemistry, corrosion and in understanding the problem of water and its treatments.

3. The required skills to get clear concepts on basic spectroscopy and application to medical and other fields.

4. The knowledge of configurational and conformational analysis of molecules and reaction mechanisms.

PROGRAMMING FOR PROBLEM SOLVING

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
A5CS01	**Foundation**	3	-	-	3	25	75	100

Contact Classes: 64	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 64

Course Objectives
- To impart basic knowledge about simple algorithms for arithmetic and logical problems.
- To understand how to write a program, syntax and logical errors.
- To enable them how to implement conditional branching, iteration and recursion.
- To understand how to decompose a problem into functions and synthesize a complete program.
- To enable them to use arrays, pointers, strings and structures in solving problems.
- To understand how to solve problems related to matrices, Searching and sorting.
- To make them to understand the use files to perform read and write operations.

UNIT-I	INTRODUCTION	Classes: 12

Introduction to Programming: Computer system, components of a computer system, computing environments, computer languages, creating and running programs, Algorithms, flowcharts.
Introduction to C language: History of C, basic structure of C programs, process of compiling and running a C program, C tokens, keywords, identifiers, constants, strings, special symbols, variables, data types, I/O statements.

UNIT-II	OPERATORS, EXPRESSIONS AND CONTROL STRUCTURES	Classes: 15

Operators and expressions: Operators, arithmetic, relational and logical, assignment operators, increment and decrement operators, bitwise and conditional operators, special operators, operator precedence and associativity, evaluation of expressions, type conversions in expressions.
Control structures: Decision statements; if and switch statement; Loop control statements: while, for and do while loops, jump statements, break, continue, goto statements.

UNIT-III	ARRAYS AND FUNCTIONS	Classes: 17

Arrays: Concepts, One dimensional array, declaration and initialization of one dimensional arrays, two dimensional arrays, initialization and accessing, multi dimensional arrays, Basic Algorithms: Searching, Basic Sorting Algorithms- Bubble sort, Insertion sort and Selection sort.
Functions: User defined and built-in Functions, storage classes, Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference, Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc, Quick sort or Merge sort.

UNIT-IV	STRINGS AND POINTERS	Classes: 10

Strings: Arrays of characters, variable length character strings, inputting character strings, character library functions, string handling functions.
Pointers: Pointer basics, pointer arithmetic, pointers to pointers, generic pointers, array of pointers, functions returning pointers, Dynamic memory allocation.

UNIT-V	STRUCTURES AND FILE HANDLING	Classes: 10

Structures and unions: Structure definition, initialization, accessing structures, nested structures, arrays of structures, structures and functions, self referential structures, unions, typedef, enumerations.

File handling: command line arguments, File modes, basic file operations read, write and append, example programs

Text Books:

1. Byron Gottfried, "Programming with C", Schaum's Outlines Series, McGraw Hill Education, 3rdedition, 2017.
2. E. Balagurusamy, "Programming in ANSI C", McGraw Hill Education, 6th Edition, 2012.

Reference Books:

1. W. Kernighan Brian, Dennis M. Ritchie, "The C Programming Language", PHI Learning, 2nd Edition, 1988.
2. YashavantKanetkar, "Exploring C", BPB Publishers, 2nd Edition, 2003.
3. Schildt Herbert, "C: The Complete Reference", Tata McGraw Hill Education, 4th Edition, 2014.
4. R. S. Bichkar, "Programming with C", Universities Press, 2nd Edition, 2012.
5. DeyPradeep, ManasGhosh, "Computer Fundamentals and Programming in C", Oxford University Press, 2nd Edition, 2006.

Web References:

1. https://www.bfoit.org/itp/Programming.html
2. https://www.khanacademy.org/computing/computer-programming
3. https://www.edx.org/course/programming-basics-iitbombayx-cs101-1x-0
4. https://www.edx.org/course/introduction-computer-science-harvardx-cs50x

E-Text Books:

1. http://www.freebookcentre.net/Language/Free-C-Programming-Books-Download.htm
2. http://www.imada.sdu.dk/~svalle/courses/dm14-2005/mirror/c/
3. http://www.enggnotebook.weebly.com/uploads/2/2/7/1/22718186/ge6151-notes.pdf

MOOC Course

1. https://onlinecourses.nptel.ac.in/noc18_cs33/preview
2. https://www.alison.com/courses/Introduction-to-Programming-in-c
3. http://www.ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-s096-effective-programming-in-c-and-c-january-iap-2014/index.htm

Course Outcomes
At the end of the course, student will be able to:
- Formulate simple algorithms for arithmetic and logical problems.
- Test and execute the programs and correct syntax and logical errors.

- Implement conditional branching, iteration and recursion.
- Decompose a problem into functions and synthesize a complete program.
- Use arrays, pointers, strings and structures to formulate algorithms and programs.
- Apply programming to solve problems related to matrices, Searching and sorting.
- Use files to perform read and write operations.

ENGLISH								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
A5HS01	**Foundation**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		2	-	-	2	25	75	100
Contact Classes: 60	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 60**		

OBJECTIVES:

The course should enable the students to:

I. Improve language proficiency with emphasis on Vocabulary, Grammar, Reading and Writing skills.

II. Apply the theoretical and practical components of English syllabus to study academic subjects more effectively and critically.

III. Analyze a variety of texts and interpret them to demonstrate in writing or speech.

IV. Write clearly and creatively, and adjust writing style appropriately to the content, the context, and nature of the subject.

V. Develop language components to communicate effectively in formal and informal situations.

UNIT-I	THE RAMAN EFFECT	Classes: 12

Chapter entitled 'The Raman Effect' from the prescribed textbook, 'English for Engineers' published by Cambridge University Press.
V- The concept of Word Formation, Root Words and their use in English
G- Types of Sentences, Parts of Speech, Nouns, Pronouns, Adjectives
R- Reading and its importance
W- Sentence Structures, Punctuation, Writing Introductions and Conclusions

UNIT-II	LETTER WRITING	Classes: 12

Letter Writing.
V- Synonyms and Antonyms, Standard Abbreviations
G- Verbs, Modal Auxiliaries, Adverbs, Prepositions, Conjunctions
R- Improving Comprehension Skills, Reading and Comparing Two Articles
W- Writing Paragraphs, Letter Writing- Letters of Request, Apology and Complaint- Letter of Application with Resume.

UNIT-III	BLUE JEANS	Classes: 12

Chapter entitled 'Blue Jeans' from the prescribed textbook, 'English for Engineers' published by Cambridge University Press.
V- Prefixes and Suffixes, Idioms and Phrasal verbs
G- Articles, Tenses and its forms
R- Sub skills of Reading- Skimming and Scanning
W- Essay writing andDescribing Objects, Places and Events

UNIT-IV	WHAT SHOULD YOU BE EATING	Classes: 12

Chapter entitled 'What Should You Be Eating' from the prescribed textbook, 'English for Engineers' published by Cambridge University Press.
V- One word Substitutes, Words often confused
G- Active and passive Voice Subject Verb Agreement (Concord)

R- Reading Comprehension- Intensive and Extensive W- Technical Report Writing, E-mail writing, Picture Essay		
UNIT-V	**HOW A CHINESE BILLIONARE BUILT HER FORTUNE**	**Classes: 12**

Chapter entitled 'How a Chinese Billionaire Built Her Fortune' from the prescribed textbook, 'English for Engineers' published by Cambridge University Press.
V- Technical Vocabulary and their Usage, Misplaced Modifiers, Redundancies
G- Direct and Indirect Speech, Degrees of Comparison, Common Errors in English
R-Effective Reading and Exercises for Practice
W- Memo, Précis and Resume Writing

Text Books:

1. Sudarshan, N. P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.

2. Wren & Martin. (2017). High School English Grammar and Composition Book. S Chand Publishing.

Reference Books:

1. Murphy, R. (2015). Essential Grammar in Use. Cambridge University Press.
2. Wood, F.T. (2007).Remedial English Grammar. Macmillan.
3. Swan, M. (2016). Practical English Usage. Oxford University Press.
4. Kumar, S and Lata, P. (2018). Communication Skills. Oxford University Press.
5. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
6. Hamp-Lyons, L. (2006).Study Writing. Cambridge University Press.
7. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.

Web References:

1. https://www.oxfordlineenglish.com
2. https://www.bbclearningenglish.com
3. https://www.learnenglish.britishcouncil.org
4. https://www.fluentu.com/english
1.

E-Text Books:

1. https://www.uop.edu.jo/download/research/members/oxford_guide_to_english_grammar.pdf
2. http://www.espressoenglish.net/wp-content/uploads/2012/07/Free-Grammar-Ebook-Level-2.pdf
3. https://update24hour.com/2018/03/wren-and-martin-english-grammar-pdf
1.

MOOC Course

1. http://www.cambridgeenglish.org/learning-english/free-resources/mooc/
2. https://www.britishcouncil.org.tr/en/english/mooc
3. https://mooec.com

PROGRAMMING FOR PROBLEM SOLVING LABORATORY								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
A5CS02	**Foundation**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		-	-	4	2	25	75	100
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 36**				**Total Classes:36**		

COURSE OBJECTIVES:

- To understand how to formulate the algorithms for simple problems
- To be able to translate given algorithms to a working and correct program
- To make them understand how to correct syntax errors as reported by the compilers
- To be able to identify and correct logical errors encountered at run time
- To understand how to write iterative as well as recursive programs
- To enable them to represent data in arrays, strings and structures
- To impart the knowledge of declare pointers of different types and their usage.
- To understand how to create, read and write to and from simple text files.

LIST OF EXPERIMENTS

Week-1   INTRODUCTION TO LINUX COMMANDS

a. Basic Linux commands
b. Write a C program to use printf() and scanf() functions
c. Write C programs to implement basic arithmetic operations – sum, average, product, difference, quotient and remainder of given numbers etc.

Week-2   OPERATORS AND EVALUATION OF EXPRESSIONS

a. Write a C program to check whether a number is even or odd using ternary operator.
b. Write a C program to perform the addition of two numbers without using +operator.
c.   Write a C program to evaluate the arithmetic expression $((a + b / c * d - e) * (f - g))$. Read the values a, b, c, d, e, f, g from the standard input device.
d. Write a C program to find the sum of individual digits of a 3 digit number.
e.   Write a C program to read the values of x and y and print the results of the following expressions in one line:
    i. $(x + y) / (x - y)$
    ii. $(x + y)(x - y)$

Week-3   CONDITIONAL STATEMENTS

a. Write a C program to find largest and smallest of given numbers.
b. Write a C program to find roots of a quadratic equation.
c. Write a C program which takes two integer operands and one operator form the user(+,-,*,/,% use switch)

Week-4   LOOPING STATEMENTS

a. Write a C program to find Sum of individual digits of given integer
b. Write a C program to generate first n terms of Fibonacci series
c. Write a C program to generate prime numbers between 1 and n

Week-5	**LOOPING STATEMENTS**

a. Write a C Program to find the Sum of Series SUM=1-x2/2! +x4/4!-x6/6!+x8/8!-x10/10!

b. Write a C program to generate Pascal's triangle.

c. Write a C program to generate pyramid of numbers.

1

Week-6	**ARRAYS**

a. Write a C Program to implement following sorting methods
    i. Bubble sort
    ii. Selection sort
    iii. Insertion sort
b. Write a C program to find largest and smallest number in a list of integers

Week-7	**ARRAYS**

a. Write a C program
    i. To add two matrices
    ii. To multiply two matrices
b. Write a C program to find Transpose of a given matrix

Week-8	**FUNCTIONS**

a. Write a C program to find the factorial of a given integer using functions
b. Write a C program to find GCD of given integers using functions
c. Write a C Program to find the power of a given number using functions

Week-9	**RECURSION**

a. Write a C Program to find binary equivalent of a given decimal number using recursive functions.
b. Write a C Program to print Fibonacci sequence using recursive functions.
c. Write a C Program to find LCM of 3 given numbers using recursive functions

Week-10	**STRINGS**

a. Write a C program using functions to
    a. Insert a sub string into a given main string from a given position
    b. Delete n characters from a given position in a string
b. Write a C program to determine if given string is palindrome or not

Week-11	**POINTERS AND STRUCTURES**

a. Write a C program to print 2-D array using pointers
b. Write a C program to allocate memory dynamically using memory allocation functions (malloc, calloc, realloc, free)
c. Write a C Program using functions to
   a. Reading a complex number
   b. Writing a complex number
   c. Add two complex numbers
   d. Multiply two complex numbers

Note: represent complex number using structure.

Week-12	FILES

a. Write a C program to copy one file to other
b. Write a C program to copy one file to other
c. Write a C Program to merge two files into a third file

Text Books:

YashavantKanetkar, "Let Us C", BPB Publications, New Delhi, 13th Edition, 2012.
Oualline Steve, "Practical C Programming", O'Reilly Media, 3rd Edition, 1997.

Reference Books:

1. King KN, "C Programming: A Modern Approach", Atlantic Publishers, 2nd Edition, 2015.
   Kochan Stephen G, "Programming in C: A Complete Introduction to the C Programming Language", Sam's Publishers, 3rd Edition, 2004.
3. Linden Peter V, "Expert C Programming: Deep C Secrets", Pearson India, 1st Edition, 1994.

Web References:

1. http://www.sanfoundry.com/c-programming-examples
   http://www.geeksforgeeks.org/c
   http://www.cprogramming.com/tutorial/c
   http://www.cs.princeton.edu

COURSE OUTCOMES:

At the end of the course, student will be able to
- Formulate the algorithms for simple problems
- Translate given algorithms to a working and correct program
- Correct syntax errors as reported by the compilers
- Identify and correct logical errors encountered at run time
- Write iterative as well as recursive programs
- Represent data in arrays, strings and structures and manipulate them through a program
- Declare pointers of different types and use them in defining self-referential structures.
- Create, read and write to and from simple text files.

CHEMISTRY LABORATORY

Course Code	Category	Hours / Week			Credits	Maximum Marks	
		L	**T**	**P**	**C**	**CIE**	**SEE**
A5BS12	**BS**	-	-	3	2	25	75
Contact Classes: 00	**Tutorial Classes: 00**	**Practical Classes: 39**				**Total Classes: 39**	

OBJECTIVES:

The course should enable the students to:

   I. Estimation of hardness and chloride content in water to check its suitability for drinking purpose.

   II. To determine the rate constant of reactions from concentrations as a function of time.

   III. The measurement of physical properties like adsorption and viscosity.

   IV. To synthesize the drug molecules and check the purity of organic molecules by thin layer chromatographic (TLC) technique.

**LIST OF
EXPERIMENTS**

Week-1	**DETERMINATION OF TOTAL HARDNESS OF WATER BY COMPLEXOMETRIC METHOD USING EDTA**
Week-2	**ESTIMATION OF AN HCL BY CONDUCTOMETRIC TITRATIONS**
Week-3	**ESTIMATION OF ACETIC ACID BY CONDUCTOMETRIC TITRATIONS**
Week-4	**ESTIMATION OF HCL BY POTENTIOMETRIC TITRATIONS**
Week-5	**ESTIMATION OF ACETIC ACID BY POTENTIOMETRIC TITRATIONS**
Week-6	**DETERMINATION OF RATE CONSTANT OF ACID CATALYSED HYDROLYSIS OF METHYL ACETATE**

Week-7	**SYNTHESIS OF ASPIRIN**

Week-8	**THIN LAYER CHROMATOGRAPHY CALCULATION OF R_F VALUES. EG ORTHO AND PARA NITRO PHENOLS**
Week-9	**VERIFICATION OF FREUNDLICH ADSORPTION ISOTHERM-ADSORPTION OF ACETIC ACID ON CHARCOAL**
Week-10	**DETERMINATION OF VISCOSITY OF CASTOR OIL AND GROUND NUT OIL BY USING OSTWALD'S VISCOMETER**
Week-11	**DETERMINATION OF SURFACE TENSION OF A GIVE LIQUID USING STALAGMOMETER**
Week-12	**SYNTHESIS OF THIOKOL RUBBER**
Week-13	**DETERMINATION OF CHLORIDE CONTENT OF WATER USING ARGENTOMETRIC METHOD**
Week-14	**DETERMINATION OF RATE CONSTANT OF ACID CATALYSED HYDROLYSIS OF METHYL ACETATE**

Reference Books:

1. Senior practical physical chemistry, B.D. Khosla, A. Gulati and V. Garg (R. Chand & Co., Delhi).
2. An introduction to practical chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, N. Delhi).
3. Vogel's text book of practical organic chemistry 5th edition.
4. Text book on Experiments and calculations in Engineering chemistry – S.S. Dara.

Web References:

1. http://amrita.olabs.edu.in/?sub=73&brch=8&sim=153&cnt=2
2. https://chem.libretexts.org/Textbook_Maps/Analytical_Chemistry_Textbook_Maps/Map%3A_Analytical_Chemistry_2.0_(Harvey)/11_Electrochemical_Methods/11.2%3A_Potentiometric_Methods
3. http://fch.upol.cz/skripta/fcc_and_zvem_english/FCH/Adsorption%20of%20oxalic%20acid%20on%20activated%20charcoal.htm
4. https://www.askiitians.com/iit-jee-chemistry/physical-chemistry/electrolytic-conductance-molar-conductance-and-specific-conductance.aspx
5. https://owlcation.com/stem/tlc-thin-layer-chromatography-Principle-Procedure

OUTCOMES:
The course should enable the students to:

I.   Determination of parameters like hardness and chloride content inwater.

II.   Estimation of rate constant of a reaction from concentration – timerelationships.

III.   Determination of physical properties like adsorption andviscosity.

IV.   Calculation of R_f values of some organic molecules by TLCtechnique.

ENGLISH LANGUAGE COMMUNICATION SKILLS LABORATORY

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
A5HS02	**HS**	0	0	2	1	25	75	100

Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 26	Total Classes:26

OBJECTIVES:

The course should enable the students to:

I. Facilitate computer-assisted multi-media instruction enabling individualized and independent language learning.
II. Enhance English language skills, communication skills and to practice soft skills.
III. Improve fluency and pronunciation intelligibility by providing an opportunity for practice in speaking.
IV. Train students in different interview and public speaking skills such as JAM, debate, role play, group discussion etc.
V. Instill confidence and make them competent enough to express fluently and neutralize their mother tongue influence.

LIST OF ACTIVITIES

Week-1	GENERAL INTRODUCTIONS AND FORMAL GREETINGS

a. Introductions and greetings in formal and informal situations
b. Worksheets to extract information
c. Questionnaires to enquire about the expressions used during formal introductions
d. Ice Breaking activity by preparing and asking five questions each
e. Creation of dialogues using greetings, leave- taking and introductions

Week-2	JAM- JUST A MINUTE

a. Strengthen the ability to analyze a topic and logical organization of thoughts.
b. Logically starting with introductory sentence, points of discussion and closing sentence.
c. Practicing to speak within one minute
d. Activity based on JAM on a familiar topic
e. Planning and executing JAM considering the parameters

Week-3	PHONETICS

a. Speech sounds and their prominence in pronunciation
b. Understanding and practicing word stress
c. Neutralizing the accent and practicing the right intonation
d. Knowing the differences between different accents
e. Increase fluency with the help of Phonetics

Week-4	LISTENING SKILLS

a. Developing good listening skills for effective communication
b. Enhancing listening skills through audio tracks and oral conversation
c. Empathizing others point of view while they speak
d. Incorporating non verbal communications while listening
e. Improving overall performance listening to the audio tracks

Week-5	SITUATIONAL DIALOGUES AND GIVING DIRECTIONS

a. Creating dialogues in any given situations
b. Framing and choosing appropriate words to frame the dialogues in any situation
c. Guiding and giving directions using appropriate expressions
d. Activities on how to make polite requests, offers, rejections etc
e. Practicing to speak confidently in different situations

Week-6	ROLE PLAY

a. Understanding a Role playand its procedure
b. Planning and Executing a Role Play accordingly
c. Practicing to get into the role and perform within stipulated time
d. Activities based on Role Play with different situations
e. Performing a Role Play considering the parameters

Week-7	GROUP DISCUSSIONS

a. Understanding a Group Discussion (GD) and its procedure
b. Following the rules of a GD
c. Planning and Executing a GD within the stipulated time
d. Activities based on GD
e. Performing a GD considering the parameters

Week-8	DEBATE

a. Understanding the procedure of a Debate
b. Planning and executing a Debate following its rules
c. Strengthen the ability to analyze a topic and logical organization of thoughts.
d. Logically arranging the arguments
e. Performing a Debate considering the parameters

Week-9	TELEPHONIC ETIQUETTES

a. Understanding basic Telephonic Etiquettes
b. The approach one needs to follow while making and answering a call
c. Making a formal telephonic conversation
d. Activities based on modulating voice and tone
e. Interpersonal skills required to overcome rude and hostile behavior

Week-10	PRESENTATION SKILLS

a. Planning a Presentation
b. Enhancing skills required for making effective presentations
c. Usage of different tools that help us to give effective presentations
d. Executing a presentation effectively
e. Activities based on presentations

Week-11	ORAL PRESETATIONS AND EXTEMPORE

a. Planning an oral presentation or an Extempore
b. Preparing good PPT
c. Using appropriate body language in public speaking domain
d. Planning and Executing oral presentation
e. Activities based on oral presentations and extempore

Week-12	INTERVIEW SKILLS

a. Preparing to succeed in Interviews
b. Preparing a strong Resume for interviews
c. Practicing different techniques to overcome nervousness in interviews
d. Using appropriate body language in interviews
e. Activities based on Interviews skills

Week-13	INFORMATION TRANSFER

a. Extracting Information Transfer from different kinds of representation
b. Reading and decoding the information given in various types
c. Representing the information in charts or graphs in a written document
d. Developing writing skills from these aspects
e. Activity on transferring given data into graphs or charts for presentation skills

Reference Books:

1. E. Suresh Kumar. A Handbook for English Language Laboratories (with CD) Revised Edition

2. Normal Whitby. Business Benchmarch. Cambridge University Press(with CD) 2nd Edition

3. Liz Hamp-Lyons and Ben Heasly. Study Writing.Cambridge University Press. 2006.

4. Sanjay Kumar and PushpLata.Communication Skills. Oxford University Press. 2011.

5. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

6. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.

7. Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York, 2004.

Websites:

https://www. britishcouncil.org
https://www. bbc.co.uk
https://www. grammarly.com
https://www. fluentu.com
https://www.cambridgeenglish.org/exams-and-tests/business-preliminary
https://www.cambridgeenglish.org/exams-and-tests/business-vantage

OUTCOMES:

The course should enable the students to:

I. Better perception of nuances of English language through audio- visual experience

II. Neutralization of accent for intelligibility

III. Take part in group activities

IV Speaking skills with clarity and confidence which in turn enhances their employability

SOCIAL INNOVATION

Course Code	Category	Hours / Week			Credits	Maximum Marks		
A5HS03	HSMC	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		2	-	-	1	25	75	100
Contact Classes: 32	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 32**		

OBJECTIVES:

The course should enable the students to:

1. Understand social innovation concepts and approaches.

2. Understand the community problems, social and economical change.

3. Identify new and unaddressed social needs.

4. Analysis of social innovation disclosures in different sectors.

5. Design innovative solutions with Social impact through application of new models of leadership, collective intelligence and creativity techniques.

UNIT-I	**INTRODUCTION TO SOCIAL INNOVATION**	Classes: 06

Core definitions, core elements and common features of social innovation, a topology of social innovations, history of social innovation, social and economic change, Swachh Bharat, Unnat Bharat Abhiyan, National Service Scheme (NSS).

UNIT-II	**INTERACTION AND ENGAGEMENT WITH SOCIETY**	Classes: 06

Engage with community, interact with them to understand the community problems, Understanding social and economical change – individuals, organizations and movements.

UNIT-III	**PROCESS OF SOCIAL INNOVATION**	Classes: 06

Understanding the pain/need, description and problem definition, social and economic constraints for affordable and appropriate technology.

UNIT-IV	**SOCIAL INNOVATION ACROSS FOUR SECTORS IN INDIA AND GLOBAL SCENARIO**	Classes: 06

The four sectors – the non-profit sector, public sector, the private sector, the informal sector, links between and cross sectors.

UNIT-V	**SOCIAL INNOVATION – CASE STUDIES**	Classes: 08

Designing and implementing social innovations, report writing and documentation, presentation of the case studies with a focus on impact and vision on society.

Text Books:

2. The Power of Social Innovation: How Civic Entrepreneurs Ignite Community Networks for Good 1st Edition by Stephen Goldsmith, Michael R. Bloomberg, Gigi Georges, Tim Glynn Burke.
3. The Open Book of Social Innovation: Ways to Design, Develop and Grow Social Innovation Paperback – March, 2010 by Robin Murray, Julia Caulier-Grice, Geoff Mulgan.

Reference Books:

1. Social innovator series: ways to design, develop and grow social innovation, the open book of social innovation by robin murrayjuliecaulier-gricegeoffmulgan.
2. The International Handbook on Social Innovation: Collective Action, Social Learning and

Transdisciplinary Research Paperback by Frank Moulaert , Diana MacCallum.

3. Guide to Social Innovation by Johannes HAHN and Laszlo ANDOR

4

Web References:

2. http://s3platform.jrc.ec.europa.eu/documents/20182/84453/Guide_to_Social_Innovation.pdf
2. https://www.si-drive.eu/wp-content/uploads/2016/12/SI-DRIVE-CA-short-2016-11-30-Druckversion.pdf

E-Text Books:

2. https://epdf.tips/the-power-of-social-innovation-how-civic-entrepreneurs-ignite-community-networks.html
2. https://youngfoundation.org/wp-content/uploads/2012/10/The-Open-Book-of-Social-Innovationg.pdf
3. http://www.idmais.org/desislab/wp-content/media/social.pdf

MOOC Course

1. https://iversity.org/en/courses/social-innovation-101-en
2. https://www.class-central.com/tag/social%20innovation
3. https://www.mooc-list.com/tags/social-innovation

II Semester

INTEGRAL CALCULUS AND TRANSFORMS

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
A5BS03	**BSC**	3	1	-	4	25	75	100
Contact Classes: 44	**Tutorial Classes: 08**	**Practical Classes: Nil**				**Total Classes: 52**		

COURSE OBJECTIVES:
To learn
1. Evaluation of the multiple integrals.
2. Finding the integrals in two and three dimensional space over given curve and surface.
3. Concept and application of Laplace transforms.
4. Fourier series for periodic functions.
5. Classification of second order partial differential equations.

COURSE OUTCOMES:
Upon successful completion of the course, the student is able to
1. Evaluate multiple integrals.
2. Verify vector integral theorems.
3. Solve the differential equations using Laplace transform techniques.
4. Find the Fourier transforms of the given functions.
5. Solve one dimensional heat equation, wave equation using method of separation of variables.

UNIT-I	MULTIPLE INTEGRALS	Classes: 10

Double and triple integrals (Cartesian and polar), Change of order of integration in double integrals, Change of variables (Cartesian to polar) in double integrals. Finding the area and volume of a region using double, centrefof mass and gravity.

UNIT-II	VECTOR CALCULUS	Classes: 11

Scalar and vector point functions - Gradient, divergence, curl and their related properties -Solenoidal and irrotational vector point functions - Scalar potential function - Laplacian operator - Line integral - work done - surface integrals - volume integral - Vector integral theorems - Green's theorem in a plane - Stoke's theorem - Gauss divergence theorem (all theorem statements and their verification).

UNIT-III	LAPLACE TRANSFORM S	Classes: 12

Laplace transforms of elementary functions- First shifting theorem - Change of scale property – Multiplication by t^n- Division by t – Laplace transforms of derivatives and integrals – Unit step function – Second shifting theorem – Periodic function – Evaluation of integrals by Laplace transforms – Inverse Laplace transforms- Method of partial fractions – Other methods of finding inverse transforms – Convolution theorem – Applications of Laplace transforms to ordinary differential equations.

UNIT-IV	FOURIER SERIES AND FOURIER TRANSFORMS	Classes:11

Periodic function-Determination of Fourier Coefficients-Fourier Series-Even and Odd functions-Fourier series in arbitrary interval-Even Odd periodic continuation-Half range Fourier sine and cosine expansions.
Fourier integral theorem (statement)-Fourier sine and cosine integrals –Fourier transforms –Fourier sine and cosine transforms-properties- Inverse transforms-Finite Fourier transforms.

UNIT-V	**PARTIAL DIFFERENTIAL EQUATIONS AND APPLICATIONS**	**Classes: 08**

Method of separation of variables. Classification of second order partial differential equations. Applications of Partial differential equations- one dimensional wave equation, Heat equation.

Text Books:

4. Ervin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna publishers, 36th Edition, 2010.

Reference Books:

5. G.B.Thomas, calculus and analytical geometry,9th Edition, Pearson Reprint 2006.
6. N.P Bali and Manish Goyal ,A Text of Engineering Mathematics,Laxmi publications,2008.
7. E.L.Ince, Ordinary differential Equations,Dover publications,1958.

Web references:

1. https://www.efunda.com/math/math_home/math.cfm
2. https://www.ocw.mit.edu/resources/#Mathematics
3. https://www.sosmath.com/
4. https://www.mathworld.wolfram.com/

E -Text Books:

1.https://www.e-booksdirectory.com/details.php?ebook=10166

2.https://www.e-booksdirectory.com/details.php?ebook=10166

MOOCS Course:

1. https://swayam.gov.in/

2. https://onlinecourses.nptel.ac.in/

APPLIED PHYSICS

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
A5BS08	BSC	3	1	0	4	25	75	100
Contact Classes: 39	Tutorial Classes: 13	Practical Classes: NIL				Total Classes: 52		

OBJECTIVES:
The course should enable the students to:
1. Learn the behavior of matter waves and applications of Schrodinger wave equations in periodic potential energy of electron.
2. Understand the formation of energy bands in solids.
3. Gain the knowledge of carrier concentration and recombination process of semiconductor materials.
4. Learn the basic principles of laser and optical fiber.
5. Understand the development of nano technology and synthesis of nano materials by using different techniques.

OUTCOMES:
The student will able to:
1. Conclude the dual nature of material particles and able to explain how moving particles are associated with its energies
2. Analyze the energy bands in solids and accordingly classify the materials
3. Evaluate the mobility of charge carrier concentration of a given semiconductor material.
4. Justify how the graded index optical fiber is more efficient than step index optical fiber in fiber optic communication system.
5. Recommend appropriate synthesis method and explain the characterization techniques.

UNIT-I	Quantum Mechanics	Classes: 08

Introduction to quantum physics: Black body radiation, Planck's law, photoelectric effect, Compton effect, Waves and Particles, de Broglie Hypothesis, Matter Waves, Davisson and Germer's Experiment, Heisenberg's Uncertainty Principle, Schrodinger's Time Independent Wave Equation-Physical Significance of the wave Function, Particle in One Dimensional Potential Box.

UNIT-II	Introduction to Electronic materials	Classes: 07

Band theory - Free electron theory, Origin of Energy Band formation in Solids, Estimation of Fermi energy level, Density of states and energy band diagrams, Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, E-k diagram, Direct and indirect bandgaps.

Classification of Materials: Conductors, Semiconductors & Insulators, Effective mass of an Electron. Fermi-Dirac Statistics (Qualitative treatment).

UNIT-III	Semiconductors and optoelectronics	Classes: 08

Semiconductors: Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics). Carrier generation and recombination, Carrier transport: diffusion and drift, Hall effect and its applications.
Semiconductors design- PN junction-diode, Zener diode, fabrication and characterization techniques-

Heterojunctions and associated band-diagrams.

Optoelectronic devices: properties of photo detectors, solar cells, Semiconductor laser, Four-point probe measurement for carrier density.

UNIT-IV	Laser & Optical fiber	Classes: 08

Laser: Characteristics of Laser beams, Energy levels in atoms, Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers -He-Ne, solid-state lasers -ruby, Nd-YAG, Applications of Lasers.

Fiber Optic Communication: Structure of Optical fibers, Basic principle of fibers, Acceptance angle and Numerical aperture, Types of Optical Fibers-Step Index and Graded Index fibers; Modes of fibers-SMSI, MMSI, MMGI.,Optical fiber Communication System with block diagram. Applications of fibers, fiber optic sensors – Basic principle, Intrinsic, Extrinsic sensors. Working of Pressure and Temperature Sensors.

UNIT-V	Introduction to Engineered materials	Classes: 08

Fundamentals of nano particles, nano scale, properties, Techniques for synthesis of nano materials -Sol-gel, Chemical vapor deposition (CVD) methods.

Characterization of nanomaterials: Imaging methods- SEM, TEM, Scanning Probe Microscopy: STM. Fabrication method- quantum wire, Applications of Nano materials in engineering and Biomedical fields.

Text Books:

1. Engineering Physics, B.K. Pandey, S. Chaturvedi – CengageLearing
2. Haliday and Resnick, Physics – wiley
3. R. Robinett, "Quantum Mechanics", OUP Oxford, 2006.IIndEdn.
4. P.K Palanisamy, Engineering Physics, Sitech Publications, 2013, IVthEdn.
5. Essentials of Nano Tecnology by Jeremy Ramsden.

Reference Books:

1. E. Hecht, "Optics", Pearson Education, 2008.
2. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill inc. (1995)
3. R. Robinett, "Quantum Mechanics", OUP Oxford, 2006.
4. O. 1Svelto, "Principles of Lasers", Springer Science & Business Media, 2010.
5. D. A. Neamen, "Semiconductor Physics and Devices", Times Mirror High Education Group, Chicago, 1997.

Web References:

1. https://www.edx.org/course?search_query=semiconductor+physics
2. https://www.edx.org/course/nanotechnology-fundamentals-purduex-nano530x
3. https://www.edx.org/course/physics-electronic-polymers-pep-purduex-nano600

E-Text Books:

1. http://www.phys.sinica.edu.tw/TIGP-NANO/Course/2010_Fall/classnotes/NanoB_week14.pdf

2. https://www.scribd.com/document/70908178/Semiconductor-Devices-Basic-Principles-Jasprit-Singh
3. https://www.scribd.com/doc/105174065/Fundamentals-of-Photonics
4. ftp://nozdr.ru/biblio/kolxo3/P/PE/PEo/Thyagarajan%20K.,%20Ghatak%20A.%20Lasers..%20Fundamentals%20and%20Applications%20(2ed.,%20GTP,%20Springer,%202010)(ISBN%20144196441X)(O)(674s)_PEo_.pdf
5. https://subodhtripathi.files.wordpress.com/2012/01/optical-fiber-communications-by-gerd-keiser_2.pdf
6. http://www.hailienene.com/resources/nano-technology.pdf

MOOC Course

1. http://nptel.ac.in/courses/115103030/(Four-point probe measurement for carrier density)
2. http://nptel.ac.in/courses/115102025/ (Fundamental concepts of semiconductors)
3. http://nptel.ac.in/courses/118104008/1 (Fundamentals of Nano technology)
4. http://nptel.ac.in/courses/118104008/13 (Nano structures, synthesis and characterization)
5. http://nptel.ac.in/courses/104104085/2(Lasers and its applications)

BASIC ELECTRICAL ENGINEERING

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
A5EE01	Foundation	3	1	-	3	25	75	100
Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 50		

OBJECTIVES:
The course should enable the students to:
I.   To understand and analyze basic electric and magnetic circuits
II. To study the working principles of electrical machines

III. To introduce the components of low voltage electrical installations		
UNIT-I	**DC CIRCUITS**	**Classes: 10**
Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current andvoltage laws, analysis of simple circuits with dc excitation. Superposition, TheveninandNorton Theorems. Time-domain analysis of first-order RL and RC circuits.		
UNIT-II	**AC CIRCUITS**	**Classes: 10**
Representation of sinusoidal waveforms, peak and rms values, phasor representation, realpower, reactive power, apparent power, power factor. Analysis of single-phase ac circuitsconsisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phasebalanced circuits, voltage and current relations in star and delta connections.		
UNIT-III	**TRANSFORMERS & ELECTRICAL INSTALLATIONS**	**Classes: 12**
Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit,losses intransformers, regulation and efficiency. Auto-transformer and three-phasetransformer connections. Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types ofWires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries		
UNIT-IV	**DC MACHINES**	**Classes: 10**
Principle and operation of DC Motor, Construction of DC machine. Types of DC motor, losses and Torque equation. DC generator construction, working principle and its EMF equation. Types of dc generators, efficiency of dc generator, problems on Emf equation. Applications.		
UNIT-V	**AC MACHINES**	**Classes: 08**
Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Construction, working of Single-phase induction motor. Construction andworking of synchronous generators, Emf equation and problems.		

Text Books:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. Basic Electrical Engineering by M.S. Naidu and S. Kamakshaiah TMH
4. Mehta V K, ―Principles of Electrical Engineering‖, S. Chand & Company

Reference Books:

1. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
2. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
3. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
4. Nagsarkar T K and Sukhija M S, ―Basics of Electrical Engineering‖, Oxford press. Basic concepts of Electrical Engineering, P.S. Subramanyam, BS Publications.

ENGINEERING GRAPHICS & DESIGN								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
A5ES02	**Engineering science courses**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		1	0	4	3	25	75	100
Contact Classes: 35	**Tutorial Classes: Nil**	**Practical Classes:40**				**Total Classes: 75**		

OBJECTIVES:
The course should enable the students to:

1. Create awareness and emphasize the need for Engineering Drawing in various branches of engineering.
2. Enable the student with various concepts of dimensioning, conventions and standards related to engineering drawings.
3. Follow the basic drawing standards and conventions.
4. Develop skills in three-dimensional visualization of engineering component.

UNIT-I	INTRODUCTION	Classes: 7

Introduction to Engineering Drawing covering: Principles of Engineering Graphics and their significance, usage of drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute.

UNIT-II	DRAWING OF PROJECTIONS OR VIEWS: ORTHOGRAPHIC PROJECTION IN FIRST ANGLE PROJECTION ONLY	Classes: 10

Principles of orthographic projections – conventions – first and third angle projections. Projections of points- Projection of lines inclined to both the planes.
PROJECTIONS OF PLANES: Projections of regular planes, inclined to both planes.

UNIT-III	INTRODUCTION TO COMPUTER AIDED DRAFTING	Classes: 8

INTRODUCTION TO COMPUTER AIDED DRAFTING: Generation of points, lines, curves, polygons, simple solids, dimensioning. LAYERS: Concept of layers, working with layers, creating, display, locking, unlocking, and delete commands, Coordinate system in AutoCAD, UCS, WCS, MCS
PROJECTION OF SOLIDS-Solids inclined to both planes(Auxiliary plane method)
DEVELOPMENT OF SURFACES OF SOLIDS:Theory of development,development of lateral surface along with base
.

UNIT-IV	ISOMETRIC DRAWINGS	Classes: 05

Divisions of pictorial projection, theory of Isometric Drawing- Isometric view and Isometric projections; Drawing Isometric circles, Dimensioning Isometric Objects; Conversion of Isometric view to Orthographic views and Orthographic to isometric views

UNIT-V	3D MODELING	Classes: 04

Types of 3D models, 3D Coordinate Systems, basic commands in 3D, PEDIT command. CREATING SOLID MODELS: creating pre-defined Solid Primitives, Dynamic UCS, methods of creating solids by - Extrude, Revolve, Swept, Loft, &Presspull, in 3Dcreating solid models, Dynamic UCS. MODIFYING 3D OBJECTS: Fillet, Chamfer, Rotate, Mirror, Array, Slicing solid Models. EDITING 3D OBJECTS: SOLVIEW, SOLDRAW, SOLPROF,

Text Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. &Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, ScitechPublishers .
5. D.M. Kulkarni,A.P.Rastogi,A.K. Sarka "Engineering Graphics with AutoCAD" PHI publications, 2013

Reference Books:

1. Johle (2009), Engineering Drawing, Tata McGraw Hill, New Delhi, India.
2. Trymbaka Murthy (2007), Computer Aided Engineering Drawing, I.K. International Publishers, New Delhi.
3. Sham Tickoo, D. saravanan, "AutoCAD 2010 for engineers and designers" Dreamtech Press, 2010 2.
4. Sham Tickoo" AutoCAD 2011: A Problem solving approach" Autodesk Press, USA.

Web References:
1. nptel.ac.in/courses/112103019/

2. web.iitd.ac.in/~achawla/public_html/201/lectures/sp46.pdf

E-Text Books:
1. https://www.researchgate.net/publication/305754529_A_Textbook_of_Engineering_Drawing_A_Textbook_of
2. **https://www.researchgate.net/publication/305754529_A_Textbook_of_Engineering_Drawing_A_Textbook_of**

APPLIED PHYSICS LABORATORY

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
A5BS10	**BSC**	-	-	3	1.5	25	75	100
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 42**				**Total Classes:42**		

OBJECTIVES:

The course should enable the students to:

1. To provide an experimental foundation for the theoretical concepts introduced in the lectures.

2. To teach how to make careful experimental observations and how to think about and draw conclusions from such data.

3. To help students understand the role of direct observation in physics and to distinguish between inferences based on theory and the outcomes of experiments.

4. To introduce the concepts and techniques which have a wide application in experimental

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LIST OF EXPERIMENTS

Week-1	**LIGHT EMITTING DIODE (LED)**

a. Analyze the V-I characteristics of GREEN LED Source by varying input voltage from zero to two volts. Analyze the graph obtained.
 b. Analyze the results obtained for V-I characteristics of RED LED Source by varying input voltage with interval 0.2 volts.
 c. Analyze the V-I characteristics of YELLOW LED Source for the resistance of 100Ω. What is the effect of doubling the resistance on the V-I characteristics.

Week-2	**SOLAR CELL**

 a. Study the V-I characteristics of a solar cell for the voltage interval of 0.4 V when the given electric

bulb is at a distance of 10cm. Will there be any change if the distance is doubled?

 b. Study the P-V characteristics of a solar cell for the voltage interval of 0.3 V for four different distances of the given electric bulb. Discuss your observations.

c. Study the P-I characteristics of a solar cell for the given electric bulb for the distances 30 cm. What

Week-3	OPTICAL FIBER

To determine the numerical aperture and acceptance angle of an optical fiber.

Week-4	HALL EFFECT

a. Investigate the deflection of the carriers in the conductor under the function of the magnetic field. Based on this measurement, calculate the density of the carriers and the sign of the charges in the conductor.

   b. Verifty the Hall effect in extrinsic semiconducting samples and determine the type of given semiconductoranddensity of majority charge carriers.

Week-5	ENERGY GAP OF PN JUNCTION DIODE

   a. Using PN junction diode, determine the energy gap of a semiconductor by applying 2V of reverse bias by increasing the temperature from 30-70 degree centigrade. Analyze the obtained results.

   b. Evaluate the energy gap of Si PN junction diode by applying 1.5V of reverse bias for values of temperature 70,60,50,40,30 centigrade.

   c. Evaluate the energy gap of a semiconductor by applying 0.5V of reverse bias for temperatures at 75, 65, 55,45,35 centigrade.

Week-6	THERMISTER

  a. Study the variation of Resistance versus Temperature using Thermister. Plot graph between Resistance vs Temperature and analyze the results.

  b. Evaluate the Temperature dependent resistance of a given material by using Thermister.

Week-7	LCR CIRCUIT

  i. To determine the Resonance frequency and Quality factor of a LCR Circuit
  j. Study the Resonance frequency of an electrical circuit by varying values of inductance, Capacitance and resistors and analyze the results.

Week-8	PIN PHOTO DIODE

To determine the V-I characteristics of PIN photo diode.

Week-9	RC CIRCUIT

a. Analyze the time constant of R-C circuitby varying Resistance and Capacitance values in a electrical circuit.
b. Determine the time constant of a given RC circuit by plotting a graph between Charging current versus time.

Week-10	TORSIONAL OSCILLATOR

a. Making use of a torsional oscillator of 300gms circular disc, determine the rigidity modulus of given steel wire for 65 cm &55 cm lengths. Analyze the results obtained.

b. Determine the rigidity modulus of the given copper wire for 50,40,30 lengths by using torsional oscillator of 400gms circular disc. Analyze the results obtained.

c. Give your analysis of $L\&T^2$ behavior of a torsional oscillator. You may pick your own values for the analysis.

Week-11	LASER - DIFFRACTION GRATTING

a. Using a diffraction grating element of 2500 LPI determine the wavelength of LASER source for first and second order diffraction when the distance between the screen and grating is 50cm. What is your analysis?

 b. Determine the wavelength of a LASER source for first three orders of diffraction by maintaining a distance of 30 cms between grating material and the screen. Use diffraction grating element of 15000 LPI. What differences do you observe for the three orders.

Week-12	MELDE'S EXPERIMENT

a. Determine the longitudinal frequency of tuning fork by using 100cm length of the thread by varying

masses of 5gms, 10gms. Discuss your findings.

b. Findout the transverse frequency of tuning fork by using 80cm length of the thread and by varying

Reference Books:

1. "Semiconductor Physics and Devices: Basic Principles" by Donald ANeamen.
2. "Optics, Principles and Applications" by K K Sharma.
3. "Principles of Optics" by M Born and E Wolf.
4. "Oscillations and Waves" by SatyaPrakash and VinayDua.
5. "Waves and Oscillations" by N Subrahmanyam and BrijLal.

Web References:

1. **http://www.**arxiv.org/pdf/1510.00032
2. http://www nptel.ac.in/courses/122103010/
3. http://www. researchgate.net/.../276417736_Video_Presentations_in_Engineering-Ph...
4. http://www. wileyindia.com/engineering-physics-theory-and-practical.html

Note: Students can perform any 8 experiments

BASIC ELECTRICAL ENGINEERING LABORATORY

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
A5EE02	**Foundation**	-	-	2	1	25	50	75
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 24**				**Total Classes:24**		

OBJECTIVES:

The course should enable the students to:

I. Get an exposure to common electrical components and their ratings.
II. Make electrical connections by wires of appropriate ratings.
III. Understand the usage of common electrical measuring instruments.
IV. Understand the basic characteristics of transformers and electrical machines.

LIST OF EXPERIMENTS

Week-1	**INTRODUCTION AND USE OF MEASURING INSTRUMENTS & SAFETY PRECAUTIONS**
	TO STUDY THE USAGE OF ELCTRICAL INSTRUMENTS AND THE REQUIRED PRECAUTIONS TO BE TAKEN.
Week-2	**KIRCHOFF'S LAWS(KVL & KCL)**
	TO VERIFY KVL AND KCL
Week-3	**SUPERPOSITION THEOREM**
TO VERIFY SUPERPOSITION THEOREM	
Week-4	**THEVENIN'S AND NORTON'S THEOREM**
TO OBTAIN EQUIVALENT CIRCUIT OF A COMPLEX NETWORK	
Week-5	**STEADY STATE AND TRANSIENT RESPONSE OF R-L, R-C & R-L-C CIRCUITS**
	TO FIND THE STEADY AND TRANSIENT RESPONSE OF R-L, R-C & R-L-C CIRCUITS FOR STEP INPUT.
Week-6	**OPEN CIRCUIT, SHORT CIRCUIT & LOAD TEST ON SINGLE PHASE TRANSFORMER**
	TO CALCULATE THE EFFICIENCY OF SINGLE PHASE TRANSFORMER.
Week-7	**CUT OUT VIEW OF DC MACHINE**

	DEMONSTRATION ON CONSTRUCTIONAL AND CUT OUT VIEW OF DC MACHINE

Week-8	**CUT OUT VIEW OF INDUCTION MOTOR**
	DEMONSTRATION ON CONSTRUCTIONAL AND CUT OUT VIEW OF SINGLE PHASE INDUCTION MOTOR

Week-9	**MAGNETIZATION CHARACTERISTICS OF DC SHUNG GENERATOR**
	TO FIND THE MAGNETIZATION CHARACTERISTICS OF DC SHUNT GENERATOR

Week-10	**BRAKE TEST ON DC SHUNT MOTOR**
	TO FIND THE TORQUE-SPEED CHARACTRISTICS OF DC SHUNT MOTOR.

Week-11	**THREE PHASE TRANSFORMER CONNECTIONS**
	TO CALCULTE THE RELATION BETWEEN PHASE AND LINE VOLTAGES

Week-12	**BRAKE TEST ON 3-PHASE INDUCTION MOTOR**
	TO FIND THE TORQUE-SLIP CHARACTERISTICS OF INDUCTION MOTOR

Reference Books:

1. Department Lab Manual
2. A. Chakrabarthi, " Circuit Theory", DhanpatRai Publications, 6th Edition,2006
3. V K Mehta, Rohit Mehta, "Principles of Electrical Machines", S Chand Publications, 1st Edition,2006
4. I Nagrath& DP Kothari, "Electrical Machines", Mcgraw Hill Education Publications, 4th Edition, 2010.

Web References:

1. http://www.ee.iitkgp.ac.in
2. http://www.citchennai.edu.in

WORKSHOP PRACTICES								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
	Foundation	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		1	-	2	2	30	70	100
Contact Classes: 14	**Tutorial Classes: Nil**	**Practical Classes: 56**				**Total Classes:70**		

COURSE OUTCOMES:

Student will be able to:

      I.   Fabricate components with their own hands
     II.   Get practical knowledge of the dimensional accuracies and tolerances possible with
         different manufacturing processes
   III.   Assemble different components
   IV.   Produce small devices of their interest

VIDEO LECTURES

Week-1	Carpentry
Week-2	Fitting operations & Power Tools
Week-3	Casting
Week-4	Forming
Week-5	Machining
Week-6	Joining – Bolted & Riveted Joints
Week-7	Arc welding & Gas welding
Week-8	Brazing& Soldering
Week-9	Advanced Manufacturing methods
Week-10	CNC Machining
Week-11	Additive manufacturing
Week-12	Electrical & Electronics
Week-13	Plastic moulding, Glass cutting

Week-14	Metal casting

LIST OF EXPERIMENTS		
WEEKS	**BASIC TRADES**	**BASIC MANUFACTURING**
	Fitting	**Machine Shop**
Week 1	Filing Four Sides of Work piece	Facing & Step Turning on Lathe
Week 2	L Fit	Milling and Drilling
	Carpentry	**Black Smithy**
Week 3	Half Lap Joint	Convert round rod to S-hook
Week 4	Dove Tail Joint	Convert round rod to Chisel
	Tin Smithy	**Casting**
Week 5	Tin Smithy- Prepare a Rectangular Tray	Preparation of Mould Cavity for Multi Piece Pattern
Week 6	Prepare A Square Tin	Casting of Simple pattern
	Electrical	**Welding Shop**
Week 7	House Wiring Parallel and Series Connection	Lap/Butt joint Using Arc Welding
Week 8	House Wiring Two Way Switch	Lap/Butt joint Using Gas Welding
	Electronics	**Plastic Moulding & Glass Cutting**
Week 9	Soldering Parallel Connection	Injection moulding of Simple Components
Week 10	Soldering Series Connection	Glass Cutting
Week 11	Revision/Practice	Revision/Practice

Text Books:

1. Workshop Manual by P. Kannaiah and K. L. Narayana.
2. Rao P.N., "Manufacturing Technology", Tata McGraw Hill House, Vol. I and Vol. II.

Reference Books:

1. HajraChoudhury S.K., HajraChoudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Media promoters and publishers private limited, Mumbai, Vol. I 2008 and Vol. II 2010.
2. H. S. Bawa, "Workshop Practice", Tata McGraw-Hill Publishing Company Limited, New Delhi, (2007).
3. Kalpakjian

S. and Steven S. Schmid, "Manufacturing Engineering and Technology", Pearson Education India Edition, 4thedition,2002.

E-Text Books:
1. https://blogpuneet.files.wordpress.com/2013/07/introduction-to-basic-manufacturing-processes-and-workshop-technology.pdf 2. https://soaneemrana.org/onewebmedia/Manufacturing%20Processes%20By%20H.N.%20Gupta.pdf

MOOC Course:
1. https://www.class-central.com/course/edx-fundamentals-of-manufacturing-processes-7224

ENGINEERING EXPLORATION

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
A5HS04	**HSMC**	2	-	-	1	25	75	100
Contact Classes: 32	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 32**		

OBJECTIVES:

The course should enable the students to:
IV. Understand the Engineering attributes and Ethics.
V. Identify the community problem and its stakeholder.
VI. Examine required specifications and gap in existing and required product.
VII. Build sustaining interactions among people that create social value by transforming ideas into tangible products, services, or initiatives.
VIII. Develop skills to work collaboratively, reports and progress updates throughout the lifecycle of the project.

UNIT-I	**INTRODUCTION TO ENGINEERING AND ENGINEERING EXPLORATION**	**Classes: 06**

Engineering Projects in Community Service, Design Thinking Process-Empathize, Define, Ideate,   Prototype, Test.
Engineering Ethics: Introduction to ethics, moral values, significance of professional ethics, code of conduct for engineers, identify ethical dilemmas in different tasks of engineering, applying moral theories and codes of conduct for resolution of ethical dilemmas.

UNIT-II	**PROBLEM IDENTIFICATION**	**Classes: 06**

Authentic need in the community or society. Identify a real user or stake holder, Interaction with Stakeholders, Viewpoints, Interviewing, Scenario.

UNIT-III	**SPECIFICATION DEVELOPMENT**	**Classes: 06**

Clear and measurable requirements, criteria for success, Identifying relevant benchmarks, identifying the gap between the available and required products, requirements documentation.

UNIT-IV	**CONCEPTUAL DESIGN**	**Classes: 06**

Ideation-generated multiple ideas, evaluation of ideas, systems model, Architectural Design,prototype development, testing – real/simulated users, feedback.

UNIT-V	**PROJECT MANAGEMENT**	**Classes: 08**

Importance of team work, importance of project life cycle, project management, tools, various tools used in electronics documentation, importance of communication, usage of communication media.

Text Books:

1. Software Engineering: A Practitioner's Approach, Roger S. Pressman, 7th Edition, McGraw Hill Education (India) Pvt. Ltd.
2. Software Engineering, Sommerville Ian, 7th Edition, Pearson Education.
3. EPICS Design Process
   https://sharepoint.ecn.purdue.edu/epics/teams/Public%20Documents/EPICS_Design_Process.pdf
4. Examples of good practice in Special Needs Education & Community Based Programs, UNESCO PRESS.
5. Project Management, GRY r. Heerkens, McGraw-Hill

Web References:

1. **http://www.purdue.edu/epics**
2. http://epics.ieee.org/
3. https://www.uninettunouniversity.net/en/epics.aspx

E-Text Books:

1. http://www.uoitc.edu.iq/images/documents/informatics-institute/exam_materials/Software%20Engineering%20(9th%20Edition)%20by%20Ian%20Sommerville.pdf
2. https://engineering.purdue.edu/EPICS/k12/resources/1.6%20Teacher%20Toolbox%20EPICS%20High%20Design%20Process%20and%20Cycle.pdf
3. https://launchschool.com/books/agile_planning/read/epics_and_stories
   http://www.enggnotebook.weebly.com/uploads/2/2/7/1/22718186/ge6151-notes.pdf

MOOC Course

1. https://www.mooc-list.com/tags/design-thinking
2. https://www.class-central.com/tag/design%20thinking