FACULTY OF ENGINEERING

Scheme of Instruction & Examination

and

Proposed Scheme and Syllabus

B.E. I Semester

of
Four Year Degree Programme

In
Group – B (Civil, ECE, EEE, EIE)

(With effect from the academic year 2018– 2019)

As approved in the faculty meeting held on ……. 2018

Issued by

Dean, Faculty of Engineering

Osmania University, Hyderabad

…… 2018

S. No.	Course Code	Course Title	Scheme of Instructions				Scheme of Examination			Credits
			L	T	Pr/ Drg	Contact Hours/ Week	CIE	SEE	Duration in Hours	
Theory Courses										
1	**BSC102CH**	**Chemistry**	3	1	-	4	30	70	3	4
2	**BSC103MT**	**Mathematics-I** (Calculus, Multivariable Calculus and Linear Algebra **for CE**)/ (Calculus and Differential Equations **for ECE, EEE & EIE**)	3	1	-	4	30	70	3	4
3	**ESC102CS**	**Programming for Problem Solving**	3	-	-	3	30	70	3	3
Practical/ Laboratory Courses										
4	**BSC151CH**	**Chemistry Lab**	-	-	3	3	25	50	3	1.5
5	**ESC152CS**	**Programming for Problem Solving**	-	-	4	4	25	50	3	2
6	**ESC153ME**	**Workshop/ Manufacturing Process**	1	-	4	5	50	50	3	3
		Total	**10**	**02**	**11**	**23**	**190**	**360**		**17.5**

BSC: Basic Science Course **ESC**: Engineering Science Course
L: Lectures **T**: Tutorials **Pr** : Practicals **Drg**: Drawing
CIE: Continuous Internal Evaluation **SEE:** Semester End Examination (Univ. Exam)

Note: 1) Each contact hour is a Clock Hour
2) The practical class can be of two and half hour (clock hours) duration as per the requirement of a particular laboratory.

Course Code	Course Title						Core / Elective
BSC102CH	**CHEMISTRY** Concepts in chemistry for engineering) (Common to all branches)						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
High-school education	3	1	0	0	**30**	**70**	4

Course Objectives

Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

- Analyze microscopic chemistry in terms of atomic and molecular orbital's and intermolecular forces.
- Rationalize bulk properties and processes using thermodynamic considerations.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- Rationalize periodic properties such as ionization potential, electro negativity, oxidation states and electro negativity.

Course Outcomes

- The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications.

MODULE – 1: Atomic and molecular structure (12 lectures)

Schrodinger equation, Particle in a box solution and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

MODULE – 2: Spectroscopic techniques and applications (8 lectures)

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.

MODULE – 3: Intermolecular forces and potential energy surfaces (4 lectures)

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN and trajectories on these surfaces.

MODULE – 4: Use of free energy in chemical equilibria (6 lectures)

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

MODULE – 5: Periodic properties (4 Lectures)
Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

MODULE – 6: Stereochemistry (4 lectures)
Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

MODULE – 7: Organic reactions and synthesis of a drug molecule (4 lectures)
Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Suggested readings:

1) University chemistry, by B. H. Mahan
2) Chemistry: Principles and Applications, by M. J. Sienko and A. Plane
3) Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4) Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
5) Physical Chemistry, by P. W. Atkins
6) Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition

Course Code	Course Title						Core / Elective
BSC103MT	**MATHEMATICS – I (Calculus, Multivariable Calculus & Linear Algebra) (Civil Engineering)**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	1	0	0	**30**	**70**	4
Course Objectives **Course Outcomes**							

MODULE - 1: Calculus (Single Variable) (6 Lectures)

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

MODULE - 2: Calculus: (6 Lectures)

Rolle's theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.

MODULE - 3: Sequences and series: (10 Lectures)

Convergence of sequence and series, tests for convergence, power series, Taylor's series. Series for exponential, trigonometric and logarithmic functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Multivariable Calculus

MODULE - 4: Multivariable Calculus (Differentiation) (10 Lectures)

Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

MODULE - 5: Multivariable Calculus (Integration) (10 Lectures)

Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by (double integration) Center of mass and Gravity (constant and variable densities). Theorems of Green, Gauss and Stokes, orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds. Matrices and Linear Algebra

MODULE - 6: Matrices (8 Lectures)

Matrices, vectors: addition and scalar multiplication, matrix multiplication; Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

MODULE - 7: Vector spaces (10 Lectures)
Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank- nullity theorem, composition of linear maps, Matrix associated with a linear map.

MODULE - 8: Vector spaces (10 Lectures)

Eigen values, eigen vectors, symmetric, skew-symmetric, and orthogonal Matrices, Eigen bases. Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
6. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
7. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.
8. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

Course Code	Course Title						Core / Elective
BSC103MT	**MATHEMATICS – I (Calculus & Differential Equations) (ECE, EEE, & EIE)**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	1	0	0	**30**	**70**	4
Course Objectives **Course Outcomes**							

MODULE 1: Calculus (8 Lectures)

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Rolle's theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.

MODULE - 2: Sequences and Series (7 Lectures)

Convergence of sequence and series, tests for convergence, power series, Taylor's series. Series for exponential, trigonometric and logarithmic functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

MODULE - 3: Multivariable Calculus (Differentiation) (6 Lectures)

Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

MODULE - 4: Multivariable Calculus (Integration) (7 Lectures)

Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by (double integration) Center of mass and Gravity (constant and variable densities). Theorems of Green, Gauss and Stokes, orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds.

MODULE - 5: First Order Ordinary Differential Equations (3 Lectures)

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

MODULE - 6: Ordinary Differential Equations of Higher Order (6 Lectures)

Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

MODULE - 7: Partial Differential Equations (First Order) (3 Lectures)

First order partial differential equations, solutions of first order linear and non-linear PDEs.

Text / References:

1. G.B. Thomas and R.L. Finney, " Calculus and Analytic geometry" , Pearson,
2. 2002.
3. T. Veerarajan, " Engineering Mathematics" , McGraw-Hill, New Delhi, 2008.
4. B. V. Ramana, " Higher Engineering Mathematics", McGraw Hill, New Delhi,
5. 2010.
6. N.P. Bali and M. Goyal, " A text book of Engineering Mathematics" , Laxmi
7. Publications, 2010.
8. B.S. Grewal, " Higher Engineering Mathematics" , Khanna Publishers, 2000.
9. Kreyszig, " Advanced Engineering Mathematics", John Wiley & Sons, 2006.
10. W. E. Boyce and R. C. DiPrima, " Elementary Differential Equations and Boundary Value Problems" , Wiley India, 2009.
11. S. L. Ross, " Differential Equations" , Wiley India, 1984.
12. A. Coddington, " An Introduction to Ordinary Differential Equations" ,
13. Prentice Hall India, 1995.
14. L. Ince, " Ordinary Differential Equations" , Dover Publications, 1958.
15. G.F. Simmons and S.G. Krantz, " Differential Equations" , McGraw Hill, 2007.

Course Code	Course Title						Core / Elective
ESC102CS	**PROGRAMMING FOR PROBLEM SOLVING**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	**30**	**70**	3

Course Objectives

Course Outcomes

The student will learn

1. To formulate simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs (in C language).
3. To test and execute the programs and correct syntax and logical errors.
4. To implement conditional branching, iteration and recursion.
5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
6. To use arrays, pointers and structures to formulate algorithms and programs.
7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
8. To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.

MODULE- 1 Introduction to Programming (4 lectures)

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) - **(1 lecture).**
Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. **(1 lecture)**
From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code- **(2 lectures)**

MODULE - 2: Arithmetic expressions and precedence (2 lectures)

Conditional Branching and Loops **(6 lectures)**
Writing and evaluation of conditionals and consequent branching **(3 lectures)**
Iteration and loops **(3 lectures)**

MODULE-3Arrays (6 lectures)

Arrays (1-D, 2-D), Character arrays and Strings

MODULE-4 Basic Algorithms (6 lectures)

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

MODULE-5 Function (5 lectures)

Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

MODULE-6 Recursion (4 -5 lectures)

Recursion, as a different way of solving problems. Example programs, such as Finding

Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

MODULE-7 Structure (4 lectures)
Structures, Defining structures and Array of Structures

MODULE-8 Pointers (2 lectures)
Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

MODULE-9 File handling (only if time is available, otherwise should be done as part of the lab)

Suggested Text Books

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Suggested Reference Books

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Course Code	Course Title						Core / Elective
BSC151CH	**CHEMISTRY LAB (Common to all branches)**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Chemistry Theory	0	0	0	3	**25**	**50**	1.5

Course Objectives

Course Outcomes

- The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:
- Estimate rate constants of reactions from concentration of reactants/products as a function of time
- Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
- Synthesize a small drug molecule and analyse a salt sample

List of Experiments:

1. Determination of surface tension and viscosity
2. Thin layer chromatography
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Colligative properties using freezing point depression
6. Determination of the rate constant of a reaction
7. Determination of cell constant and conductance of solutions
8. Potentiometry - determination of redox potentials and emfs
9. Synthesis of a polymer/drug
10. Saponification/acid value of an oil
11. Chemical analysis of a salt
12. Lattice structures and packing of spheres
13. Models of potential energy surfaces
14. Chemical oscillations- Iodine clock reaction
15. Determination of the partition coefficient of a substance between two immiscible liquids
16. Adsorption of acetic acid by charcoal
17. Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg .

Note: *At least ten to twelve experiments should be conducted in the Semester*

Suggested readings:

Course Code	Course Title						Core / Elective
ESC152CS	**PROGRAMMING FOR PROBLEM SOLVING LAB**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	4	**25**	**50**	2

Course Objectives

Course Outcomes

- ✓ To formulate the algorithms for simple problems
- ✓ To translate given algorithms to a working and correct program
- ✓ To be able to correct syntax errors as reported by the compilers
- ✓ To be able to identify and correct logical errors encountered at run time
- ✓ To be able to write iterative as well as recursive programs
- ✓ To be able to represent data in arrays, strings and structures and manipulate them through a program
- ✓ To be able to declare pointers of different types and use them in defining self-referential structures.
- ✓ To be able to create, read and write to and from simple text files.

Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:

Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:
Lab 7: Simple functions

Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures

Tutorial 12: File handling:
Lab 12: File operations

Course Code	Course Title						Core / Elective
ESC253ME	**WORKSHOP/ MANUFACTURING PROCESS LAB**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	1	0	0	4	**50**	**50**	3

Course Objectives

Course Outcomes

Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials. (Workshop)

Upon completion of this laboratory course, students will be able to fabricate components with their own hands. (Manufacturing Process)

- ✓ They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
- ✓ By assembling different components, they will be able to produce small devices of their interest.

Lectures & videos: (10 hours)

Detailed contents

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods **(3 lectures)**
2. CNC machining, Additive manufacturing **(1 lecture)**
3. Fitting operations & power tools **(1 lecture)**
4. Electrical &Electronics **(1 lecture)**
5. Carpentry **(1 lecture)**
6. Plastic moulding, glass cutting **(1 lecture)**
7. Metal casting **(1 lecture)**
8. Welding (arc welding & gas welding), brazing **(1 lecture)**

Suggested Text/Reference Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.

3. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.

4. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.

5. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

(ii) Workshop Practice:(60 hours)[L : 0; T:0 ; P : 4 (2 credits)]

1. Machine shop **(10 hours)**
2. Fitting shop **(8 hours)**
3. Carpentry **(6 hours)**
4. Electrical & Electronics**(8 hours)**
5. Welding shop **(8 hours (Arc welding 4 hrs + gas welding 4 hrs)**
6. Casting **(8 hours)**
7. Smithy **(6 hours)**
8. Plastic moulding& Glass Cutting (6 hours)

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.