Dr. D. Y. PATIL VIDYAPEETH, PUNE
(Deemed to be University)

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DR. D. Y. PATIL BIOTECHNOLOGY & BIOINFORMATICS INSTITUTE

TATHAWADE, PUNE

SYLLABUS FOR

B. TECH. ARTIFICIAL INTELLIGENCE (AI) AND DATA SCIENCE

2021-22

DR. D.Y. PATIL VIDYAPEETH, PUNE
DR. D. Y. PATIL BIOTECHNOLOGY & BIOINFORMATICS INSTITUTE, TATHAWADE, PUNE

COURSE STRUCTURE FOR B. TECH. ARTIFICIAL INTELLIGENCE (AI) AND DATA SCIENCE

SEMESTER I						
Course Code	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
BSC 101	Physics	3	0	2	5	4
BSC 102	Chemistry	3	0	2	5	4
ESC 101	Basic Electronics and Electrical Engineering	3	0	2	5	4
ESC 102	Fundamentals of programming Languages	3	0	4	7	5
HSMC 101	Communication Skills	1	2	0	3	3
BSC 103	Mathematics	3	0	0	3	3
Total		**16**	**2**	**10**	**28**	**23**
SEMESTER II						
Course Code	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
ESC 201	Problem Solving by Programming	3	0	4	7	5
BSC 201	Computational Statistics	3	0	0	3	3
BSC 202	General Biology	2	1	0	3	3
ESC 202	Engineering Graphics and Design	1	0	4	5	3
ESC 203	Engineering Mechanics	3	0	0	3	3
ESC 204	Project Based Learning –I	0	0	4	4	2
ESC 205	Workshop and manufacturing practices-laboratory	0	0	4	4	2
Total		**12**	**1**	**16**	**29**	**21**
SEMESTER III						
Course Code	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
BSC 301	Discrete Mathematics	3	0	0	3	3
PCC-AI 301	Data Structures	3	0	4	7	5
PCC-AI 302	Software Engineering	3	0	0	3	3
PCC-AI 303	System Programming and Operating System	3	0	2	5	4
PCC-AI 304	Principles of Programming Languages	3	0	4	7	5
HSMC 201	Universal Human Values II	2	1	0	3	3
Total		**17**	**1**	**10**	**28**	**23**
SEMESTER IV						
Course Code	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
PCC-AI 401	Database Management System	3	0	4	7	5
PCC-AI 402	Management Information System	3	0	0	3	3
PCC-AI 403	Internet of Things	3	0	2	5	4
PCC-AI 404	Artificial Intelligence	3	0	4	7	5

PCC-AI 405	R Programming	2	0	2	4	3
ESC 401	Project Based Learning-II	0	0	4	4	2
Total		**14**	**0**	**16**	**30**	**22**
SEMESTER V						
Course Code	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
PCC-AI 501	Advanced Databases	3	0	4	7	5
PCC-AI 502	Machine Learning	3	0	4	7	5
PCC-AI 503	Web Technology	3	0	2	5	4
PCC-AI 504	Design and Analysis of Algorithm	3	0	0	3	3
PEC-AI 501	Elective-I	3	0	2	5	4
		15	**0**	**12**	**27**	**21**
Total						
Elective I (Human Computer Interface, System modeling and Design, Pattern Recognition, Structural Biology and Bioinformatics)						
SEMESTER VI						
Course Code	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
PCC-AI 601	Data Warehouse and Mining	3	0	2	5	4
PCC-AI 602	Deep Learning	3	0	4	7	5
PCC-AI 603	Computer Networks and Security	3	0	4	7	5
PCC-AI 604	Information Retrieval	2	0	0	2	2
PEC-AI 601	Elective II	3	0	2	5	4
PCC-AI 606	Seminar and Technical Communication	0	1	0	0	0
Total		**14**	**1**	**12**	**26**	**20**
Elective II (Software architecture, Quantum AI , Robotics and Automation, Clinical Science and Data management)						
SEMESTER VII						
Course Code	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
PCC-AI 701	Big Data and Analytics	3	0	4	7	5
PCC-AI 702	Data Modeling & Visualization	3	0	4	7	5
PEC-AI 701	Elective III	3	0	4	7	5
PEC-AI 702	Elective-IV	3	0	0	3	3
PCC-AI 705	Project- I	0	0	4	4	2
Total		**12**	**0**	**16**	**28**	**20**
Elective III (Cyber Security, Software Testing and Quality Assurance, Bio-inspired Algorithms, Biomechatronics) **Elective IV (**Principles of Compiler Design, Mobile Computing, AI in Healthcare, Epidemiology and Public Health)						
SEMESTER VIII						
Course Code	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
PCC-AI 801	Distributed Systems	3	0	2	5	4
PEC-AI 801	Elective V	3	0	4	7	5
PEC-AI 802	Elective VI	3	0	4	7	5
PCCAI 804	Project : II	-	-	12	12	6
Total		**9**	**0**	**18**	**27**	**20**

Elective V (Cloud computing, High Performance computing, Cyber physical systems, AI in Agriculture) **Elective VI** (Soft Computing, Blockchain Technology, Web Mining and Text Mining, Chemoinformatics and Drug Designing)
TOTAL CREDITS-170

Course Code:

BSC	Basic Science Course
ESC	Engineering Science Course
PCC	Professional Core Course
PEC	Professional Elective Course
HSMC	Humanities & Social Sciences including Management

SEMESTER I						
Course Code	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
BSC 101	Physics	3	0	2	5	4
BSC 102	Chemistry	3	0	2	5	4
ESC 101	Basic Electronics and Electrical Engineering	3	0	2	5	4
ESC 102	Fundamentals of programming Languages	3	0	4	7	5
HSMC 101	Communication Skills	1	2	0	3	3
BSC 103	Mathematics	3	0	0	3	3
Total		**16**	**2**	**10**	**28**	**23**

TITLE OF THE COURSE: PHYSICS
COURSE CODE: BSC 101 **L T P Hr C**
MARKS: 150 **3 0 2 5 4**

COURSE OBJECTIVE:
The objective of this course is:
1.To create general understanding regarding basic physical principles involved in living systems.
2.To familiarize the student with basic concepts in classical physics such as classical optics used in microscopes and telescopes, mechanics, fluid properties, oscillations and waves, electricity and magnetism
3.To introduce them to concepts in modern physics such as production of X-rays, X-ray crystallography, quantum mechanics etc.

COURSE OUTCOME:
Upon successful completion of this course, students will be able to:
1.Understand the basic concepts in physics
2.Understand the principles of – classical mechanics, optics, fluid properies, oscillations and waves
3. Demonstrate the concepts in modern physics such as- X-rays, crystallography and quantum Mechanics

PREREQUISITES
This is an introductory course. School level knowledge of physics is sufficient. There are no prerequisites.

COURSE DETAILS

Sr. No.	Topics	Detail Syllabus	No of lectures
1.	Newtonian Mechanics	Forces in Nature; Newton's laws and its completeness in describing particle motion; Potential energy function; F = - Grad V, Conservative and non-conservative forces, Central forces	4
2.	Elasticity	Stress and Strain, Hook's law, Stress-strain curve, Young's modulus, Determination of Young's modulus	3
3.	Properties of Fluid: Surface Tension & Viscosity	Surface Tension, Surface Energy, Angle of Contact, Capillarity action, Determination of Surface tension by capillary rise method Viscosity, Coefficient of viscosity, Streamline and turbulent flow, Reynold's number, Stoke's law, Terminal velocity, Determination of 'η' by falling sphere method.	6

4.	Oscillations and Waves	Simple harmonic motion, Transverse wave on a string, The wave equation on a string, Reflection and transmission of waves at a boundary Sound waves : Audible, Ultrasonic and Infrasonic waves, Beats, Doppler effect, Applications of Ultrasonic waves.	6
5.	Optics: Interference Diffraction & Polarization	Introduction to optics, Principles of superposition, Constructive & Destructive Interference, Types of Interference, Newton's rings. Diffraction- Types of diffraction, Diffraction grating, Rayleigh's criterion, Resolving power of Microscope and Telescope. Polarization of light waves, Polaroid, Optical activity.	8
6.	Electricity, Magnetism, Electromagnetic Induction	Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential; Heating effect of electric current, Joule's law Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem Faraday's law in terms of EMF produced by changing magnetic flux; Transformers, Types of Transformers.	7
7.	Modern Physics: X-rays, Crystallography, Introduction to Quantum Mechanics	Introduction to X-Rays : Introduction, Production of X-rays, X-Ray diffraction and its Applications. Plank's Quantum Theory, Properties of Photon, Photoelectric effect, Wave particle duality of radiation, De Broglie's hypothesis, Heisenberg's Uncertainty principle. The Schrodinger equation for wavefunction, Statistical interpretation, Probability, Momentum	8
8	Lasers	Properties of Lasers, Production mechanism, Ruby Laser, Helium Neon Laser, applications of Lasers	3
Total Lectures			**45**

METHODOLOGY

The course will be covered through lectures and supported by practicals.

EVALUATION SCHEME (THEORY)

Examination	Duration	Marks
I Internal	60 minutes	20
II Internal	45 minutes	15
Attendance		5
End Semester	2 hours 30 minutes	60
Total		**100**

BOOKS RECOMMENDED

1. Physics by D. Haliday and R. Resnik 5 th edition, Wiley Eastern Pub, 2007.
2. Perspectives of Modern Physics by A. Beiser, 6 th edition, Mc Graw Hill, 2003.
3. Fundamensls of optics by F. A. Jenkins and H. E. White, 4 th edition, Mc Graw Hill, 1976.
4. Optics by A. Ghatak, 3 rd edition, Tata Mc Graw Hill, 2006.
5. David Griffiths, Introduction to Electrodynamics, 3rd edition, 1999, Prentice Hall
6. David Griffiths, Introduction to Quantum Mechanics, 2nd edition, 2005, Prentice Hall

PRACTICALS

1. Diffraction Grating: Use of diffraction grafting for determination of wavelength of
2. spectral lining.

3. Resolving Power: To determine the resolving power of Microscope or telescope

4. Ultrasonic Interferometer: Determination of velocity of ultrasonic waves by ultrasonic

5. Surface Tension: Determination of the surface tension of a given solution.

6. Viscosity: Determination the coefficient of viscosity by Stoke’s method and its
7. practical application.

8. Joule’s Law: Determine of Joule’s constant.

9. Determination of wavelength of monochromatic light by Newton’s rings experiments.

PRACTICAL EVALUATION SCHEME

Examination Marks

Practical Internal (Continuous) assessment: 20
End semester examination: 30
Total: 50

TITLE OF THE COURSE: CHEMISTRY
COURSE CODE: BSC 102 **L T P Hr C**
MARKS: 150 **3 0 2 5 4**

COURSE OBJECTIVE:

1. The objective of this course is to familiarize the student with the different concepts of physical and organic chemistry.
2. The students will learn the structures of organic molecules as: alkanes, alkenes, alkynes, aliphatic and aromatic molecules and the stereochemistry behind the molecules with its importance in day today life
3. They would learn the Basic concepts and principles with respect to physical chemistry, the bioenergetics of different reactions and the principles and applications of radioactivity.

COURSE OUTCOME:

At the end of course, students will have the ability to:

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.

The course will enable the student to:

1. Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Rationalise bulk properties and processes using thermodynamic considerations.
3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
4. Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
5. List major chemical reactions that are used in the synthesis of molecules.

PREREQUISITES

This is the introductory course and there are no prerequisites**.**

COURSE DESCRIPTION

Sr no	Topics	Description	Hrs.
1.	Atomic and molecular structure	Schrodinger equation. Particle in a box solutions 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 multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity.	8
2.	Spectroscopic techniques and applications	Principles of spectroscopy Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic	7

		molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging,.	
3.	Intermolecular forces and potential energy surfaces	Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H_3, H_2F and HCN and trajectories on these surfaces.	4
4.	Thermodynamics	Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Use of free energy considerations in metallurgy through Ellingham diagrams.	6
5.	Periodic properties	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,	5
6.	Stereochemistry	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	5
7.	Organic reactions	Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.	3
		Total Lectures	**38**

METHODOLOGY

The course will be covered through lectures, demonstration and practicals.

EVALUATION SCHEME (THEORY)

Examination	**Duration**	**Marks**
I Internal	60 minutes	20
II Internal	45 minutes	15
Attendance		5
End Semester Exam	2 hours 30 minutes	60
Total		**100**

BOOKS RECOMMENDED:

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R. 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 http://bcs.whfreeman.com/vollhardtschore5e/default.asp

PRACTICAL IN CHEMISTRY (2 Hrs. PER WEEK) MARKS 50

Sr. No.	Name of the experiment
1	Determination of surface tension and viscosity
2	Spectroscopy
3	Measurement of Optical activity.
4	Determination of chloride content of water OR Chemical analysis of a salt
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	Determination of the partition coefficient of a substance between two immiscible liquids
10	Adsorption of acetic acid by charcoal

PRACTICAL EVALUATION SCHEME

Examination	**Marks**
Practical Internal (Continuous) assessment:	20
End semester examination:	30
Total:	**50**

THE COURSE: BASIC ELECTRONICS AND ELECTRICAL ENGINEERING

COURSE CODE: ESC 101	**L**	**T**	**P**	**Hr**	**C**
MARKS: 150	**3**	**0**	**2**	**5**	**4**

1. COURSE OBJECTIVE:

1. To understand the fundamentals of electronic circuit constructions.
2. To learn the fundamental laws, theorems of electrical circuits and also to analyze them
3. To study the basic principles of electrical machines and their performance
4. To study the different energy sources, protective devices and their field applications
5. To understand the principles and operation of measuring instruments and transducers

COURSE OUTCOME:

Upon completion of the course, the students will be able to:

1. Discuss the essentials of electric circuits and analysis.
2. Discuss the basic operation of electric machines and transformers
3. Introduction of renewable sources and common domestic loads.
4. Introduction to measurement and metering for electric circuits

PREREQUISITES: Basic knowledge of Electronics Circuits.

COURSE DESCRIPTION

Sr. No	Topic	Description	Hrs
1	Introduction to Electronics	Evolution of Electronics, Impact of Electronics in industry and in society. Introduction to active and passive components, P-type Semiconductor, N-type Semiconductor. Current in semiconductors(Diffusion and Drift Current) **P-N Junction Diode:** P-N Junction diode construction and its working in forward and reverse bias condition, V-I characteristics of P-N junction Diode, Diode as a switch, Half Wave Rectifier, Full wave and Bridge Rectifier. **Special purpose diodes:** Zener diode, Light Emitting Diode (LED) and photo diode along with V-I characteristics and their applications.	08
2	Transistor and OPAMP	Bipolar Junction Transistor : Construction, type, Operation, V-I Characteristics, region of operation, BJT as switch and CE amplifier **Metal Oxide Semiconductor Field Effect Transistors (MOSFET):** Construction, Types, Operation, V-I characteristics, Regions of operation, MOSFET as switch & amplifier. **Operational amplifier:** Functional block diagram of operational amplifier, ideal operational amplifier, Op-amp as Inverting and Non inverting amplif	08

3	Number System and Logic Gates	Number System:- Binary, BCD, Octal, Decimal, Hexadeci De-Morgan's theorem. Basic Gates:- AND, OR, NOT, Universal Gate- XOR, XN Flip Flop's SR, JK, T and D Introduction to Microprocessor and Microcontroller (Only block diagram and explanation)	08
4	Electrical Circuits Analysis	Ohms Law, Kirchhoff's Law-Instantaneous power- series and parallel circuit analysis with resistive, capacitive and inductive network - nodal analysis, mesh analysis- network theorems - Thevenins theorem, Norton theorem, maximum power transfer theorem and superposition theorem, three phase supply-Instantaneous, Reactive and apparent power-star delta conversion.	08
5	Electrical Machines	DC and AC ROTATING MACHINES:Types, Construction, principle, Emf and torque equation, application Speed Control- Basics of Stepper Motor – Brushless DC motors- Transformers- Introduction- types and construction, working principle of Ideal transformer- Emf equation- All day efficiency calculation.	08
Total Number of lectures			**40**

METHODOLOGY:

The course will be covered through lectures, demonstration and practicals.

EVALUATION SCHEME (THEORY)

Examination	**Duration**	**Marks**
I Internal	60 minutes	20
II Internal	45 minutes	15
Attendance		5
End Semester Exam	2 hours 30 minutes	60
Total		**100**

PRACTICALS ELECTRONICS AND ELECTRICAL ENGINEERING (2 Hrs. PER WEEK) MARKS 50

Sr. No.	Name of the experiment
1	Study of different electronic components. a. Resistors (Carbon Film, Metal Film, Wire wound, Variable) b. Capacitors (Electrolytic,Mica,Ceramic,variable) c. Inductors, transformers d. Relay, switches, and connectors
2	Study of basic electronics measuring instruments. a. To study different controls of DMM and measurements of parameters like AC & DC voltage, current b. To study controls of CRO, measurements of frequency, phase, AC and DC voltages c. To study various controls of function generator
3	Study of DC regulated power supply
4	Study of semiconductor devices, P-N junction Diode. Plot VI characteristics of P-N junction diode.
5	Study of single stage BJT common emitter amplifier circuit
6	Study of operational amplifier a. Op-amp IC741 b. Op-amp as inverting and non-inverting amplifier.
7	Study of digital logic circuits. a. Truth table verification of AND,OR,NOT,NAND,NOR b. Implement half adder circuit with logic gate ICs.
8	Verification of super position, Thevenin and Norton's theorem
9	Study of Series RLC circuit(Power measurement, Phasor diagram)
10	Study of single phase and three phase transformers

PRACTICAL EVALUATION SCHEME

Examination	**Marks**
Practical Internal (Continuous) assessment:	20
End semester examination:	30
Total:	**50**

THE COURSE: FUNDAMENTALS OF PROGRAMMING LANGUAGES

COURSE CODE: ESC 102	**L**	**T**	**P**	**Hr**	**C**
MARKS: 100	**3**	**0**	**4**	**7**	**5**

COURSE OBJECTIVE:

The objective of the course is

1. To familiarize the students with computers and programming concepts.
2. Programming module is intended to familiarize them with computer logic and solution of real world problems using C and C++ programming languages.

COURSE OUTCOME:

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

1. Understand the organization of computers and the basic principles of Computing
2. Deal with the basics problems that arise while using computers
3. Demonstrate the basics of C Programing and their applications
4. Demonstrate the basics of object oriented programming(C++)
5. Apply programming for solving biological problems by logic based approach

PREREQUISITES

The course requires the basic knowledge about the Computer system.

COURSE DESCRIPTION

Sr No	Topic	Description	Hrs
1	Organization of Computer	History of computer and various parts and functions performed by them	1
2	Hardware & Software	Various hardware of computer, Application software and system software	1
3	Operating System	Various functions of operating system, MS-DOS, LINUX commands	1
4	Basics of programming	Machine language, High level language, Compilation process	1
5	Introduction to C	An overview of C, C expressions, Operators, Data types	1
6	The Decision controls in C	The ‘if’ statements within if, Multiple statements within if , The ‘if-else’ statement, The ! operator Hierarchy of Logical Operators, The Conditional Operators	2
7	Loop control structures	Loops, The ‘While’ Loop, The ‘for’ loop , Nesting of Loops , Multiple Initializations in the for loop The ‘Odd’ Loop, The ‘break’ statement, The ‘continue’ statement, The ‘do-while’ statement	5
8	Case control structures	Decisions using switch	1

		The goto statement	
9	Functions	What is a function? Why Use Functions Passing values between functions, Scope of functions	3
10	Array & strings	Single-dimension Arrays, Generating a Pointer to an array, Passing single dimension arrays to functions, Strings, Two-dimensional Arrays, Arrays of Strings, Multidimensional Arrays, Array Initialization, Variable-Length arrays	3
11	Puppeting on strings	What are Strings? ,More about Strings Pointers and Strings ,Standard Library String functions ,Two-Dimensional Array of Characters, Array of pointers to Strings,	4
12	Pointers	Pointer variables ,The pointer Operators ,Pointer Expressions ,Pointers and Arrays ,Initializing Pointers ,Pointers to Functions, C's Dynamic Allocation Arrays	2
13	Structures, Union, Enumeration & type definition	Structures, Arrays of structures, Passing structures to functions, Structure Pointers,Unions, Bit-Fields Enumerations ,Typedef	2
14	File Handling in C	Opening and closing a stream, open modes, Reading and writing to/from a stream, Predefined streams: stdin, stdout and stderr, Stream manipulation: fgetc(), fputc(), fgets() and fputs() functions	3
15	Introduction To Object-Oriented Programming(C++)	Introduction – Procedure vs. object oriented programming – Data types – control structures – Arrays and Strings – User defined types – Functions and Pointers – Case study	07
16	Object Oriented Programming Concepts(C++)	Classes and Objects – Operator Overloading – Inheritance – Polymorphism and Virtual Functions – Case study	08
Total Number of Lectures			**45**

METHODOLOGY:

The course will be covered through lectures, demonstration and practicals**.**

EVALUATION SCHEME (THEORY)

Examination **Duration** **Marks**

Internal	45 minutes	15
Attendance		5
End Semester Exam	1 hours 15 minutes	30
Total		**50**

RECOMMENDED BOOKS:

1. The complete reference of C by H. Schildt, 4th edition, Mc Graw Hill, 2003.
2. Let us C By Y. Kanitkar, 15th edition, BPB Publication, 2017.
3. Data Structure Through C by Y. Kanitakar, 2nd edition, BPB Publication, 2003.
4. Understanding Pointers in C by Y. Kanitakar, 4th edition, BPB Publication, 2007.
5. Data Structure using C and C++ by A. M. Taneumbam, 2nd edition, PHI, 2017.
6. Computers Fundamentals by P K Sinha and P. Sinha, 6th edition, BPB publications, 2004.
7. HM Deitel and PJ Deitel "C++ How to Program", Seventh Edition, 2010, Prentice Hall.
8. E Balagurusamy, "Object oriented Programming with C++", Third edition, 2006, Tata McGraw Hill.
9. Robert Lafore, "Object Oriented Programming in C++", 2002, Pearson education.

PRACTICAL IN COMPUTERS & C PROGRAMMING
(4 Hrs. PER WEEK) MARKS: 100

Sr. No.	Practical Name
1	Introduction to Microsoft Word and Microsoft Power point
2	Introduction to Microsoft Excel and MS-DOS commands
3	Programs on basic programming in C
4	Programs using Decision Controls in C
5	Programs using while, do-while and for Loop
6	Programs using Case Control Structure, odd loop
7	Programs illustrating use of function
8	Programs illustrating use of arrays
9	Programs using Pointers and Structure
10	Programs illustrating use of String
11	Programs for file handling in C
12	Programs in basic programming in C++
13	Basic programs for object oriented concepts using C++
14	Programs for Biological application

- Finding complement of DNA
- ORF finding
- Inverted Repeats
- Motif finding
- Translation
- Transcription

TITLE OF THE COURSE: COMMUNICATION SKILLS

COURSE CODE:HSMC-101	**L**	**T**	**P**	**Hr**	**C**
MARKS: 100	**1**	**2**	**0**	**3**	**3**

COURSE OBJECTIVE:

1. Understand the role of communication in personal & professional success.
2. Develop awareness of appropriate communication strategies.
3. Prepare and present messages with a specific intent.
4. Analyze a variety of communication acts.
5. Ethically use, document and integrate source

COURSE OUTCOME:

The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

COURSE DESCRIPTION :

Sr. no.	Topics	Description	Hrs.
1	Vocabulary Building	• The concept of Word Formation • Root words from foreign languages and their use in English • Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. • Synonyms, antonyms, and standard abbreviations.	
2	Basic Writing Skills	• Sentence Structures • Use of phrases and clauses in sentences • Importance of proper punctuation • Creating coherence • Organizing principles of paragraphs in documents • Techniques for writing precisely	
3	Identifying Common Errors in Writing	• Subject-verb agreement • Noun-pronoun agreement • Misplaced modifiers • Articles • Prepositions • Redundancies • Clichés	
4	Nature and Style of sensible Writing	• Describing • Defining • Classifying • Providing examples or evidence • Writing introduction and conclusion	
5	Writing Practices	• Comprehension • Précis Writing • Essay Writing	
6	Oral Communication	(This unit involves interactive practice sessions in Language Lab) • Listening Comprehension • Pronunciation, Intonation, Stress and Rhythm • Common Everyday Situations: Conversations and	

		Dialogues • Communication at Workplace • Interviews • Formal Presentations	
Total Number of Lectures			

METHODOLOGY

EVALUATION SCHEME (THEORY)

Examination		**Duration**	**Marks**
I	Internal	60 minutes	20
	Internal	45 minutes	15
	Attendance		5
End Semester Exam		2 hours 30 minutes	60
Total			**100**

BOOKS RECOMMENDED:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

TITLE OF THE COURSE: Maths I - MATHEMATICS

COURSE CODE: BSC-103	**L**	**T**	**P**	**Hr**	**C**
MARKS: 100	**3**	**0**	**0**	**3**	**3**

COURSE OBJECTIVE:

The objective of the course is to familiarize the student with basic concepts in mathematics.

COURSE OUTCOME:

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

The students will learn:

1. To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.
2. The fallouts of Rolle's Theorem that are fundamental to application of analysis to Engineering problems.
3. The tool of power series and Fourier series for learning advanced Engineering Mathematics.
4. To deal with functions of several variables that are essential in most branches of engineering.
5. The essential tool of matrices and linear algebra in a comprehensive manner.

PREREQUISITES

Students should be familiar with school level mathematics to take up this course. In case they do not have mathematics at the 10+2 level they should have cleared the core mathematics in the first semester.

COURSE DESCRIPTION

Sr.	**Topics**	**Description**	**Lectures**
1	Calculus	Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas.	06
2	Calculus	Expansion of Functions: Taylor's series and Maclaurin's Series ; Differential Calculus: Indeterminate Forms, L'Hospital's Rule, Evaluation of Limits	06
3	Sequences and series	Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Range of convergence.	10
4	Multivariable Calculus	Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit Functions, Total Derivatives, Change of Independent Variables; Maxima and Minima of functions of two variables, Lagrange's method of undetermined multiplier	08

5	Matrices	Rank, Normal Form, System of Linear equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values,Eigen Vectors, Cayley-Hamilton Theorem.	10
Total Number of Lectures			**40**

METHODOLOGY

EVALUATION SCHEME (THEORY)

Examination	**Duration**	**Marks**
I Internal	60 minutes	20
II Internal	45 minutes	15
Attendance		05
End Semester Exam	2 hours 30 minutes	60
Total		**100**

BOOKS RECOMMENDED:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
8. Dr, M,Y Gokhale, Dr. N.S. Mujumdar Engineering Mathematics-I, Nirali Prakashan, 8th Edition

SEMESTER II						
Course Code	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
ESC 201	Problem Solving by Programming	3	0	4	7	5
BSC 201	Computational Statistics	3	0	0	3	3
BSC 202	General Biology	2	1	0	3	3
ESC 202	Engineering Graphics and Design	1	0	4	5	3
ESC 203	Engineering Mechanics	3	0	0	3	3
ESC 204	Project Based Learning –I	0	0	4	4	2
ESC 205	Workshop and manufacturing practices-laboratory	0	0	4	4	2
Total		**12**	**1**	**16**	**29**	**21**

TITLE OF THE COURSE: PROBLEM SOLVING BY PROGRAMMING

COURSE CODE: ESC 201	**L**	**T**	**P**	**Hr**	**C**
MARKS: 200	**3**	**0**	**4**	**7**	**5**

COURSE OBJECTIVE:

Prime objective is to give students a basic introduction to programming and problem solving with computer language Python. And to introduce students not merely to the coding of computer programs, but to computational thinking, the methodology of computer programming, and the principles of good program design including modularity and encapsulation.

1. To understand problem solving, problem solving aspects, programming and to know aboutvarious program design tools.
2. To learn problem solving with computers
3. To learn basics, features and future of Python programming.
4. To acquaint with data types, input output statements, decision making, looping and functions in Python
5. To learn features of Object Oriented Programming using Python.

COURSE OUTCOME:

On completion of the course, learner will be able to–

1. Inculcate and apply various skills in problem solving.
2. Choose most appropriate programming constructs and features to solve the problems in diversified domains.
3. Exhibit the programming skills for the problems those require the writing of well-documented programs including use of the logical constructs of language, Python.
4. Demonstrate significant experience with the Python program development environment.

PREREQUISITES:

Students are expected to have a good understanding of basic computer principles.

COURSE DESCRIPTION

Sr. No.	**Topics**	**Detail syllabus**	**No. of Lectures**
1	Problem Solving, Programming and Python Programming General Problem Solving Concepts	Problem solving in everyday life, types of problems, problem solving with computers, difficulties with problem solving, problem solving aspects, top down design. Problem Solving Strategies, **Program Design Tools:** Algorithms, Flowcharts and Pseudo-codes, implementation of algorithms. **Basics of Python Programming:** Features of Python, History and Future of Python, Writing and executing Python program, Literal constants, variables and identifiers, Data Types, Input operation, Comments, Reserved words, Indentation, Operators and expressions, Expressions in Python.	07

2	Decision Control Statements Decision Control Statements	Decision control statements, **Selection/conditional** branching Statements: if, if-else, nested if, if-elif-else statements. **Basic loop** Structures/Iterative statements: while loop, for loop, selecting appropriate loop. Nested loops, The *break*, *continue*, *pass*, *else* statement used with loops. Other data types- Tuples, Lists and Dictionary.	08
3	Functions and Modules	Need for functions, **Function**: definition, call, variable scope and lifetime, the return statement. Defining functions, Lambda or anonymous function, documentation string, good programming practices. Introduction to modules, Introduction to packages in Python, Introduction to standard library modules.	08
4	Strings	**Strings and Operations-** concatenation, appending, multiplication and slicing. Strings are immutable, strings formatting operator, built in string methods and functions. Slice operation, ord() and chr() functions, in and not in operators, comparing strings, Iterating strings, the string module	07
5	Object Oriented Programming	Programming Paradigms-monolithic, procedural, structured and object oriented, **Features of Object oriented programming-** classes, objects, methods and message passing, inheritance, polymorphism, containership, reusability, delegation, data abstraction and encapsulation. **Classes and Objects**: classes and objects, class method and self object, class variables and object variables, public and private members, class methods.	08
6	File Handling and Dictionaries	**Files:** Introduction, File path, Types of files, Opening and Closing files, Reading and Writing files. Dictionary method. **Dictionaries-** creating, assessing, adding and updating values. **Case Study:** Study design, features, and use of any recent, popular and efficient system developed using Python. (This topic is to be excluded for theory examination).	08
Total Lectures			45

METHODOLOGY

EVALUATION SCHEME (THEORY)

Examination	Duration	Marks
I Internal	60 minutes	20
II Internal	45 minutes	15
Attendance		05
End Semester Exam	2 hours 30 minutes	60
Total		**100**

BOOKS RECOMMENDED:

1. Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford
2. University Press, ISBN 13: 978-0-19-948017-6
3. R. Nageswara Rao, "Core Python Programming", Dreamtech Press; Second edition ISBN-10: 938605230X, ISBN-13: 978-9386052308 ASIN: B07BFSR3LL

Reference Books:

1. R. G. Dromey, "How to Solve it by Computer", Pearson Education India; 1st edition, ISBN-8131705625, ISBN-13: 978-8131705629 Maureen Spankle, "Problem Solving and Programming Concepts",
2. Romano Fabrizio, "Learning Python", Packt Publishing Limited, ISBN: 9781783551712, 1783551712
3. Paul Barry, "Head First Python- A Brain Friendly Guide", SPD O'Reilly, 2nd Edition, ISBN:978-93-5213-482-34
4. Martin C. Brown, "Python: The Complete Reference", McGraw Hill Education, ISBN-10:
5. 9789387572942, ISBN-13: 978-9387572942, ASIN: 9387572943
6. Jeeva Jose, P. Sojan Lal, "Introduction to Computing & Problem Solving with Python",
7. Khanna Computer Book Store; First edition, ISBN-10: 9789382609810, ISBN-13: 978-938260981

Suggested Reference Books

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

PRACTICALS PROBLEM SOLVING BY PROGRAMMING (2 Hrs. PER WEEK) MARKS 50

Sr.	Problem Statement
1.	To calculate salary of an employee given his basic pay (take as input from user).Calculate gross salary of employee. Let HRA be 10 % of basic pay and TA be 5% of basic pay. Let employee pay professional tax as 2% of total salary. Calculate net salarypayable after deductions.
2.	To accept an object mass in kilograms and velocity in meters per second and display its momentum. Momentum is calculated as $e=mc^2$ where m is the mass of the object and c isits velocity.
3.	To accept N numbers from user. Compute and display maximum in list, minimum in list,sum and average of numbers.

4. To accept student's five courses marks and compute his/her result. Student is passing if he/she scores marks equal to and above 40 in each course. If student scores aggregate greater than 75%, then the grade is distinction. If aggregate is 60>= and <75 then the grade if first division. If aggregate is 50>= and <60, then the grade is second division. If aggregate is 40>= and <50, then the grade is third division.

5. To check whether input number is Armstrong number or not. An Armstrong number is aninteger with three digits such that the sum of the cubes of its digits is equal to the number itself. Ex. 371.

6. To simulate simple calculator that performs basic tasks such as addition, subtraction, multiplication and division with special operations like computing x^y and x!.

7. To accept the number and Compute a) square root of number, b) Square of number, c) Cube of number d) check for prime, d) factorial of number e) prime factors

8. To accept two numbers from user and compute smallest divisor and Greatest Common Divisor of these two numbers.

9. To accept a number from user and print digits of number in a reverse order.

10. To input binary number from user and convert it into decimal number.

11. To generate pseudo random numbers.

12. To accept list of N integers and partition list into two sub lists even and odd numbers.

13. To accept the number of terms a finds the sum of sine series.

14. To accept from user the number of Fibonacci numbers to be generated and print the Fibonacci series.

15. Write a python program that accepts a string from user and perform following string operations- i. Calculate length of string ii. String reversal iii. Equality check of two strings iii. Check palindrome ii. Check substring

16. To copy contents of one file to other. While copying a) all full stops are to be replaced with commas b) lower case are to be replaced with upper case c) upper case are to be replaced with lower case.

17. To count total characters in file, total words in file, total lines in file and frequency of given word in file.

18. Create class EMPLOYEE for storing details (Name, Designation, gender, Date of Joining and Salary). Define function members to compute a)total number of employees in an organization b) count of male and female employee c) Employee with salary more than 10,000 d)

Employee with designation “Asst Manager”

19. Create class STORE to keep track of Products (Product Code, Name and price). Display menu of all products to user. Generate bill as per order.

Mini Project

20. Program that simulates rolling dice. When the program runs, it will randomly choose a number between 1 and 6 (Or other integer you prefer). Print that number. Request user to roll again. Set the min and max number that dice can show. For the average die, that

means a minimum of 1 and a maximum of 6.

21. Use raspberry pi/or similar kit and python for-

- Room Temperature Monitoring System
- Motion Detection System
- Soil Moisture Sensor
- Home Automation System
- A robot
- Smart mirror or a smart clock.

Smile Detection using Raspberry Pi Camera

22. Guess Number: Randomly generate a number unknown to the user. The user needs to guess what that number is. If the user’s guess is wrong, the program should return some sort of indication as to how wrong (e.g. the number is too high or too low). If the user guesses correctly, a positive indication should appear. Write functions to check if the user

- input is an actual number, to see the difference between the inputted number and the randomly generated numbers, and to then compare the numbers.

PRACTICAL EVALUATION SCHEME

Examination	**Marks**
Practical Internal (Continuous) assessment:	40
End semester examination:	60
Total:	**100**

TITLE OF THE COURSE: COMPUTATIONAL STATISTICS

COURSE CODE: BSC 201	**L**	**T**	**P**	**Hr**	**C**
MARKS: 100	**3**	**0**	**0**	**3**	**3**

COURSE OBJECTIVE:

The objective of this course is to familiarize the students with statistical techniques. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.

COURSE OUTCOME:

The students will learn:

1. The ideas of probability and random variables and various discrete and continuous probability distributions and their properties.
2. The basic ideas of statistics including measures of central tendency, correlation and regression.
3. The statistical methods of studying data samples.
4. Communicate the results of statistical analyses effectively.
5.

COURSE DESCRIPTION

Sr. No.	**Topics**	**Description**	**Lectures**
1	Basic Probability	Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.	12
2	Continuous Probability Distributions	Continuous random varibales and their properties, distribution functions and densities, normal, exponential and gamma densities.	04
3	Bivariate Distributions	Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.	04
4	Basic Statistics	Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.	08
5	Applied Statistics	Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.	08

6	Small samples	Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.	04
Total Number of lectures			40

METHODOLOGY

The course will be covered through lectures.

EVALUATION SCHEME (THEORY)

Examination	**Duration**	**Marks**
I Internal	60 minutes	20
II Internal	45 minutes	15
Attendance		05
End Semester Exam	2 hours 30 minutes	60
Total		**100**

BOOKS RECOMMENDED:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall.
3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint,
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

TITLE OF THE COURSE: GENERAL BIOLOGY

COURSE CODE: BSC 202	**L**	**T**	**P**	**Hr**	**C**
MARKS: 100	**2**	**1**	**0**	**3**	**3**

OBJECTIVE OF THE COURSE:

The objective of this course is to familiarize the students with basic concepts in biology.

COURSE OUTCOME:

After studying the course, the student will be able to:

- Describe how biological observations of 18th Century that lead to major discoveries.
- Convey that classification per se is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical and ecological
- Highlight the concepts of recessiveness and dominance during the passage of genetic material from parent to offspring
- Convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine
- Classify enzymes and distinguish between different mechanisms of enzyme action.
- Identify DNA as a genetic material in the molecular basis of information transfer.
- Analyse biological processes at the reductionistic level
- Identify and classify microorganisms

PREREQUISITES:

Basic school level knowledge in Biology.

COURSE DESCRIPTION

Sr. No.	**Topics**	**Description**	**Lectures**
1	Introduction	Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.	2
2	Classification	Hierarchy of life forms at phenomenological level. A	3

		common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilization -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus	
3	Genetics	Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.	4
4	Biomolec ules	Discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.	4
5	Enzymes	How to monitor enzyme catalyzed reactions. How does an enzyme catalyzereactions. Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.	4
6	Informati on Transfer	DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination. Define gene in terms of complementation and recombination.	4

7	Macromolecular analysis	Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.	5
8	Metaboli sm	Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of Keq and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO2 + H2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO2 and H2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge Module 9. (3 hours)- Microbiology Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.	4
9	Microbiology	Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.	3

METHODOLOGY

The course will be covered through lectures and tutorials.

EVALUATION SCHEME (THEORY):

Examination	**Duration**	**Marks**
I Internal	60 minutes	20
II Internal	45 minutes	15
Attendance		05
End Semester Exam	2 hours 30 minutes	60
Total		**100**

BOOKS RECOMMENDED:

1) Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd

2) Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons

3) Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company

4) Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher

5) Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

TITLE OF THE COURSE: ENGINEERING GRAPHICS & DESIGNING

COURSE CODE: – ESC 202	**L**	**T**	**P**	**Hr**	**C**
MARKS:	**1**	**0**	**4**	**5**	**3**

COURSE OBJECTIVE:

Objective of the course are: To Learn basic engineering drawing formats. Learn to take data and transform it into graphics drawings.
Learn to sketch and take field dimensions.

COURSE OUTCOME:

On completion of the course, learner will be able to

1. Draw the fundamental engineering objects using basic rules and be able to construct the simple geometries.
2. Construct the various engineering curves using the drawing instruments.
3. Apply the concept of orthographic projection of an object to draw several 2D views and its sectional views for visualizing the physical state of the object.
4. Apply the visualization skill to draw a simple isometric projection from given orthographic views precisely using drawing equipment.
5. Draw the development of lateral surfaces for cut sections of geometrical solids.

PREREQUISITES

Since the course is very basic in nature, knowledge of mathematics is required.

COURSE DESCRIPTION

Sr. No.	**Topics**	**Detail syllabus**	**No. of Lectures**
1	Fundamentals of Engineering Drawing	Need of Engineering Drawing and design, Sheet layout, Line types and dimensioning and simple geometrical constructions	01
2	Introduction to 2D and 3D computer aided drafting packages	Evolution of CAD, Importance of CAD, Basic Commands - Edit, View, Insert, Modify, Dimensioning Commands, setting and tools etc. and its applications to construct the 2D and 3D drawings	02
3	Engineering Curves	Introduction to conic sections and its significance, various methods to construct the conic sections. Helix for cone and cylinder , rolling curves (Involutes , Cycloid) and Spiral	05
4	Orthographic Projection	Principle of projections, Introduction to First and Third angle Projection methods, Orthographic projection of point, line, plane, solid and machine elements/parts	04
5	Isometric Projection	Introduction to isometric projection, oblique projection and perspective projection. Draw the isometric projection from the given orthographic views	02

6	Development of Lateral Surfaces	Introduction to development of lateral surfaces and its industrial applications. Draw the development of lateral surfaces for cut section of cone, pyramid, prism etc	01
Total Number of Lectures			**15**

METHODOLOGY

The course would be taught through lectures, demonstrations and practicals.

EVALUATION SCHEME (THEORY)

Examination	**Duration**	**Marks**
Internal	45 minutes	15
Attendance		5
End Semester Exam	1 hours 15 minutes	30
Total		**50**

BOOKS RECOMMENDED:

Text Books

1. Bhatt, N. D. and Panchal, V. M., (2016), "Engineering Drawing", Charotar Publication, Anand, India

2. K. Venugopal, K, (2015), "Engineering and Graphics", New Age International, New Delhi

3. Jolhe, D. A., (2015), "Engineering Drawing with introduction to AutoCAD", Tata McGraw Hill, New Delhi

4. Rathnam, K., (2018), " A First Course in Engineering Drawing", Springer Nature Singapore Pte. Ltd., Singapore

Reference Books

1. Madsen, D. P. and Madsen, D. A., (2016), "Engineering Drawing and design", Delmar Publishers Inc., USA

2. Bhatt, N. D., (2018), "Machine Drawing", Chartor Publishing house, Anand, India

3. Dhawan, R. K., (2000), "A Textbook Of Engineering Drawing", S. Chand, New Delhi

4. Luzadder, W. J. and Duff, J. M., (1992), "The Fundamentals of Engineering Drawing: With an Introduction to Interactive Computer Graphics for Design and Production", Peachpit Press, USA

5. Giesecke, F. E., Mitchell, A., Spencer, H. C., Hill, I. L., Loving, R. O., Dygon, J. T., (1990), "Principles of engineering graphics", McMillan Publishing, USA

6. Jensen, C., Helsel, J. D., Short, D. R., (2008), "Engineering Drawing and Design", McGraw-Hill International, Singapore Guidelines for L

PRACTICAL IN ENGINEERING GRAPHICS (4 Hrs. PER WEEK) MARKS 50

1. Draw minimum two problems on each assignment on the A3 size drawing sheet.
2. Suggested List of Laboratory Experiments/Assignments Assignment
3. Construct any Engineering Curve by any method Assignment
4. Orthographic view of any machine element along with sectional view. Assignment

5. Draw Isometric view for given orthographic views. Assignment
6. Draw the development of lateral surface of a solid/ truncated solid Assignment
7. Draw the isometric or Orthographic view of a product/object (For example Workshop Job prepared during the workshop practice or any product developed during the first year session.)

EVALUATION SCHEME

Examination	**Marks**
Practical Internal (Continuous) assessment:	20
End semester examination:	30
Total:	**50**

NAME OF THE COURSE: ENGINEERING MECHANICS

COURSE CODE: BT 203	**L**	**T**	**P**	**Hr**	**C**
MARKS: 100	**3**	**0**	**0**	**3**	**3**

COURSE OBJECTIVE:

The objective of the course is to familiarize the students with the basic concepts of engineering mechanics.

COURSE OUTCOME:

At the end of the course the students will have sufficient knowledge of mechanical engineering techniques which will help them to implement them in the life sciences.

PREREQUISITES

Since the course is technical in nature the students must have the basic knowledge of Math sans Physics.

COURSE DESCRIPTION

Sr. No.	Topics	Detail syllabus	No. of Lectures
1	Module 1	Introduction, Units and Dimensions, Laws of Mechanics, Vectors – Victorian representation of forces and moments, Vector operations	04
2	Module 2	Principle of statics, Force system, Resolution and composition of forces, Resultant of concurrent forces. Moment of a force, Varignon's theorem, resultant of parallel force system, Couple, Equivalent force couple system, Resultant of parallel general force system	08
3	Module 3	Free body diagram Equilibrium of concurrent, parallel forces in a plane Equilibrium of general forces in a plane Equilibrium of three forces in a plane, Types of beams, simple and compound beams, Type of supports and reaction, Forces in space, Resultant of concurrent and parallel forces in a space, Equilibrium of concurrent and parallel forces in a space.	08
4	Module 4	Frictional Force, Laws of Coulomb friction, Simple Contact friction, Rolling Resistance & Belt Friction	04

5	Module 5	Kinematics of linear motion- Basic concepts Equation of motion for constant acceleration Motion under gravity, Variable acceleration motion curves. Kinematics of curvilinear motion- Basic Concepts Equation of motion in Cartesian coordinates Equation of motion in path coordinates Equation of motion in polar coordinates Motion of projectile.	07
6	Module 6	Kinetics- Newton's Second Law of motion Application of Newton's Second Law. Work, power, energy, conservative and non-conservative forces Conservation of energy for motion of particle, Impulse, Momentum, Direct central impact. Coefficient of restitution, Impulse Momentum principle of particle.	07
Total Lectures			38

BOOKS RECOMMENDED:

1. Engineering Mechanics, 2nd ed. — MK Harbola
2. Introduction to Mechanics — MK Verma
3. An Introduction to Mechanics — D Kleppner & R Kolenkow
4. Principles of Mechanics — JL Synge & BA Griffiths
5. Mechanics — JP Den Hartog
6. Engineering Mechanics - Dynamics, 7th ed. - JL Meriam
7. Mechanical Vibrations — JP Den Hartog
8. Theory of Vibrations with Applications — WT Thomson

METHODOLOGY

The course will be covered through lectures supported by practicals.

EVALUATION SCHEME (THEORY)

Examination	**Duration**	**Marks**
I Internal	60 minutes	20
II Internal	45 minutes	15
Attendance		5
End Semester Exam	2 hours 30 minutes	60
Total		**100**

TITLE OF THE COURSE: PROJECT BASED LEARNING -I

COURSE CODE: – ESC 204	**L**	**T**	**P**	**Hr**	**C**
MARKS:	**0**	**0**	**4**	**4**	**2**

COURSE OBJECTIVE:

1. To emphasizes learning activities that are long-term, interdisciplinary and student-centric.
2. To inculcate independent learning by problem solving with social context.
3. To engages students in rich and authentic learning experiences.
4. To provide every student the opportunity to get involved either individually or as a group so as to develop team skills and learn professionalism.

COURSE OUTCOME:

1: Project based learning will increase their capacity and learning through shared cognition.

2: Students able to draw on lessons from several disciplines and apply them in practical way.

3: Learning by doing approach in PBL will promote long-term retention of material and replicable skill, as well as improve teachers' and students' attitudes towards learning.

Group Structure:

Working in supervisor/mentor –monitored groups. The students plan, manage and complete a task/project/activity which addresses the stated problem.

- There should be team/group of 5 -6 students
- A supervisor/mentor teacher assigned to individual groups

Selection of Project/Problem:

The problem-based project oriented model for learning is recommended. The model begins with the identifying of a problem, often growing out of a question or "wondering". This formulated problem then stands as the starting point for learning. Students design and analyze the problem within an articulated interdisciplinary or subject frame.

A problem can be theoretical, practical, social, technical, symbolic, cultural and/or scientific and grows out of students' wondering within different disciplines and professional environments. A chosen problem has to be **exemplary**. The problem may involve an interdisciplinary approach in both the analysis and solving phases.

By exemplarity, a problem needs to refer back to a particular practical, scientific, social and/or technical domain. The problem should stand as one specific example or manifestation of more general learning outcomes related to knowledge and/or modes of inquiry.

There are no commonly shared criteria for what constitutes an acceptable project. Projects vary greatly in the depth of the questions explored, the clarity of the learning goals, the content and structure of the activity.

- A few hands-on activities that may or may not be multidisciplinary

- Use of technology in meaningful ways to help them investigate, collaborate, analyze, synthesize and present their learning.

- Activities may include- Solving real life problem, investigation /study and Writing reports of in depth study, field work.

The institution/head/mentor is committed to assessing and evaluating both student performance and program effectiveness.

Progress of PBL is monitored regularly on weekly basis. Weekly review of the work is necessary. During process of monitoring and continuous assessment AND evaluation the individual and team performance is to be measured. PBL is monitored and continuous assessment is done by supervisor /mentor and authorities.

Students must maintain an institutional culture of authentic collaboration, self-motivation, peer-learning and personal responsibility. The institution/department should support students in this regard through guidance/orientation programs and the provision of appropriate resources and services. Supervisor/mentor and Students must actively participate in assessment and evaluation processes.

Group may demonstrate their knowledge and skills by developing a public product and/or report and/or presentation.

- Individual assessment for each student (Understanding individual capacity, role and involvement in the project)
- Group assessment (roles defined, distribution of work, intra-team communication and togetherness)
- Documentation and presentation

Evaluation and Continuous Assessment:

It is recommended that the all activities are to be record and regularly, regular assessment of work to be done and proper documents are to be maintained at college end by both students as well as mentor (you may call it PBL work book).

Continuous Assessment Sheet (CAS) is to be maintained by all mentors/department and institutes.

Recommended parameters for assessment, evaluation and weightage:

- Idea Inception **(5%)**
- Outcomes of PBL/ Problem Solving Skills/ Solution provided/ Final product **(50%)** (Individual assessment and team assessment)
- Documentation (Gathering requirements, design & modeling, implementation/execution, use of technology and final report, other documents) **(25%)**
- Demonstration (Presentation, User Interface, Usability etc) **(10%)**
- Contest Participation/ publication **(5%)**
- Awareness /Consideration of -Environment/ Social /Ethics/ Safety measures/Legal aspects**(5%)**

PBL workbook will serve the purpose and facilitate the job of students, mentorand project coordinator. This workbook will reflect accountability, punctuality, technical writing ability and work flow of the work undertaken.

References:-

- Project-Based Learning, Edutopia, March 14, 2016.
- What is PBL? Buck Institute for Education.
- www.schoology.com
- www.wikipedia.org
- www.howstuffworks.com

TITLE OF THE COURSE: WORKSHOP & MANUFACTURING PRACTICES - LABORATORY

COURSE CODE: – ESC 205	**L T P Hr C**
MARKS: 50	**0 0 4 4 2**

COURSE OBJECTIVE:

1. To understand the construction and working of machine tools and functions of its parts.
2. To develop the skill through hands-on practices using hand tools, power tools, machine tools in manufacturing and assembly shops leading to understanding of production processes.
3. To understand workshop layout and safety norms.

COURSE OUTCOME:

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**.**

PREREQUISITES:

This subject requires basic knowledge of Mathematics & Engineering Graphics.

COURSE DESCRIPTION:

PRACTICAL DETAILS

***Minimum eight experiments to be conducted out of 10.**

1. Mandatory briefing on shop-floor safety

2. Demonstration and working of centre lathe, Demonstration on various functions of lathe parts: Headstock, Tailstock, Carriage, Lead screw, All geared Mechanism, Apron mechanism etc.

3. Demonstration of Lathe operations: Step turning and facing, drilling operation on a Mild Steel cylindrical job on centre lathe. Understanding the concept of speed, feed and depth of cut.

4. Demonstration of Drilling machine Demonstration on construction of Radial drilling machine, Tool holding devices, Concept of speed, feed and depth of cut.

5. Demonstration on Milling machine Demonstration on construction, table movements, indexing and tooling of milling machine.

6. Demonstration of Shaper/Grinding machine (Any one) Shaper: Crank and slotted link mechanism, Work feed mechanism Grinding: Surface grinder/Cylindrical grinding machine, Mounting of grinding wheel

7. Term work includes one job of Carpentry Introduction to woodworking, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns and its allowances.

8. Term work to include one job involving fitting to size, male-female fitting with drilling and tapping operation on Mild Steel plate; Introduction to marking, cutting and sawing, sizing of metal, shearing, Concept of fits and interchangeability, selection of datum and measurements.

9. Term work to include one utility job preferably using sheet metal (e.g. Tray, Funnel etc.) with riveting/welding/brazing/soldering (at least one temporary and one Permanent joint either using resistance welding/Arc welding); Introduction to sheet metal operations: punching, blanking, bending, drawing.

10. Prepare a Layout of the workshop..

11. Collection of information about safety norms in any one of the following type of industry:Metalworking/Chemical/Cement/Pharmaceuticals/Defense/Atomic energy/Aerospace /Marine/Construction/Railway etc.

METHODOLOGY:
The course will be covered through practicals supported by the theoretical part.

EVALUATION SCHEME (THEORY)

Examination	***Marks***
Practical Internal (Continuous) assessment:	20
End semester examination:	30
Total:	**50**

BOOKS RECOMMENDED

1. John, K. C., (2010),"Mechanical Workshop Practice, Prentice Hall Publication, New Delhi

2. Hazra and Chaudhary, Workshop Technology-I & II, Media promoters & Publisher Pvt. Ltd