BTECH BIOTECHNOLOGY

&

BTECH BIOINFORMATICS

COURSE STRUCTURE

Department of Biotechnology & Bioinformatics

PROGRAM OUTCOMES

Engineering Graduates will be able to:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, SOLAN

COURSE CURRICULUM OF BT & BI DEPARTMENT- 2024 Batch

B. TECH 1st SEMESTER

S. No.	Category Code	ubject Code	Name of the Subjects	Course Hours			Credits	Total Hours
				L	T	P		
1	HSS	21B11HS111	English	2	0	0	**2**	**2**
2	HSS	21B17HS171	English Lab	0	0	2	**1**	**2**
3	Basic Sciences	24B11MA112	Mathematics for Life Sciences-I OR	3	1	0	**4**	**4**
4	Basic Sciences	18B11BT111	Fundamental Biology	3	0	0	**3**	**3**
5	Basic Sciences	18B17BT171	Fundamental Biology lab	0	0	2	**1**	**2**
6	Basic Sciences	18B11PH112	Basic Engineering Physics-I	3	1	0	**4**	**4**
7	Engg Science	24B11CI111	Problem Solving and Programming	3	0	0	**3**	**3**
8	Engg Science	18B17GE173	Engineering Graphics	0	0	3	**1.5**	**3**
9	Basic Sciences	18B17PH172	Basic Engineering Physics Lab-I	0	0	2	**1**	**2**
10	Engg Science	24B17CI171	Problem Solving and Programming Lab	0	0	2	**1**	**2**
11	Project	24B19CI191	Project – I	0	0	2	**1**	**2**
						Total	**18.5**	**24**

B. TECH 2nd SEMESTER

S.No.	Category Code	Subject Code	Name of the Subjects	Course Hours			Credits	Total Hours
				L	T	P		
1	Basic Sciences		Mathematics for Life Sciences-II	3	1	0	**4**	**4**
2	Basic Sciences	18B11PH212	Bioinstrumentation Techniques	3	1	0	**4**	**4**
3	Engg Science		Basic Electrical Engineering for Life Sciences	3	1	0	**4**	**4**
4	Engg Science		Basic Electrical Engineering for Life Sciences Lab	0	0	2	**1**	**2**
5	Engg Science		Data Structures & Algorithms	3	0	0	**3**	**3**
6	Engg Science	18B17CI271	Data Structure & Algorithms Lab	0	0	4	**2**	**4**
7	Engg Science	18BI7GE171	Workshop Practices	0	0	3	**1.5**	**3**
8	HSS	23B11HS211	Universal Human Values II: Understanding Harmony	2	1	0	**3**	**3**
9	HSS	23B11HS212	Professional Communication Practice	0	0	2	**Audit**	**2**
10	PR		Project-II	0	0	2	**1**	**2**
						Total	**23.5**	**31**

B.TECH. BIOTECHNOLOGY /

B.TECH. BIOINFORMATICS

SYLLABUS

ENGLISH

COURSE CODE: 21B11HS111

COURSE CREDITS: 2

CORE/ELECTIVE: CORE

L-T-P : 2-0-0

Pre-requisite: None

Course Objectives:

1. The students will be able to analyze different communication situations to make choices about the most effective and efficient ways to communicate.
2. The student will learn to deliver effective presentations in contexts that may require power point, extemporaneous or impromptu oral presentations.
3. The student will learn to write effective technical documents using appropriate style.
4. The student will learn to design effective resumes, and write effective emails, letters and reports
5. Students will develop command over their language and synchronize their thoughts into written form

Course Outcomes:

SNo	Course Outcomes	Level of Attainment
CO-1	Understand and learn the concepts of better and effective communication	Familiarity
CO-2	Enable students to prepare better Power Point Presentations with clarity of expression and appropriate language.	Assessment and Usage
CO-3	Help make communication better by learning the nature and mechanics of effective writing	Assessment and Usage
CO-4	Design effective resumes, and write effective emails, letters and reports	Usage
CO-5	Understand different workplace scenarios and communicate accordingly in diverse communicative situations	Assessment and Usage

Course Contents:

Unit	Contents	Lectures required
1	**Workplace Communication: Meaning and Importance** • Importance of communicating effectively: Theories of communication • Understanding interpersonal Communication: The Johari Window Model • Stages of communication: Ideation, encoding, transmission, decoding & response • Feedback in organizations • Barriers to effective communication: Physical, Social, Psychological, Cultural, Language & organizational • Guidelines to overcome communication barriers	6
2	**Listening Skills & Nonverbal Communication and Body Language** **(i) Listening** • Empathetic Listening and its importance in leadership communication • Process and Principles of Listening • Types of Listening • Barriers to listening **(ii) Nonverbal Communication** • Nonverbal communication and body language defined • Functions of nonverbal communication and Body Language: Conveying meanings, expressing emotion, presenting self, managing interactions, defining relationship • Nonverbal Communication Codes: Communicating through Body Movements, Voice, Touch, Personal Space, Time, Physical Appearance	6
3	**Intercultural Communication: An Introduction** • Intercultural Communication in a globalized world • Language, Communication, and Culture • Nonverbal Communication and Culture • Intercultural Communication Competence	3
4	**Effective Presentation Skills** • Planning Presentations • Making PowerPoint presentations • Pre- presentation jitters • Preparation and Practice • Delivering the Presentation • Handling Questions	5
5	**Communication Strategies & Professional Writing** • Principles of Technical Writing • Writing Process: Pre-writing, writing & post-writing • Neutral, positive, Negative messages and Persuasive messages • Letters, Emails • Resume and Cover Letter **Report Writing**	8

	• Functions of a report • Types of reports • Format of the reports • Use of Visuals-Charts, Tables, Pictures	
	Total lectures	**28**

***Modified Portions have been Highlighted**

Suggested Text Book(s):

1. M.A. Guffey: *Business Communication: Product & Process*. South-Western College Publishing, 2000.
2. R.V Lesikar, M.E. Flatley, K Rentz, N Pande: *Business communication, 12th Edition,* McGraw Hill, 2009.

Suggested Reference Book(s):

1. Herta A. Murphy, Herbert Hildebrandt, Jane Thomas: *Effective Business Communication*, 7th Edition, Tata Mcgraw Hill, 2017.
2. Karen Schneiter Williams, Joyce P Logan, A.C. Buddy Krizan , Patricia Merrier: *Communicating in Business, Cengage Learning, 1st Edition 2012.*
3. H.S. Mukherjee: *Business Communication-connecting at work*, Oxford University Press, 2nd Edition 2013.

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered up to T-1
2	T-2	25	1.5 Hours	Syllabus covered up to T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment (2) - 10 Quizzes (2) - 10 Attendance - 5

Course Outcomes (COs) contribution to the Programme Outcomes (POs)

Course outcomes	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	Average
CO-1	1	3	3	3	1	2	3	3	3	3	1	3	2.4
CO-2	1	2	3	2	1	1	2	3	3	3	1	3	2
CO-3	1	1	3	2	2	2	1	2	3	3	1	3	2
CO-4	1	2	2	3	2	1	1	3	2	3	1	3	1.9
CO-5	1	2	3	2	2	2	1	3	2	3	1	3	2
Average	1	2	2.6	2.3	1.6	1.6	1.5	2.8	2.5	3	1	3	2

ENGLISH LAB

COURSE CODE: 21B17HS171

COURSE CREDITS: 1

CORE/ELECTIVE: CORE

L-T-P : 0-0-2

Pre-requisite: None

Course Objectives:

1. The students will learn to speak and write grammatically correct sentences with the ability to express thoughts with clarity and accuracy.
2. The students will learn the rules of grammar in writing. It will enhance their ability to use logical sequencing while writing any business letter or document.
3. The students will learn using new words and build their vocabulary steadily and systematically by following lab exercises.
4. Students will develop command over their language and synchronize their thoughts while writing different types and kinds of Business letters.
5. Students will be groomed to develop the art of speaking logically, confidently and pragmatically which involves understanding work ethics and manners and the correct use of body language.

Course Outcomes:

SNo	Course Outcomes	Level of Attainment
CO-1	Understand and sharpen writing skills using correct grammar in Emails, Business letters and Report writing.	Usage and Assessment
CO-2	Help make communication stronger by learning Non verbal cues and correct Body Language.	Familiarity and Assessment
CO-3	Enable students to prepare better Power Point Presentations with clarity of expression and appropriate language.	Familiarity and Assessment
CO-4	Develop advanced vocabulary by learning to use different ways of word construction and strategies of learning new words.	Usage and Assessment
CO-5	Learn about the ethics of writing and different types of formats in documents with command over language.	Usage and Assessment

Course Contents:

Unit	Content	Lecture required
1	**Software: Tense Buster** The students will take the 'Test Your Level' Test on the Software and start with the respective Exercise as per the level achieved **Exercises:** Elementary Level: Am, is, are (to be) Pre-Intermediate Level: Comparisons Intermediate Level: The passive Upper Intermediate Level: Present Perfect Advanced Level: Past perfect	1
2	**Software: Tense Buster** **Exercises:** Elementary Level: Simple present Pre-Intermediate Level: Simple present Intermediate Level: Will and going to Upper Intermediate Level: Past continuous Advanced Level: Reported speech	1
3	**Software: Tense Buster** **Exercises:** Elementary Level: Negatives (I don't go) and Questions (does he?) Pre-Intermediate Level: Present continuous Intermediate Level: Question tags Upper Intermediate Level: Adjectives and adverbs Advanced Level: Phrasal verbs	1
4	Software: Tense Buster **Exercises:** Elementary Level: Countable? and Some, any Pre-Intermediate Level: Present perfect Intermediate Level: Equality Upper Intermediate Level: Modal verbs Advanced Level: Nouns	1
5	**Software: Tense Buster Exercises:** Elementary Level: I, my, me, A, an, the Pre-Intermediate Level: Simple past Intermediate Level: Relative clauses Upper Intermediate level: The future Advanced Level: The passive	1
6	**Software: Tense Buster Exercises:** Elementary level: Have got (International English version only) Pre-Intermediate level: Prepositions Intermediate Level: Conditionals Upper Intermediate level: Conditionals Advanced Level: Articles	1
7	**Software: Practical Writing Essays: For and Against** What will I learn? Stages of writing Brainstorming (1) Brainstorming (2) Planning your essay (1) Choosing a style Quick quiz: the Writing Process Lab work: First and Final Draft	1

8	**Software: Practical Writing Essays: Descriptive:** What will I learn?, Planning your essay (1), Planning your essay (2), Words and senses (1), Vocab focus: choosing precise words, Linking ideas (1), Linking ideas (2), Quick quiz: descriptive essays	**1**
9	**Software: Practical Writing A Short Report Graphs (I):** What will I learn in this unit? A report on graph, Choosing tenses (1), Choosing tenses (2), Write a report (1), Prepositions of time (1), Describing differences (1), Quick quiz: A report on graphs, Lab work: Report writing from graph	**1**
10	**Software: Practical Writing** **A Short Report: Hotel and restaurants (II)**: What will I learn? Restaurant reviews: structure, Vocab: Hotels and restaurants, Topic sentences (1), Mixing sentences (1), Mixing sentences (2), Past or Present?, Write two reviews, Quick quiz: a short report Lab work: Write any one review	**1**
11	**Software: Practical Writing** **Emails I: Asking for Information (I):** What will I learn?, Emails: an overview, Emails: structure, Finding functional language, Asking people to do things, Enquiries and Responses	**1**
12	**Software: Practical Writing** **Emails II: Asking for Information (II):** Functional language for emails, Emails: Correcting mistakes, Write two emails, Vocabulary Focus, Quick quiz: Email basics, Lab work: Write 2 emails	**1**
13	**Software: Practical Writing Official Letters:** What will I learn in this unit? Official letters: layout Official letters: vocabulary Build up an official letter Letters: style. The cover letter: job applications Letters: proofreading Present perfect or simple past? Quick quiz: letters	**1**
14	**Text speak:** What will I learn? Text speak: an overview Text terms (1) Text terms (2) Inviting people to do things Responding appropriately Text speak and speaking Quick quiz: text speak	**1**
Total lectures		**14**

***Modified Portions have been Highlighted**

Evaluation Scheme:

S. No	Exam	Marks	Coverage / Scope of Examination
1	P-1	20	Syllabus covered up to T-1
2	P-2	20	Syllabus covered up to T-2
3.	Lab Assignments	10	Entire Syllabus
4.	Tutorial Activities	50	Ongoing evaluation throughout the semester

Course Outcomes (COs) contribution to the Programme Outcomes (POs)

Course outcomes	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	Average
CO-1	x	x	x	x	x	x	2	1	2	3	x	3	0.92
CO-2	x	x	x	x	x	1	3	2	3	3	x	3	1.25
CO-3	x	x	x	x	x	x	2	3	2	3	x	3	1.08
CO-4	x	x	x	x	x	1	2	1	2	3	x	3	1
CO-5	x	x	x	x	x	1	2	1	2	3	x	3	1
Average	0	0	0	0	0	0.6	2.2	1.6	2.2	3	0	3	1.05

Mathematics for Life Sciences - I

COURSE CODE: 24B11MA112

COURSE CREDITS: 4

CORE/ELECTIVE: CORE

L-T-P: 3-1-0

Pre-requisite: Basic knowledge of arithmetic, algebra, and trigonometry.

Course Objectives:

- To learn the basic concepts of matrices and determinants used in solving the systemof linear equations.
- To learn the fundamentals of vector, coordinate geometry and complex numbers.
- To learn and use the basic concepts of differential and integral calculus.

S. No.	Course Outcomes	Level of Attainment
CO-1	Understand the basic properties of matrices and determinants,solution of system of linear equations.	Familiarity
CO-2	Understand the basic concept of Differential Calculus; limit and continuity, derivative, rules of differentiation, Taylor's series, maxima and minima.	Assessment
CO-3	Understand complex numbers and their properties, geometrical representation, Polar form & De Moivre's theorem.	Assessment
CO-4	Understand the various concept of vectors and coordinate geometry.	Assessment
CO-5	Understand the basic concept of integral calculus, method of integrations, definite integral and their applications.	Usage

Course Contents:

Unit	Contents	Lectures required
1	**Matrix Algebra:** Algebra of matrices, type of matrices, inverse of a matrix, determinants, elementary row operations, rank of matrix, solution of systems of linear equations - Cramer's rule, inverse matrix method, Gauss elimination method, eigenvalues & eigenvectors, Cayley-Hamilton theorem and its applications.	**10**
2	**Differential Calculus:** Sets and their basic operations, functions, basic concepts of trigonometric functions, types of functions, limit & continuity of functions, derivative, rules of differentiation, Taylor's series, maxima and minima.	**9**

3	**Complex Numbers:** Definition and geometrical representation, algebra, complex conjugate, modulus and amplitude, polar form, De Moivre's theorem, roots of complex numbers.	**7**
4	**Vectors and Coordinate Geometry:** Vectors and their algebra, types of vectors, dot and cross products, projection of a vector, equations of a line and plane, shortest distance between lines and planes.	**7**
5	**Integral Calculus:** Integrals of elementary functions, methods of integration - substitution, partial fraction and integration by parts, definite integrals, properties and their applications.	**9**
	Total Lectures	**42**

Suggested Text Book(s):

1. NCERT. Mathematics Textbook for class XI and XII.
2. R.D. Sharma, Mathematics, Dhanpat Rai Publications, New Delhi.

Suggested Reference Book(s):

1. G. B Thomas, R. L. Finney Calculus and analytical geometry, 9th Ed., Pearson Education Asia (AdissonWesley), New Delhi, 2000.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour	Syllabus covered up to T-1
2	T-2	25	1.5 Hours	Syllabus covered up to T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment (2) - 8 Quizzes(3) - 12 Attendance - 5

Course Outcomes (COs) contribution to the Programme Outcomes (POs)

Course outcomes (MLS-I)	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	Average
CO-1	3	2	2	2	3	3	2	1	3	2	3	3	2.4
CO-2	3	1	1	2	2	2	2	1	2	2	1	2	1.8
CO-3	2	1	1	1	1	1	1	1	1	1	1	2	1.2
CO-4	2	1	1	1	1	1	1	1	1	3	1	2	1.3
CO-5	3	2	2	3	2	2	2	1	2	1	3	2	2.1
Average	2.6	1.4	1.4	1.8	1.8	1.8	1.6	1	1.8	1.8	1.8	2.2	

Fundamental Biology

COURSE CODE: 18B11BT111

COURSE CREDITS: 3

CORE/ELECTIVE: CORE
L-T-P:3-0-0

Pre-requisite:Xth Class Biology

Course Objectives:

1. This is basic foundation biology course for the students having mathematics background.
2. The objectives are to familiarize students with basics of biology.
3. Learn about various living organism.
4. Learn about different biological at molecular or celluar level.

Course Outcomes:

S. No.	Course Outcomes	Level of Attainment
CO-1	Overview of living system, different life forms and Maintenance of Life.	Familiarity
CO-2	Fundamental understanding of Bio-molecules: Building blocks of living system	Assessment
CO-3	Understanding of structure and function of cell: Prokaryotic and Eukaryotic cells system.	Assessment
CO-4	Understanding the Basic of cellular transport system and cellular inheritance.	Assessment
CO-5	Flow of information in biological system- Central Dogma, DNA replication, Transcription, and Translation	Usage

Course Contents:

Unit	Contents	Lectures required
1	**General Biology:**The nature of life, Characteristics of living organisms, Concept and use of a classification system, brief of five Kingdome and three domain classification system.Concepts of species and hierarchical taxa, biological nomenclature, classical and quantititative methods of taxonomy of plants, animals and microorganisms.	5
2	**Introduction to bio-molecule: Structure and function relationship** Structure, chemical reactions and biological functions of carbohydrate, lipid, protein and nucleotides.Stablizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc	8
3	**Cell: Basic structure and functions**Unicellular, colonial and multicellular forms; levels of organization of tissues systems; comparative anatomy Structural and biochemical organization of cell. Prokaryotic and Eukaryotic cells. Cell organelles, their molecular composition, structure and functions.	6
4	**Basic of cellular transport system** Diffusion , Osmosis, Active transport	4

5	**Cellular inheritance** Cell division, cell cycle, Mitosis, Meiosis and Inheritance	**6**
6	**Flow of genetic information**The DNA, Search for Genetic Material, RNA World, Genetic Code, Central Dogma, replication, transcription and translation, (initiation, elongation and termination).	**8**
7	**Maintenance of Life:Adjustment and control.**Homeostasis, thermoregulation, and osmoregulation, Speciation and selection.	**5**
	Total Number of Lectures	**42**

Suggested Text Book(s):

1. Stryer, Lubert (2002). Biochemistry; Fifth edition. W. H. Freeman and Company.
2. Principles of Biochemistry [5th edition], Lehninger.
3. NCERT –XII class Biology

Suggested Reference Book(s):

1. Neill, Campbell (1996). Biology; Fourth edition.The Benjamin/Cummings Publishing Company. p. 309,310. ISBN 0-8053-1940-9.
2. A. W. Haupt, Fundamental of Biology, 3rd ed. McGRAW-HILL

Other useful resource(s):

1. https://nptel.ac.in/courses/122103039/
2. https://nptel.ac.in/syllabus/122103039/

Evaluation Scheme:

S. No.	Exam	Marks	Duration	Coverage/Scope of Examination
1	T-1	15	1 Hour	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3	T-3	35	2 Hours	Entire Syllabus
4	Teaching Assessment	25	Entire Semester	Quiz, Assignment, Attendance, etc.

Course Outcomes (COs) contribution to the programme Outcomes (POs):

Course outcomes (Fundamental Biology)	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	Average
CO-1	3	2	2	2	1	3	3	1	1	2	1	2	3	2	**1.8**
CO-2	2	2	3	2	1	3	3	-	1	2	1	3	3	2	**1.8**
CO-3	2	3	3	2	2	2	2	-	-	2	2	3	3	2	**1.8**
CO-4	3	2	2	2	3	2	2	1	-	1	2	3	3	2	**2.0**
CO-5	3	3	3	3	3	3	2	1	2	2	3	3	2	3	**2.5**
Average	**2.6**	**2.4**	**2.6**	**2.2**	**2.0**	**2.6**	**2.4**	**1.8**	**1.6**	**1.8**	**1.8**	**2.8**	**2.8**	**2.2**	

Fundamental Biology Lab

COURSE CODE: 18B17BT171

COURSE CREDITS: 1

CORE/ELECTIVE: CORE
L-T-P:0-0-2

Pre-requisite: Xth class biology

Course Objectives:

1. The objective of this course is to familiarize the students with basic biology laboratory techniques specifically used in modern biotechnology area.
2. Learn handling of microorganism
3. To learn about safe laboratory practices
4. To learn ethics, team work and discipline

Course Outcomes:

S.No.	Course Outcomes	Level of Attainment
CO1	Introduction to basic laboratory practices, microscopy, Bio- safety cabinet and sterilization.	Familiarity
CO2	Fundamental understanding of Biological buffers preparation and application.	Familiarity
CO3	Introduction to microscopic examination of different biological system.	Assessment
CO4	Introduction to analytical technique and application in macromolecular estimation.	Assessment
CO5	Able to understand ethics, team work and discipline.	Usage

List of Experiments

S. No.	Description	Hours
1	**Laboratory safety and basic laboratory Instrumentation** Basic laboratory operation: safety procedure, general safety practice and awareness. (personal safety, eye safety,handling of biologically hazardous material, handling of needles, sharps and chemicals)	2
	To study the different parts and application of simple and compound microscope	2
	To study the fundamental component and application of the Bio-safety cabinet (BSL) in biotechnology.	2
	To study the fundamental of different sterilization method in laboratory practices (Autoclave, Radiation sterilization)	2
2	**Biological buffers: (Preparation and application)**Hands on training on different buffer preparation, purification and pH measurement.	2
	Application of purified buffer in different biotechnology experiment.	2
	Collect water from two different water bodies around you and study them for pH, clarity and presence of any living organism.	2

3	**Microscopic Analysis of biological sample** To perform simple and differential staining of given microorganism and classify them (gram staining) Isolation and identification of microbe from given sample: Microscopic examination and motility test. To perform microscopic examination of unicellular eukaryote organism: identification and characterization	2 2 2
4	**Analytical estimation of bio-molecule** Estimation of Different macromolecules by visible spectrophotometer. To study the basic of standard curve preparations and application in biotechnology experiments.	2 2
Total Lab hours		24

Suggested/Resources:

1 Lab manual
2 Laboratory exercises in Microbiology – Harley Prescott
3 Biotechnology Lab Course: Jeffery M.Becker, Guy A. Caldwell, Eve Ann Zachgo
4 Biology 6thedition : Raven - Johnson

EvaluationScheme:

1	Mid Sem. Evaluation	20 Marks
2	End Sem. Evaluation	20 Marks
3	Lab Assessment	60 Marks
	Total	100 marks

Course Outcomes (COs) contribution to the Programme Outcomes (POs)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Average
CO1	2	2	3	2	1	3	3	1	2	2	3	3	**2.3**
CO2	2	2	2	3	2	2	3	2	2	-	1	1	**1.9**
CO3	3	3	2	3	2	2	2	2	1	2	1	2	**2.1**
CO4	2	3	2	3	3	2	2	2	2	2	2	2	**2.3**
CO5	1	1	1	2	1	1	-	3	3	2	3	3	**1.8**
Average	**2.0**	**2.2**	**2.0**	**2.6**	**1.8**	**2.0**	**2.0**	**2.0**	**2.0**	**1.6**	**2.0**	**2.2**	

Basic Engineering Physics - I

COURSE CODE: 18B11PH112

COURSE CREDITS: 4

CORE/ELECTIVE: CORE

L-T-P: 3-1-0

Pre-requisite: None

Course Objectives:

1. To understand the general scientific concepts required for technology.
2. To apply the concepts in solving BT/BI engineering problems.
3. To explain scientifically the new developments in engineering and technology
4. To get familiarized with the concepts, theories, and models behind many technological applications.

Course Outcomes:

S. No.	Course Outcomes	Level of Attainment
CO-1	Understand the basic concepts of nature light and matter.	Familiarity
CO-2	Apply the concept of light in physical optics, lasers and Optical fibers.	Assessment and usage
CO-3	Acquire the fundamental knowledge of surface tension and plasma physics	Assessment and usage
CO-4	Familiarized with the basic concepts of biomaterials	Familiarity and assessment
CO-5	Familiarized with the basic concepts of nanotechnology	Familiarity

Course Contents:

Unit	Contents	Lectures required
1	**Wave Optics: Interference, Diffraction and Polarization:** Wave nature of light, Particle nature of radiation, the wave nature of matter, Wave function, X-rays, Bragg's law. Interference by division of wave front, Interference by division of amplitude. Fraunhofer diffraction: Single slit, circular aperture, double slit, N-slit, resolving power and dispersive power of diffraction grating. Brewster's law, Malu's law, elliptically and circularly polarized light, optical activity, specific rotation.	16
2	**Lasers, Optical fibers and Plasma Physics:** Principle and working of laser, Different types of lasers (Three level and four level lasers). Optical Fibers: principle, types, material, mode, refractive index; Fibre loss, Expression for acceptance angle and numerical aperture. Application- Communication. Plasma Physics: Plasma state, types of plasma, applications of plasma.	10
3	**Biomaterials:** Introduction to Biomaterials: Biomaterial, Types of Biomaterials, Biocompatible, Biodegradable, Bio-resorbable Bio-inert Bio-active Biological materials, Pyrogenicity, Properties of Biomaterials, Interaction of biomaterials with bio-molecules, Performance and applications of Biomaterials.	8
4	**Introduction to Nanotechnology:** Origin of Nanotechnology, Nano Scale, Quantum Confinement, and Fabrication: Bottom-up and Top-down, Characterization, introduction to nano-biotechnology. Introduction to Active Colloids and Molecular motor proteins: functions, interaction and applications.	8
Total lectures		**42**

Suggested Text Book(s):

1. Brij Lal and Subramanyam, Optics, S. Chand & Company, 2012.
2. Engineering Physics, Shatendra Sharma & Jyotsna Sharma, Pearson Pub. 2018.
3. Neeraj Mehta, Applied Physics for Engineers, PHI India Limited, 2011.
4. R S Burden , Surface Tension and the Spreading of Liquids, Cambridge University Press, 2014.
5. K. K. Chattopadhyay, Introduction to Nanoscience and Nanotechnology, PHI India, 2009.
6. NUCLEAR PHYSICS, D.C. Tayal, Himalaya Publishing House, 2018.

Suggested Reference Book(s):

1. Ajoy Ghatak, Optics, Tata McGraw Hill, 2005.
2. Arthur Beiser, Concepts of Modern Physics, McGraw Hill, 1994.

3. Other useful resource(s):
   1. https://nptel.ac.in/courses/122107035/
   2. https://nptel.ac.in/courses/122103011/
   3. https://nptel.ac.in/courses/122103010/
   4. https://nptel.ac.in/courses/118107015/
   5. https://nptel.ac.in/courses/118102003/
   6. https://nptel.ac.in/courses/122101002/27

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment (3) -15 Quizzes (2) - 5 Attendance - 5

Course Outcomes (COs) contribution to the Programme Outcomes (POs)

Course outcomes (Basic Engineering Physics - I)	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	Average
CO-1	3	3	3	2	2	1	1	-	-	-	-	2	**2.125**
CO-2	2	3	3	3	3	1	1	-	-	-	-	3	**2.375**
CO-3	3	2	2	2	2	1	1	-	-	-	-	2	**1.875**
CO-4	3	2	2	2	2	3	3	-	-	-	-	2	**1.875**
CO-5	2	3	3	3	3	1	1	-	-	-	-	3	**2.375**
Average	**2.6**	**2.6**	**2.6**	**2.4**	**2.4**	**1.4**	**1.4**	**-**	**-**	**-**	**-**	**2.4**	

Problem Solving and Programming

COURSE CODE: 24B11CI111
COURSE CREDITS: 3
CORE/ELECTIVE: CORE
L-T-P: 3-0-0

Prerequisite: None

Course Objectives:

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 understand various number systems associated with C.
6. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
7. To use arrays, pointers and structures to formulate algorithms and programs.
8. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
9. To apply programming to solve simple numerical method problems, namely rot finding of function,differentiation of function and simple integration

Course Outcomes:

S. No.	Course Outcomes	Level of Attainment
CO-1	To formulate simple algorithms for arithmetic and logical problems.	Familiarity
CO-2	To translate the algorithms to programs (in C language).	Assessment
CO-3	To understand various number systems associated with C	Usage
CO-4	To test and execute the programs and correct syntax and logical errors.	Usage
CO-5	To implement conditional branching, iteration and recursion.	Usage

CO-6	To use arrays, pointers and structures to formulate algorithms and programs.	Usage
CO-7	To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.	Usage

Course Contents:

Unit	Contents	Lectures required
1	Introduction to Programming, Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) 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	**4**
2	Number System: Decimal, Binary, Octal, Hexadecimal and interconversion.	**3**
3	Arithmetic expressions and precedence	**3**
4	Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching	**6**
5	Arrays (1-D, 2-D), Character arrays and Strings	**4**
6	Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs	**4**
7	Function: Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays	**8**

	to functions: idea of call by reference Recursion: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort and Merge sort. Tracking Recursion	
8	Idea of pointers, Defining pointers, Use of Pointers in self-referential structures.	**4**
9	Structures, Defining structures and Array of Structures, notion of linked list (Basic Idea of Implementation).	**2**
10	File Handling	**4**
Total lectures		**42**

Suggested Text Book(s):

1. Mittal, Ajay. Programming in C: A Practical Approach. Pearson Education India, 2010.
2. Kernighan, Brian W., and Dennis M. Ritchie. "The C programming language." (2002).

Suggested Reference Book(s):

1. Deitel, H., and PJ C+ Deitel. How to program. Pearson, 2021.

Other useful resource(s):

1. Link to NPTEL course contents:
   https://www.youtube.com/watch?v=t9WKOcRB63Q&list=PLJ5C_6qdAvBFzL9su5J-FX8x80BMhkPy1

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination

1	T-1	15	1 Hour.	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment (2) – 10 Quizzes (2) - 10 Attendance - 5

Course Outcomes (COs) contribution to the Programme Outcomes (POs)

Course outcomes (Parallel and Distributed Algorithms)	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**	**Average**
CO-1	2	2	2	2	2	1	1	1	2	2	2	2	**1.75**
CO-2	2	3	3	3	3	1	1	1	2	2	1	2	**2.00**
CO-3	2	2	2	2	3	1	1	1	2	2	1	2	**1.75**
CO-4	2	3	3	3	2	1	1	1	2	3	2	2	**2.08**
CO-5	2	3	3	3	3	1	1	1	2	2	1	2	**2.00**
CO-6	2	2	2	2	2	1	1	1	2	2	2	2	**1.75**
CO-7	2	3	3	3	3	1	1	1	2	2	1	2	**2.00**
Average	**2.00**	**2.57**	**2.57**	**2.57**	**2.57**	**1.00**	**1.00**	**1.00**	**2.00**	**2.14**	**1.43**	**2.00**	**1.90**

Engineering Graphics

COURSE CODE: 18B17GE173

COURSE CREDITS: 1.5

CORE/ELECTIVE: CORE

L-T-P : 0-0-3

Pre-requisite: None Course Objectives:

1. To introduce the students to the "universal language of Engineers" for effective communication through drafting exercises of geometrical solids.
2. To enable students to acquire and use engineering drawing skills as a means of accurately and clearly communicating ideas, information and instructions.
3. To impart knowledge to students about creating a sheet and software aided layout of required dimensions in 2-D and 3-D view.

Course Outcomes:

S.No.	Course Outcomes	Level of Attainment
CO1	To impart and inculcate proper understanding of the theory of projection.	Familiarity
CO2	To improve the visualization skills	Assessment
CO3	To enable the students with various concepts like dimensioning, conventions and standards related to working drawings in order to become professionally efficient	Usage
CO4	To impart the knowledge on understanding and drawing of simple residential/office buildings.	Usage

List of Experiments

S.No	Description	Hours
1	Introduction to Lettering	**3**
2	Scales and their types	**2**
3	Construction of Polygons	**4**
4	Projection of points	**2**
5	Projection of lines	**4**
6	Projection of planes	**3**
7	Drawing of building plan	**6**

8	Introduction to Basic Commands in Auto-CAD	**3**
9	Orthographic projections in Auto-CAD	**3**
10	Isometric Projection in Auto-CAD	**4**
11	Projections of solids in Auto-CAD	**1**
12	Section of solids in Auto-CAD	**1**
Total Lab hours		**36**

Suggested/Resources:

1. Engineering Drawing & Graphics with AutoCAD by K.Venugopal, New Age International Pvt. Ltd., New Delhi (India)
2. Engineering Drawing by N.D.Bhatt, V.M.Panchal and Pramod R. Ingle, Charotar Publishing House,
   Anand, Gujarat (India)
3. Engineering Drawing [With Introduction to Auto-CAD] by Roop Lal and Ramakant Rana, IK International Publishing House Pvt. Ltd.

Evaluation Scheme:

1	Mid Sem. Evaluation	20 Marks
2	End Sem. Evaluation	20 Marks
3	Attendance	10 Marks
4	Lab Assessment	50 Marks
	Total	**100 marks**

Basic Engineering Physics Lab-I

COURSE CODE: 18B17PH172

COURSE CREDITS: 1

CORE/ELECTIVE: CORE

L-T-P : 0-0-2

Pre-requisite: None

Course Objectives:

1. The Art of Experimentation: The introductory laboratory engages each student in significant experiences with experimental processes, including some experience in investigation.
2. Experimental and Analytical Skills: The laboratory help the student develop a broad array of basic skills and tools of experimental physics and data analysis.
3. Conceptual Learning: The laboratory help student's to understand basic physics concepts.
4. Understanding the Basis of Knowledge in Physics: The laboratory help students understand the role of direct observation in physics and to distinguish between inferences based on theory and the outcomes of experiments.
5. Developing Collaborative Learning Skills: The laboratory helps students to develop collaborative learning skills that are vital to success in many lifelong endeavors.

Course Outcomes:

S.No.	Course Outcomes	Level of Attainment
CO1	Insight of core Basic Engineering Physics theory course to correlate their theoretical knowledge with experiment directly.	Familiarity
CO2	To demonstrate an ability to make physics measurements and understand the limits of precision in measurements.	Familiarity and Assessment
CO3	Working knowledge and principle of various instruments.	Assessment and usage
CO4	To demonstrates the ability to prepare a valid laboratory notebook.	Assessment and usage
CO5	To make students regular and punctual in performing experiments and to develop collaborative learning skills.	Assessment and usage

List of Experiments:

S.No	Description	Hours
1	To find the wavelength of sodium light using Fresnel's biprism.	**2**
2	To determine the wavelength of sodium light by measuring the diameters of Newton's rings.	**2**

3	To measure the wavelengths of certain lines in the spectrum of the mercury lamp using plane transmission grating.	**4**
4	To find the specific rotation of sugar solution by using a polarimeter.	**2**
5	To calculate the angle of prism and dispersive power of the materials of the prism with the help of spectrometer.	**4**
6	Studies for absorbance in liquids in support of Jablonski diagram.	**4**
7	Studies for excitation and emission in liquids in support of Jablonski diagram.	**2**
8	To determine coefficient of viscosity of water by Poiseuille's Method.	**2**
9	Viscosity To determine coefficient of viscosity of water by Poiseuille's Method.	**2**
10	Surface tension To measure the surface tension of a liquid and/or the interfacial tension between two liquids using tensiometer.	**2**
11	Surface tension To measure the surface tension between two surfaces using theta tensiometer	**2**
Total Lab hours		**28**

Suggested/Resources:

1. S. P. Singh, Advanced Practical Physics,Pragati Prakashan, Vol. 1 (2013).
2. C. L. Arora, Practical Physics, S. Chand Company Limited, 20th edition (2004).
3. N. Subrahmanayam, Brij Lal and M.N. Avadhanulu, A Text Book of Optics, S. Chand (2012)
4. Ajoy Ghatak, Optics, Tata McGraw Hill, 5th addition, (2012)
5. F.A. Jenkins and H.E. White, Fundamentals of Optics, McGraw-Hill (1981).
6. Dabir S. Viswanath, Tushar Ghosh, Dasika H.L. Prasad, Nidamarty V.K. Dutt, Kalipatnapu Y. Rani , Viscosity of Liquids: Theory, Estimation, Experiment, and Data , Springer (2007).

Evaluation Scheme:

1	Mid Sem. Evaluation	20 Marks
2	End Sem. Evaluation	20 Marks
3	Attendance	15 Marks
4	Lab Assessment	45 Marks
	Total	100 marks

Course Outcomes (COs) contribution to the Programme Outcomes (POs)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Average
CO1	3	3	3	3	2	2	1	1	3	1	1	1	**2.00**
CO2	3	3	3	3	2	2	1	1	3	1	1	1	**2.00**
CO3	3	3	3	3	2	2	1	1	3	1	1	1	**2.00**
CO4	2	2	2	2	2	2	1	1	1	1	1	1	**1.5**
CO5	2	2	2	2	2	2	1	1	1	1	1	1	**1.5**
Average	**2.6**	**2.6**	**2.6**	**2.6**	**2.0**	**2.0**	**1.0**	**1.00**	**2.2**	**1.00**	**1.0**	**1.0**	

Problem Solving and Programming Lab

COURSE CODE: 24B17CI171
COURSE CREDITS: 1
CORE/ELECTIVE:
L-T-P: 0-0-2

Pre-requisite: Fundamentals of C Programming and Algorithms

Course Objectives:

Course Outcomes:

S. No.	Course Outcomes	Level of Attainment
CO-1	Understanding C program development, Compilation, debunking, running, etc.	Familiarity
CO-2	Introduction to C Programming using Control Statements and Repetition Statement	Usage
CO-3	Apply and practice logical formulations to solve some simple problems leading to specific problems.	Assessment
CO-4	Design effectively the required programming components that efficiently solve computing problems in the real world.	Usage

List of Experiments

S. No	Description	Hours
1	Getting acquainted with the C program Structure and basic Functions, Getting acquainted with the various data types and arithmetic operators in C	**2**
2	Write a program to obtain the reversed number and to determine whether the original and reversed numbers are equal or not.	**2**
3	Write a program to check whether a triangle is valid or not, when the three angles of triangle are entered through the keyboard. A triangle is valid if the sum of all three angles is equal to 180 degrees.	**2**
4	Check a given I/P is character, number or special symbol.	**2**

5	WAP to check if a given number is Armstrong or not. Calculate factorial of a number, Given number is prime or not.	**2**
6	(a) Write a program to add the first seven terms of the following series using any loop: 1/1! + 2/2! + 3/3! +..... (b) Develop start patterns using loops	**4**
7	Swap two numbers via various methods.	**2**
8	Functions and Recursion Applications: Factorial, sum, etc.	**2**
9	Programs on Arrays: searching and sorting	**3**
10	Dynamic Memory Allocation and Structures	**2**
11	File Handling	**2**
Total Lab hours		**25**

Suggested/Resources:

1. Deitel and Deitel, C How to Program, 7° Edition, 2013.
2. Venugopal Prasad, Mastering C, Tata McGraw Hill.
3. Complete Reference with C, Tata McGraw Hill.
4. Drmey, How to solve it by Computer, PHI.
5. Kerninghan and Ritchie, The C Programming Language.
6. http://www.acm.uiuc.edu/webmonkeys/book/c_guide/
7. http://msdn.microsoft.com/en-us/library/25db87se.aspx

Evaluation Scheme:

S. No	Exam	Marks
1	Mid Sem. Evalution	20
2	End Sem. Evalution	20
3.	Attendance	15
4.	Lab Assessment	45
	Total	**100**

Course Outcomes (COs) contribution to the Programme Outcomes(POs)

Course outcomes (Parallel and Distributed Algorithms)	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	Average
CO-1	3	3	3	3	2	2	1	1	1	1	1	1	**1.83**
CO-2	3	3	3	3	3	1	1	1	1	1	1	3	**2.00**
CO-3	3	3	2	3	2	3	2	1	1	1	2	1	**2.00**
CO-4	3	3	3	2	3	2	1	1	1	1	1	1	**1.83**
CO-5	2	2	3	3	3	3	1	1	1	1	1	1	**1.83**
CO-6	2	3	3	3	2	2	2	2	2	2	2	2	**2.25**
Average	**2.67**	**2.83**	**2.83**	**2.83**	**2.50**	**2.17**	**1.33**	**1.17**	**1.17**	**1.17**	**1.33**	**1.50**	**1.96**

Mathematics for Life Sciences - II

COURSE CODE:

COURSE CREDITS: 4

CORE/ELECTIVE: CORE

L-T-P: 3-1-0

Pre-requisite: Mathematics for Life Science - I

Course Objectives:

- To acquire the basic knowledge of sequence, series and advanced calculus.
- To study the differential equations and their solutions applicable in Biotechnology and Bioinformatics.
- To study the fundamentals and applications of Statistics and Numerical Techniques used in life sciences.

S. No.	Course Outcomes	Level of Attainment
CO-1	Understand the idea of sequence and series and to learn about theirconvergence	Familiarity
CO-2	Learn concepts of multi-variable calculus.	Familiarity
CO-3	Learn the basics of differential equations and solve various types of differential equations and also understand the fundamentals of Laplace Transformation.	Familiarity
CO-4	Learn numerical techniques to solve algebraic & transcendental equations and the concept of numerical integrations.	Assessment
CO-5	Understand basic statistics and learn to find mean mode, median and standard deviation.	Usage

Course Contents:

Unit	Contents	Lectures required
1	**Sequence and series:** Convergence and divergence of sequence and infinite series, Tests for convergence. Alternating infinite series, Absolute & Conditional convergence.	**8**
2	**Multi-variable Calculus:** Partial differentiation, chain rule, total differentiation, Taylor's series for function of two variables, maxima and minima, double integration.	**10**

3	**Differential Equations & Laplace Transform:** Differential equations of first order, Bernoulli equation, Linear differential equation with constant coefficients, Cauchy-Euler equations, Laplace transform of standard functions, Inverse Laplace transform & real-time applications.	**10**
4	**Numerical Methods:** Numerical solution of algebraic & transcendental equations – bisection & Newton-Raphson method, interpolation, integrations by trapezoidal and Simpson's rule, single step method for differential equations.	**10**
5	**Basic Statistics**: Classification of data, mean, mode, median and standard deviation.	**4**
	Total Lectures	**42**

Suggested Text Book(s):

1. G. B Thomas, R. L. Finney Calculus and analytical geometry, 9th Ed., Pearson Education Asia (Adisson Wesley), New Delhi, 2000.
2. NCERT. Mathematics Textbook for class XI and XII.
3. Sharma, R.D. Mathematics, Dhanpat Rai Publications, New Delhi.

Suggested Reference Book(s):

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006
2. Dennis G. Zill, Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett Publishers, Inc; 4th Revised edition.

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour	Syllabus covered up to T-1
2	T-2	25	1.5 Hours	Syllabus covered up to T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment (2) - 8 Quizzes (3) - 12 Attendance - 5

Course Outcomes (COs) contribution to the Programme Outcomes (POs)

Course outcomes (MLS-II)	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	Average
CO-1	2	2	1	1	1	1	1	1	1	1	2	2	1.3
CO-2	2	2	1	1	2	2	1	1	1	2	1	2	1.5
CO-3	2	3	2	2	1	2	2	1	2	1	2	2	1.8
CO-4	2	3	2	2	1	2	2	1	2	1	2	2	1.8
CO-5	3	2	2	3	3	3	2	1	3	2	3	3	2.5
Average	2.2	2.4	1.6	1.8	1.6	2	1.6	1	1.8	1.4	2	2.2	1.8

Bioinstrumentation Techniques

COURSE CODE: 18B11PH212

COURSE CREDITS: 4

CORE/ELECTIVE: CORE

L-T-P : 3-1-0

Pre-requisite: None

Course Objectives:

I. To learn concepts for strong foundation of biophysical methods and their application in the field of biotechnology.

II. Exposure to various instruments used in Biophysics.

III. To be able to use important biophysical methods to decipher problems relevant to biology.

IV. Understanding of the underlying theory of these methods and their practical applications in the laboratories.

V. Better understanding of the structure-function activity of biomolecules.

Course Outcomes:

S.No.	Course Outcomes	Level of Attainment
CO-1	Basic concepts of spectroscopy, X-Ray Diffraction	Familiarity, assessment and usage
CO-2	Electron Microscopy, Electronic spectroscopy	Familiarity, assessment and usage
CO-3	Infrared spectroscopy, Raman Spectroscopy	Familiarity, assessment and usage
CO-4	Mass Spectroscopy and spin resonance spectroscopy	Familiarity, assessment and usage
CO-5	Particle analysis and Chromatography	Familiarity, assessment and usage

Course Contents:

https://www.spectroscopyonline.com/view/bioanalysis-instruments-0

Unit	Contents	Lectures Required
1	**Electron microscopy:** Optical to electron microscopy, Transmission electron microscope, Scanning electron Microscopy, Protein crystallography	**6**
2	**Electronic spectroscopy:** UV-VIS spectroscopy and Circular dichroism spectroscopy, Fluorescence Spectroscopy	**8**
3	**Infrared Spectroscopy and Raman Spectroscopy:** Fourier Transform Infrared Spectroscopy, Raman spectroscopy, Molecular polarisability, Applications in the field of biotechnology.	**8**
4	**Mass Spectroscopy and spin resonance spectroscopy:** Producing the ion, Detection of ions and Identifying of compounds. Analysis and applications. Interaction between spin and magnetic field, Nuclear Magnetic Resonance, NMR Applications in Biochemistry, Biophysics and Medicines.	**8**
5	**Imaging Techniques:** Fluorescence Microscopy, Fluorescence-activated Cell Sorting (FACS), Fluorescence In Situ Hybridization (FISH), X-rays, computed tomography (CT) scans, and magnetic resonance imaging (MRI) scans, X-rays, Atomic force microscopy **Particle Analysis:** Dynamic light scattering for size determination and zeta potential for surface charge determination: Concept and analysis	**12**
Total Lectures		**42**

Suggested Text Book(s):

1. C. N. Banwell, Fundamentals of Molecular Spectroscopy. McGraw-Hill, 1994.
2. Sune Svanberg, Atomic and Molecular Spectroscopy: Basic Aspects and Practical applications, Springer Science & Business Media, 2012.
3. G. Aruldhas, Molecular structure and spectroscopy, PHI Learning Pvt. Ltd., 2007.
4. Wong J.Y., and Bronzino V. D. (Eds), "Biomaterials", CRC Press, Taylor and Francis, 2006.
5. Barbara H. Stuart , Infrared Spectroscopy: Fundamentals and Applications, Wiley, 2004.
6. S. O. Pillai, Solid State Physics, New age international publishers, 7th edition, 2016.
7. J. R. Lakowicz, Principles of Fluorescence Spectroscopy, Springer Science & Business Media, 2013.

Suggested Reference Book(s):

1. Brian C. Smith, Fundamentals of Fourier Transform Infrared Spectroscopy, Second Edition, CRC Press, 2011.
2. Shyam S. Mohapatra, Shivendu Ranjan, Nandita Dasgupta, Raghvendra Kumar Mishra, Sabu Thomas, In Micro and Nano Technologies, Characterization and Biology of Nanomaterials for Drug Delivery, Elsevier, Pages 375-424, ISBN 9780128140314, https://doi.org/10.1016/B978-0-12-814031-4.00014-3, 2019.
3. Nanomaterial Characterization: An Introduction, Editor(s): Ratna Tantra, (2016), ISBN:9781118753590, John Wiley & Sons, Inc. DOI:10.1002/9781118753460, 2016.

Other useful resource(s):

1. NPTEL course contents
2. Relevant research articles

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3	T-3	35	2 Hours	Entire Syllabus
4	Teaching Assessment	25	Entire Semester	Assignment (2) - 10 Quizzes (2) - 10 Attendance - 5

BASIC ELECTRICAL ENGINEERING FOR LIFE SCIENCES

COURSE CODE:

COURSE CREDITS: 4

CORE/ELECTIVE: Core

L-T-P: 3-1-0

Course Objectives:

1. To understand the fundamentals of KVL,KCL and various circuit elements.
2. Analysis the response of electrical circuit using DC and AC source.
3. To understand the working of Transformer and different biomedical instruments.

Course Outcomes:

S.No.	Course Outcomes	Level of Attainment
CO-1	Understand the basics of DC circuit and analyzing various DC theorems.	Usage
CO-2	Understanding AC circuits and analyzing different single-phase AC circuits.	Usage
CO-3	Understanding sinusoidal steady state analysis of various AC circuits.	Assessment
CO-4	Understanding the working and construction of Transformer and its various parameters.	Usage
CO-5	Understanding acquisition of Biomedical signals and images through electrodes and imaging modalities respectively.	Familiarity

Course Contents:

Unit	Contents	Lectures required
1	DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, series and parallel combination of elements, star and delta connections, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation using Node and Mesh analysis. Superposition, Thevenin and Norton Theorems, and Maximum Power theorem	**14**
2	Time-domain analysis of first-order RL and RC circuits.AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation. Analysis of single-phase AC circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance.Representation of sine function, phasor diagrams, impedances and admittances,	**14**

	RMS and average power, Peak and Form Factor.	
3	Transformers: Magnetic materials, Construction and working principle of transformer, BH characteristics, ideal and practical transformer, equivalent circuit, Step-up and step-down transformers, losses in transformers, regulation and efficiency. Introduction to biomedical signals, Acquisition of ECG, EEG, EMG, EOG and ERG. Working principle, advantages and limitations of X-ray, CT, MRI, Ultrasound, PET and SPECT	**14**
Total lectures		**42**

Suggested Text Book(s):

1. W.H. Hayt, J. E. Kemerlay& S.M. Durbin, "Engineering Circuit Analysis", 6th Ed. , TATA McGraw Hill,2006
2. R. S Khandpur and Raghbir Khandpur, "Biomedical Instrumentation", 2nd Ed., TATA McGraw-Hill,2003.

Suggested Reference Book(s):

1. Nandini K. Jog, "Electronics in Medicine and Biomedical Instrumentation", 2nd Ed., Prentice-Hall India Ltd, 2013
2. OzgurErgul, "Introduction to Electrical Circuit Analysis", 1st Ed., Wiley,2017.

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment - 10 Quizzes-10 Attendance - 5

Course Outcomes (COs) contribution to the Programmed Outcomes (POs)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Average
CO1	3	3	3	3	2	3	X	X	1	1	1	3	**1.92**
CO2	3	3	3	3	2	3	X	X	1	1	1	3	**1.92**
CO3	3	3	3	3	2	3	X	X	1	1	1	3	**1.92**
CO4	3	3	1	1	2	3	X	X	1	1	2	3	**1.67**
CO5	3	1	1	X	3	3	1	3	1	1	3	3	**1.92**
Average	**3.00**	**2.60**	**2.20**	**2.00**	**2.20**	**3.00**	**0.20**	**0.60**	**1.00**	**1.00**	**1.60**	**3.00**	

CO-PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	Average
CO1	3	3	3	3	**3.00**
CO2	3	3	3	3	**3.00**
CO3	3	3	3	3	**3.00**
CO4	1	3	2	3	**2.25**
CO5	1	2	2	3	**2.00**
Average	**2.20**	**2.80**	**2.60**	**3.00**	

Basic Electrical Engineering for Life Sciences Lab

COURSE CODE:

COURSE CREDITS: 1

CORE/ELECTIVE: CORE: Core

L-T-P: 0-0-2

Pre-requisite: None

Course Objectives:

1. Fundamentals of Ohm's law, Kirchhoff's current and voltage laws and its practical implementation
2. Measurement of voltage, current, power and impedance of any circuit
3. Analysis of a given circuit depending on types of elements - DC analysis, Transient analysis and Frequency analysis
4. Measurement of frequency and amplitude of any signal using CRO
5. Designing of circuits (at least proto type models) for a given set of specifications weather in time domain or in frequency domain

Course Outcomes:

S. No.	Course Outcomes	Level of Attainment
CO1	Practical implications of the fundamentals of Ohm's law, Kirchhoff's current and voltage laws.	Usages
CO2	Accurate measurement of voltage, current, power and impedance of any circuit.	Usages
CO3	DC analysis, Transient analysis and Frequency analysis of a given circuit depending on types of elements.	Usages
CO4	Using DSO to measure the frequency, and amplitude of any signal.	Usages
CO5	Practical implementation of the fundamental electrical theorems and modeling of simple electrical systems.	Usages
CO6	Teamwork skills for working effectively in groups and develop analytical skills to compare experimental results with theoretical concepts.	Assessment

List of Experiments

S. No	Description	Hours
1	Introduction to Power supply &Multimeter.	**2**
2	To determine the equivalent resistance of a circuit using color code and to verify it using a multimeter	**2**
3	To verify Voltage dividing rule and Kirchoff's Voltage Law (KVL)	**2**
4	To verify Current dividing rule and Kirchoff's Current Law (KCL)	**2**
5	To verify Delta to Star and Star to Delta conversion.	**2**
6	To verify Superposition Theorem	**2**
7	To verify Thevenin's Theorem	**2**
8	To verify Norton's Theorem	**2**
9	To verify Maximum Power Transfer Theorem	**2**
10	To verify reciprocity theorem	**2**
11	Introduction to CRO & Function Generator	**2**
12	To study the transient response of series RC circuits using different values of R and C	**2**
Total Lab hours		**24**

Suggested/Resources:

1. W.H. Hayt, J. E. Kemerlay& S.M. Durbin, "Engineering Circuit Analysis", Eighth Edition, McGraw Hill, 2012 2.
2. Van Valkenburg, "Network Analysis", Prentice-Hall India, 2001.

Evaluation Scheme:

1	Mid Sem. Evaluation	20 Marks
2	End Sem. Evaluation	20 Marks
3	Attendance	15 Marks
4	Lab Assessment	45 Marks
	Total	100 marks

Course Outcomes (COs) contribution to the Program Outcomes (POs)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Average
CO1	3	3	3	2	2	2	3	1	1	1	1	1	**1.92**
CO2	3	3	3	2	3	1	1	1	1	1	1	3	**1.92**
CO3	3	3	2	3	2	3	2	1	1	1	2	1	**2.00**
CO4	3	3	3	2	3	2	1	1	1	1	1	1	**1.83**
CO5	3	2	3	3	3	2	1	1	1	1	1	1	**1.83**
C06	3	3	3	3	2	2	2	3	2	2	2	2	**2.41**
Average	**3.00**	**2.83**	**2.83**	**2.50**	**2.50**	**2.00**	**1.67**	**1.33**	**1.67**	**1.67**	**1.30**	**1.50**	

Data Structure and Algorithms

COURSE CODE: 18B11CI211

COURSE CREDIT: 3

CORE/ELECTIVE: CORE

L-T-P: 3-0-0

Pre-requisites: C/C++

Course Objectives:

1. To impart the basic concepts of data structures and algorithms.
2. To understand concepts about searching and sorting techniques
3. To understand basic concepts about stacks, queues, lists, trees and graphs.
4. To enable them to write algorithms for solving problems with the help of fundamental data structures
5. Introduce students to data abstraction and fundamental data structures.

Course Outcomes:

S.No.	Course Outcomes	Level of Attainment
CO-1	To gain knowledge on the notions of data structure, Abstract Data Type.	Familiarity
CO-2	For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness.	Assessment
CO-3	For a given Search problem (Linear Search and Binary Search) student will able to implement it.	Assessment
CO-4	For a given problem of Stacks, Queues and linked list student will able to implement it and analyze the same to determine the time and computation complexity.	Assessment
CO-5	Student will able to implement Graph search and traversal algorithms and determine the time and computation complexity.	Assessment
CO-6	Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.	Usage

Course Contents:

Unit	Contents	Lectures required
1	**Introduction:** Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. Searching: Linear Search and Binary Search Techniques and their complexity analysis.	7
2	**Stacks:** ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis.	5
3	**Queues:** ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.	5
4	**Linked Lists:** Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.	8
5	**Trees:** Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.	6
6	**Sorting and Hashing:** Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.	6
7	**Graph:** Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.	5
Total lectures		42

Suggested Text Book(s):

1. "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press

Suggested Reference Book(s):

1. "Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company

2. "How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson Education.
3. "Data structures and Algorithms Made Easy" 5th edition by Narasimha Karumanchi, Career monk publications
4. "Data Stru**c**ture and Algorithms in C" 2nd edition by Mark Allen Weiss (2002), Pearson Education

Other useful resource(s):

1. Link to NPTEL course contents: https://nptel.ac.in/courses/106102064/
2. Link to topics related to course:
   a. https://onlinecourses.nptel.ac.in/noc18_cs25/preview
   b. https://nptel.ac.in/courses/106103069/
   c. http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment (2) - 10 Quizzes (2) - 10 Attendance - 5

Course Outcomes (COs) contribution to the Programme Outcomes(POs)

Course Outcomes (Data Structure and Algorithms)	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	Average
CO-1	3	3	3	2	2	3	2	2	2	3	1	3	**2.4**
CO-2	3	3	3	2	3	2	3	2	2	3	1	3	**2.5**
CO-3	3	3	3	2	2	3	1	2	3	3	1	3	**2.4**
CO-4	3	3	3	2	3	3	2	2	3	3	1	3	**2.6**
CO-5	3	3	3	2	3	3	2	2	3	3	1	3	**2.6**
CO-6	3	3	3	2	3	3	2	2	2	3	1	3	**2.5**
Average	**3**	**3**	**3**	**2**	**2.7**	**2.8**	**2**	**2**	**2.5**	**3**	**1**	**3**	

Course Outcomes (COs) contribution to the Programme Outcomes(POs)

Course outcomes (Bioinstrumentation Techniques)	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	Average
CO-1	3	3	2	3	1	1	1	1	1	1	1	3	**1.75**
CO-2	3	3	3	3	2	1	1	1	2	1	1	3	**2.00**
CO-3	3	3	3	3	3	1	1	2	2	1	1	3	**2.16**
CO-4	3	3	3	3	3	2	2	2	2	1	2	3	**2.42**
CO-5	3	3	3	3	2	2	1	1	1	1	1	1	**1.83**
Average	**3.00**	**3.00**	**2.80**	**3.00**	**2.20**	**1.40**	**1.20**	**1.40**	**1.60**	**1.00**	**1.20**	**2.60**	

Data Structure and Algorithms Lab

COURSE CODE: 18B17CI271

COURSE CREDITS: 2

CORE/ELECTIVE: CORE

L-T-P: 0-0-4

Pre-requisites: None

Course Objectives:

1. Develop problem solving ability using Programming
2. Develop ability to design and analyze algorithms
3. Introduce students to data abstraction and fundamental data structures
4. Develop ability to design and evaluate Abstract Data Types and data structures
5. Apply data structure concepts to various examples and real life applications

Course outcomes:

S.No.	Course Outcomes	Level of Attainment
CO-1	To gain knowledge on the notions of data structure, Abstract Data Type	Familiarity
CO-2	To have hands on skills to evaluate different kinds of linked lists and their applications in day to day problem solving.	Usage
CO-3	To have hands on skills to evaluate different kinds stacks and their applications and implementations in day to day problem solving	Assessment
CO-4	To have hands on skills to evaluate different kinds queues and their applications and implementations in simulations.	Assessment
CO-5	To acquire knowledge of various sorting algorithms	Usage
CO-6	To learn Searching: Balanced tree, red-black tree, lower bounds for searching	Usage
CO-7	To learn to code for operations on Tree or BST (Creation; Traversinglike pre-order,post-order and in-order; Searching element; finding height etc.)	Usage
CO-8	Introduction to Heaps	Usage
CO-9	To learn to code for operations on Graphs (Creation; entering info, printing output and deleting; traversal of BFS and DFS algorithm)	Assessment

List of Experiments:

S.No	Description	Hours
1	**Getting acquainted with** a) Arrays and Strings, Structures, b) Recursion, Pointers c) Dynamic memory allocation	 2 4 4
2	**Operations on: (Creation, insertion, deletion, sorting, traversing, reversing**	

	etc) a) Linear Linked List, b) Doubly and c) Circular Linked List	 4 4 2
3	**Operations on Stacks:** a) Creation; pushing; popping; b) testing underflow, overflow; c) prefix and postfix	 4 2 2
4	**Operations on Queues:** a) Creation; b) enqueue; dequeue; c) testing underflow, overflow	 4 2 2
5	**Operations on Tree or BST:** Creation; a) Traversing like preorder, post-order and in-order; b) Searching element; finding height etc.	 4 2
6	**Implementation of sorting algorithms 1:** Insertion Sort and Selection Sort Algorithm with arrays using dynamic memory allocation.	2
7	**Implementation of sorting algorithms 2:** Bubble Sort and Merge Sort Algorithm with arrays using dynamic memory allocation.	2
8	**Implementation of sorting algorithms 3:** Implementation of Radix Sort and Quick Sort Algorithm with arrays using dynamic memory allocation.	2
9	**Operation on Heaps:** a) Heaps, b) Heap Sort	 2 2
10	**Implementation of Searching algorithms:** Linear Search Algorithm and Binary Search Algorithm using dynamic memory allocation.	2
11	**Operations on Graphs :** (Creation; entering info; printing Output and deleting; traversal of BFS and DFS algorithm etc.)	2
Total Lab hours		**56**

Minor Project(s) – (*Only for 2 credit lab)*

- Design GUI based program to solve any binary equation.
- Design GUI based program to find the roots of quadratic equation.
- Design a program that picks the characters at equal interval from the given text/paragraph and generate a new paragraph in which each set of word can't have more than 4 characters. Last word of the paragraph can have <=4 characters.
- Program to input following data into disk file. Code, name, department and salary of employee in a firm. After creating file read the file and find following-
  Methodology algorithms Code execution Future scope
  Count number of employees as per department Search record of employee
  Display record of employee
  Display list of employee in alphabetical order as per department Read record from file

Suggested Books/Resources:

1. *Langsam, Augestein, Tenenbaum : Data Structures using C and C++, 2nd Edn, 2000, Horowitz and Sahani : Fundamental of Data Structures in C, 2nd Edn, 2008*
2. Weiss : Data Structures and Algorithm Analysis in C/C++, 3rd Edn, 2006
3. Sahani : Data Structures, Algorithms and applications in C++, 1997.
4. Corman et al : Introduction to Algorithms, 3rd Edn., 2009
5. http://www.nptel.iitm.ac.in/video.php?subjectId=106102064, last accessed Mar 13, 2014.
6. http://www.cs.auckland.ac.nz/~jmor159/PLDS210/ds_ToC.html, last accessed Mar 13, 2014.
7. http://courses.cs.vt.edu/csonline/DataStructures/Lessons/index.html, last accessed Mar 13, 2014.
8. Link to topics related to course:
   a. http://cse.iitkgp.ac.in/~pallab/pds16/pds16.htm
   b. https://onlinecourses.nptel.ac.in/programming101/preview

Evaluation Scheme:

1	Mid Sem. Evaluation	20 Marks
2	End Sem. Evaluation	20 Marks
3	Attendance	15 Marks
4	Lab Assessment	45 Marks
	Total	100 marks

Course Outcomes (COs) contribution to the Programme Outcomes(POs)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Average
CO-1	3	2	3	2	2	3	3	3	2	3	2	2	**2.5**
CO-2	3	3	3	2	3	3	3	3	2	3	2	3	**2.8**
CO-3	3	3	3	2	2	3	3	3	3	3	2	2	**2.7**
CO-4	3	3	3	3	3	3	3	2	2	3	3	3	**2.8**
CO-5	3	3	3	2	2	2	3	3	3	3	2	2	**2.6**
CO-6	3	3	3	3	3	3	3	2	2	3	3	3	**2.8**
CO-7	3	3	3	3	3	3	2	2	3	3	3	3	**2.8**
CO-8	3	3	3	2	3	3	3	3	3	3	2	3	**2.8**
CO-9	3	3	2	3	3	3	3	3	3	2	3	3	**2.8**
Average	**3**	**2.9**	**2.9**	**2.4**	**2.7**	**2.9**	**2.9**	**2.7**	**2.6**	**2.9**	**2.4**	**2.7**	

Workshop Practices

COURSE CODE:18B17GE171

COURSE CREDITS: 1.5

CORE/ELECTIVE: CORE

L-T-P: 0-0-3

Pre-requisite: Concrete Technology Course Objectives:

1. To learn the basics of different workshop practices by understanding and implementing used in different shops of workshop.

Course Outcomes:

S.No.	Course Outcomes	Level of Attainment
CO1	Study of various carpentry processes and its applications in carpentry	Familiarity
CO2	Study and practice the use of various carpentry tools for different carpentry processes	Familiarity
CO3	Study and manufacturing of different wood working joints	Assessment
CO4	Study the principles, classification and application of different welding processes	Usage
CO5	Study and Manufacturing of various welding joints using electric arc welding and gas welding	Usage

List of Experiments

S.NO.	Subtitle	Topics
1.	Carpentry	To Study the carpentry processes
		To study and identify carpentry tools
		To prepare a T-Lap Joint
		To prepare Motise-tenon joint
		To prepare corner joint
2.	Welding	To study the different welding processes with mechanism
		To prepare lap welding joint
		To prepare butt welding joint
3.	Sheet Metal work	To cut and prepare V joint from metal using hexablade
4.	Turning	To study the lathe machine and its operation with one turning job

Suggested/Resources:

1. Workshop Practices by S.K. Hajra and Chaudhary

Evaluation Scheme:

1	Mid Sem. Evaluation	20 Marks
2	End Sem. Evaluation	20 Marks
3	Attendance	15 Marks
4	Lab Assessment	45 Marks
	Total	100 marks

Course Outcomes (COs) contribution to the Programme Outcomes(POs)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Average
CO1	3	3	3	3	2	2	1	1	1	1	1	1	**1.83**
CO2	3	3	3	3	3	1	1	1	1	1	1	3	**2.00**
CO3	3	3	2	3	2	3	2	1	1	1	2	1	**2.00**
CO4	3	3	3	2	3	2	1	1	1	1	1	1	**1.83**
CO5	2	2	3	3	3	3	1	1	1	1	1	1	**1.83**
Average	**2.80**	**2.80**	**2.80**	**2.80**	**2.60**	**2.20**	**1.20**	**1.00**	**1.00**	**1.00**	**1.20**	**1.40**	

UNIVERSAL HUMAN VALUES II: UNDERSTANDING HARMONY

COURSE CODE: 23B11HS211

COURSE CREDITS: 3

CORE/ELECTIVE: Core

L-T-P: 2-1-0

Pre-requisite: None

Objective:

1. Development of a holistic perspective based on self-exploration about themselves (human being), Family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/ existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Outcomes:

S. No.	Course Outcomes	Level of Attainment
CO-1	Self Awareness, Social awareness (family, society, nature).Sustainability in relationships and Critical thinking	Familiarity
CO-2	Introspection and self reflection	Assessment
CO-3	Sensitive to commitment towards human values, human relationship and human society.	Usage
CO-4	Developing commitment and courage	Usage

Course Contents:

Unit	Contents	Lectures required
1	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education** • Purpose and motivation for the course, recapitulation from Universal Human Values-I • Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self- exploration • Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority • Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario • Method to fulfill the above human aspirations:	7

	understanding and • living in harmony at various levels.	
2	**Understanding Harmony in the Human Being - Harmony in Myself!** • Understanding human being as a co-existence of the sentient 'I' and the material 'Body' • Understanding the needs of Self ('I') and 'Body' - happiness and physical facility • Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) • Understanding the characteristics and activities of 'I' and harmony in 'I' • Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail • Programs to ensure Sanyam and Health.	**5**
3	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship** • Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship • Understanding the meaning of Trust; Difference between intention and competence • Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship • Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals • Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.	**6**
4	**Understanding Harmony in the Nature and Existence - Whole existence as Coexistence** • Understanding the harmony in the Nature • Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self regulation in nature • Understanding Existence as Co-existence of mutually interacting units in all-pervasive space • Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home"	**5**

	can be used), pollution, depletion of resources and role of technology etc.	
5	**Implications of the above Holistic Understanding of Harmony on Professional Ethics** • Natural acceptance of human values • Definitiveness of Ethical Human Conduct • Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order • Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. • Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations	**5**
	Total Lecture Hours	**28**

Suggested Text Book(s):

- Text Book 1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Suggested Reference Book(s):

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999. 2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Attendance - 5 Class Performance/Assignment - 10 Quiz-10