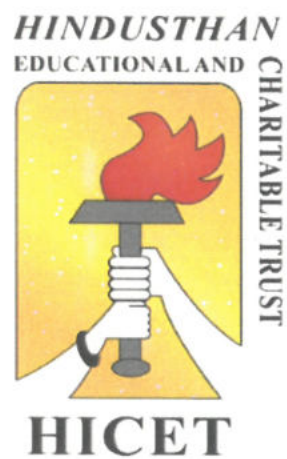


HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution, Affiliated to Anna University, Chennai
Approved by AICTE, New Delhi & Accredited by NAAC with 'A' Grade)
Coimbatore – 641 032

B.E. AGRICULTURE ENGINEERING



Curriculum & Syllabus

2019-2020

CHOICE BASED CREDIT SYSTEM

VISION AND MISSION OF THE INSTITUTION

VISION

To become a premier institution by producing professionals with strong technical knowledge, innovative research skills and high ethical values.

MISSION

1M1: To provide academic excellence in technical education through novel teaching methods.

1M2: To empower students with creative skills and leadership qualities.

1M3: To produce dedicated professionals with social responsibility.

VISION AND MISSION OF THE DEPARTMENT

VISION

To become a department of excellence in agricultural engineering by producing socially conscious professionals with good technical knowledge and innovative skill sets.

MISSION

MI: To impart strong technical knowledge in agricultural engineering through conducive learning environment.

M2: To empower students with innovative skill sets to address agricultural issues.

M3: To produce socially responsible agricultural professionals and provide sustainable solutions


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AGRI - HiCET**





**Dean (Academics)
HiCET**

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

- PO 1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO 2. 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.
- PO 3. 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.
- PO 4. 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.
- PO 5. 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.


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PO 6. 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.

PO 7. 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.

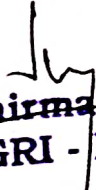
PO 8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9. 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.

PO 11 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 technology


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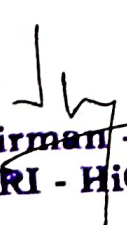

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PROGRAM SPECIFIC OUTCOMES (PSOs)


- PSO 1. Ability to understand agricultural scenario in World and India and superimpose agricultural engineering technologies for uplifting the agriculture.
- PSO 2. Ability to solve various issues in agriculture by infusing farm mechanization, conservation strategies for soil, water and renewable energy, advanced irrigation techniques and post harvest technology.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- PEO 1. Graduates shall exhibit their sound theoretical, practical skills and knowledge for being a successful professional.
- PEO 2. Graduates shall be creative with leadership qualities and lifelong learning skills.
- PEO 3. Graduates shall hold high ethical values and be able to devise sustainable solutions to address agricultural issue.


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CURRICULUM



Hindusthan College of Engineering and Technology

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Coimbatore, Tamil Nadu.



DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E. AGRICULTURE ENGINEERING

REGULATION - 2016 & 2019

REGULATION-2019

For the students admitted during the academic year 2019-2020 and onwards

SEMESTER I

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19HE1101	Technical English	HS	3	0	0	3	25	75	100
2	19MA1102	Calculus and Linear Algebra	BS	3	1	0	4	25	75	100
3	19ME1101	Basics of Civil and Mechanical Engineering	ES	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
4	19PH1151	Applied Physics	BS	2	0	2	3	50	50	100
5	19CY1151	Chemistry for Engineers	BS	2	0	2	3	50	50	100
6	19CS1151	Python programming and practices	ES	2	0	2	3	50	50	100
PRACTICAL										
7	19HE1071	Value Added Course I: Language competency enhancement course - I	HS	0	0	2	1	100	-	100
Total :				15	1	8	20	325	375	700
As per AICTE 3 weeks Induction programme is Added in the First Semester as an Audit Course										



SEMESTER II

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19HE2101	Business English for Engineers	HS	3	0	0	3	25	75	100
2	19MA2101	Differential Equations and Complex Variables	BS	3	1	0	4	25	75	100
3	19AG2104	Principles of Food Sciences	ES	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
4	19PH2151	Material Science	BS	2	0	2	3	50	50	100
5	19CY2151	Environmental Studies	BS	2	0	2	3	50	50	100
6	19IT2151	Programming in C	ES	2	0	2	3	50	50	100
PRACTICAL										
7	19ME2001	Engineering Practices Laboratory	ES	0	0	4	2	50	50	100
8	19HE2071	Language Competency Enhancement Course II	HS	0	0	2	1	100	0	100
Total :				15	1	12	22	375	425	800

For the students admitted during the academic year 2018-2019 and onwards

SEMESTER III

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	16MA3111	Fourier Analysis and Z Transforms	BS	3	1	0	4	25	75	100
2	16AG3201	Soil Science and Engineering	PC	3	0	0	3	25	75	100
3	16AG3202	Fluid Mechanics and Hydraulics	ES	3	1	0	4	25	75	100
4	16ME3232	Theory of Machines and Mechanisms	ES	3	0	0	3	25	75	100
5	16CE3231	Surveying and Leveling	ES	3	0	0	3	25	75	100
6	16ME3233	Thermodynamics	ES	3	1	0	4	25	75	100
PRACTICAL										
7	16AG3001	Fluid Mechanics Lab	ES	0	0	4	2	50	50	100
8	16CE3031	Surveying and Leveling Lab	ES	0	0	4	2	50	50	100
Total				18	3	8	25	250	550	800

SEMESTER IV



S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	16MA4112	Applied Statistics and Numerical methods	BS	3	0	2	4	25	75	100
2	16AG4201	Unit Operations in Agricultural Processing	PC	3	0	0	3	25	75	100
3	16AG4202	Farm Tractors	PC	3	0	0	3	25	75	100
4	16AG4203	Hydrology and Water Resources Engineering	PC	3	0	0	3	25	75	100
5	16AG4204	Irrigation and Drainage Engineering	PC	3	0	0	3	25	75	100
6.	16ME4231	Strength of Materials	ES	3	0	0	3	25	75	100
PRACTICAL										
7	16AG4001	Soil Science Lab	PC	0	0	4	2	50	50	100
8	16AG4002	Irrigation Field Lab	PC	0	0	4	2	50	50	100
Total				18	0	10	23	250	550	800

CREDIT DISTRIBUTION – R 2016

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	27	25	25	23	19	24	28	16	187

CREDIT DISTRIBUTION – R 2019

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	20	22	20	21	22	22	20	18	165



Chairman, Board of Studies

**Chairman - BoS
AGRI - HiCET**



Dean – Academics

**Dean (Academics)
HiCET**



Principal

PRINCIPAL
Hindusthan College of Engineering & Technology,
COIMBATORE - 641 032



SYLLABUS

SEMESTER I

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19HE1101	TECHNICAL ENGLISH (COMMON TO ALL BRANCHES)	3	0	0	3

Course Objective	• It facilitates students to communicate effectively with coherence.
	• The student will get trained in descriptive communication.
	• The trainee will be introduced to professional communication.
	• It enhances knowledge and provides the information on corporate environment.
	• The learner will equip with problem solving skills.

Unit	Description	Instructional Hours
I	Listening and Speaking – Opening a conversation, maintaining coherence, turn taking, closing a conversation (excuse, general wishes, positive comments and thanks) Reading –Reading an article from newspaper, Reading comprehension Writing Chart analysis, process description, Writing instructions Grammar and Vocabulary- Tenses, Regular and irregular verb, technical vocabulary	9
II	Listening and Speaking- listening to product description, equipment & work place (purpose, appearance, function) Reading- Reading technical articles Writing- Letter phrases, writing personal letters, Grammar and Vocabulary-articles, Cause & effect, Prepositions.	9
III	Listening and Speaking- - listening to announcements Reading- Reading about technical inventions, research and development Writing- Letter inviting a candidate for interview, Job application and resume preparation Grammar and Vocabulary- Homophones and Homonyms.	9
IV	Listening and Speaking- - Practice telephone skills and telephone etiquette (listening and responding, asking questions).Reading- Reading short texts and memos Writing- invitation letters, accepting an invitation and declining an invitation Grammar and Vocabulary- Modal verbs, Articles, Collocation, Conditionals, Subject verb agreement.	9
V	Listening and Speaking- listening to technical group discussions and participating in GDs Reading-reading biographical writing - Writing- Proposal writing, Writing definitions, Grammar and Vocabulary- Abbreviation and Acronym, Prefixes & suffixes, phrasal verbs, Idioms.	9
Total Instructional Hours		45

Course Outcome	CO1- Trained to maintain coherence and communicate effectively.
	CO2- Practiced to create and interpret descriptive communication.
	CO3- Introduced to gain information of the professional world
	CO4- acquired various types of communication and etiquette.
	CO5- Taught to improve interpersonal and intrapersonal skills.

TEXT BOOKS:

- T1 Norman Whitby, "Business Benchmark-Pre-intermediate to Intermediate", Cambridge University Press, 14
T2 Ian Wood and Anne Williams. "Pass Cambridge BEC Preliminary", Cengage Learning press 2013.

REFERENCE BOOKS:

- R1 Meenakshi Raman and Sangeetha Sharma. "Technical Communication- Principles and Practice", Oxford University Press, 2009
R2 Rizvi, Ashraf. M. Effective Technical Communication. Tata McGraw-Hill, 2005.
R3 Kamalesh Sadanan "A Foundation Course for the Speakers of Tamil-Part-I &II", Orient Blackswan, 2010.



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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19MA1102	CALCULUS AND LINEAR ALGEBRA (COMMON TO AERO, AUTO, MECH, MECHT, FOOD, AGRI & CIVIL)	3	1	0	4

Course Objective	Description
	1. Understand the concept of differentiation. 2. Evaluate the functions of several variables which are needed in many branches of engineering. 3. Understand the concept of double integrals. 4. Understand the concept of triple integrals. 5. Develop the skill to use matrix algebra techniques that is needed by engineers for practical applications.

Unit	Description	Instructional Hours
	DIFFERENTIAL CALCULUS	
I	Rolle's Theorem – Lagrange's Mean Value Theorem- Maxima and Minima – Taylor's and Maclaurin's Theorem.	12
	MULTIVARIATE CALCULUS (DIFFERENTIATION)	
II	Total derivatives - Jacobians – Maxima, Minima and Saddle points - Lagrange's method of undetermined multipliers – Gradient, divergence, curl and derivatives.	12
	DOUBLE INTEGRATION	
III	Double integrals in Cartesian coordinates – Area enclosed by the plane curves (excluding surface area) – Green's Theorem (Simple Application) - Stoke's Theorem – Simple Application involving cubes and rectangular parelloiped.	12
	TRIPLE INTEGRATION	
IV	Triple integrals in Cartesian co-ordinates – Volume of solids (Sphere, Ellipsoid, Tetrahedron) using Cartesian co-ordinates. Gauss Divergence Theorem – Simple Application involving cubes and rectangular parelloiped.	12
	MATRICES	
V	Eigen values and Eigen vectors – Properties of Eigen values and Eigen vectors (without proof) - Cayley - Hamilton Theorem (excluding proof) - Reduction of a quadratic form to canonical form by orthogonal transformation.	12
Total Instructional Hours		60

Course Outcome	Description
	CO1: Apply the concept of differentiation in any curve.
	CO2: Identify the maximum and minimum values of surfaces.
	CO3: Apply double integrals to compute area of plane curves.
	CO4: Evaluation of triple integrals to compute volume of solids.
	CO5: Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural frequencies (or Eigen frequencies) of vibration and the shapes of these vibrational modes.

TEXT BOOKS:

- T1 Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India Private Ltd., New Delhi, 2018.
 T2 Veerarajan T, "Engineering Mathematics", McGraw Hill Education (India) Pvt Ltd, New Delhi, 2016.

REFERENCE BOOKS:

- R1 Thomas & Finney "Calculus and Analytic Geometry", Sixth Edition, Narosa Publishing House, New Delhi
 R2 Bali N.P & Manish Goyal, "A Text book of Engineering Mathematics", 8th Edition, Laxmi Pub. Pvt. Ltd. 2011.
 R3 Grewal B.S, "Higher Engineering Mathematics", 42nd Edition, Khanna Publications, Delhi, 2012.


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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19ME1101	BASICS OF CIVIL AND MECHANICAL ENGINEERING	3	0	0	3

- Course Objective**
1. To learn about the working principles of IC engines and detailed explanation of components of power plant units.
 2. To study Refrigeration and Air Conditioning system.
 3. To impart basic knowledge on Civil and Mechanical Engineering
 4. To study materials used for the construction of civil structures.
 5. To gain knowledge on the fundamentals of construction of structure

Unit	Description	Instructional Hours
A – MECHANICAL ENGINEERING		
IC ENGINES		
I	Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines.	9
POWER PLANT ENGINEERING		
II	Introduction. Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits –Power Transmission in conveyor systems- Pumps– working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.	9
REFRIGERATION AND AIR CONDITIONING SYSTEM		
III	Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.	9
B – CIVIL ENGINEERING		
SURVEYING AND CIVIL ENGINEERING MATERIALS		
IV	Surveying: Objects – types – classification – principles – measurements of distances Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel sections-Woods-Plastics.	9
BUILDING COMPONENTS AND STRUCTURES		
V	Foundations: Types, Bearing capacity – Requirement of good foundations. Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Types of Bridges and Dams.	9
Total Instructional Hours		45

COURSE OUTCOMES

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

CO1: Demonstrate working principles of petrol and diesel engine.
CO2: Identify the components used in power plant cycle
CO3: Explain the components of Refrigeration and Air conditioning cycle.
CO4: Explain the usage of construction material and proper selection of construction materials.
CO5: Understand the building structures.

TEXT BOOKS:

- T1 Venugopal K. and Prabhu Raja V., —Basic Mechanical EngineeringI, Anuradha Publishers, Kumbakonam, 2010.
- T2 Shanmugam G and Palanichamy M S, —Basic Civil and Mechanical EngineeringI, Tata M Graw Hill Publishing Co., New Delhi, 2000

REFERENCE BOOKS:

- R1 Ramamrutham S., — Basic Civil EngineeringI, Dhanpat Rai Publishing Co. (P) Ltd.2004.
- R2 Seetharaman S., — Basic Civil EngineeringI, Anuradha Agencies, 2005.
- R3 Shantha Kumar S R J., — Basic Mechanical EngineeringI, Hi-tech Publications,



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Programme B.E.	Course Code 19PH1151	Name of the Course APPLIED PHYSICS	L 2	T 0	P 2	C 3
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Course Objective	The student should be able to
	1. Enhance the fundamental knowledge in properties of matter
	2. Analysis the oscillatory motions of particles
	3. Extend the knowledge about wave optics
	4. Gain knowledge about laser and their applications
	5. Conversant with principles of optical fiber, types and applications of optical fiber

Unit	Description	Instructional Hours
I	PROPERTIES OF MATTER Elasticity – Hooke's law – Stress-strain diagram - Poisson's ratio – Bending moment – Depression of a cantilever – Derivation of Young's modulus of the material of the beam by Uniform bending theory and experiment.	6
	Determination of Young's modulus by uniform bending method	3
II	OSCILLATIONS Translation motion –Vibration motion – Simple Harmonic motion – Differential Equation of SHM and its solution – Damped harmonic oscillation - Torsion stress and deformations – Torsion pendulum: theory and experiment.	6
	Determination of Rigidity modulus – Torsion pendulum	3
III	WAVE OPTICS Conditions for sustained Interference – air wedge and its applications - Diffraction of light – Fresnel and Fraunhofer diffraction at single slit –Diffraction grating – Rayleigh's criterion of resolution power - resolving power of grating.	6
	Determination of wavelength of mercury spectrum – spectrometer grating	3
	Determination of thickness of a thin wire – Air wedge method	3
IV	LASER AND APPLICATIONS Spontaneous emission and stimulated emission – Population inversion – Pumping methods – Derivation of Einstein's coefficients (A&B) – Type of lasers – Nd:YAG laser and CO ₂ laser- Laser Applications – Holography – Construction and reconstruction of images.	6
	Determination of Wavelength and particle size using Laser	3
V	FIBER OPTICS AND APPLICATIONS Principle and propagation of light through optical fibers – Derivation of numerical aperture and acceptance angle – Classification of optical fibers (based on refractive index, modes and materials) – Fiber optical communication link – Fiber optic sensors – Temperature and displacement sensors.	6
Total Instructional Hours		45

COURSE OUTCOMES	After completion of the course the learner will be able to
	CO1: Illustrate the fundamental properties of matter
	CO2: Discuss the Oscillatory motions of particles
	CO3: Analyze the wavelength of different colors
	CO4: Understand the advanced technology of LASER in the field of Engineering
CO5: Develop the technology of fiber optical communication in engineering field	

TEXT BOOKS:


- T1 Rajendran V, Applied Physics, Tata McGraw Hill Publishing Company Limited, New Delhi, 2017.
T2 Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, DhanpatRai Publications (P) Ltd., New Delhi, 2015.

REFERENCE BOOKS:

- R1 Arthur Beiser "Concepts of Modern Physics" Tata McGraw Hill, New Delhi – 2015
R2 M.N Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company Ltd., New Delhi 2016
R3 Dr. G. Senthilkumar "Engineering Physics – I" VRB publishers Pvt Ltd., 2016



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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CY1151	CHEMISTRY FOR ENGINEERS	2	0	2	3

Course Objective
The student should be conversant with
1. The boiler feed water requirements, related problems and water treatment techniques.
2. The principles of polymer chemistry and engineering applications of polymers and composites.
3. The principles of electrochemistry and with the mechanism of corrosion and its control.
4. The principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.
5. The important concepts of spectroscopy and its applications.

Unit	Description	Instructional Hours
I	WATER TECHNOLOGY Hard water and soft water- Disadvantages of hard water- Hardness: types of hardness, simple calculations, estimation of hardness of water – EDTA method – Boiler troubles - Conditioning methods of hard water – External conditioning - demineralization process - desalination: definition, reverse osmosis – Potable water treatment – breakpoint chlorination.	6
	Estimation of total, permanent and temporary hardness of water by EDTA	3
II	POLYMER & COMPOSITES Polymerization – types of polymerization – addition and condensation polymerization – mechanism of free radical addition polymerization – copolymers – plastics: classification – thermoplastics and thermosetting plastics, preparation, properties and uses of commercial plastics – PVC, Bakelite – moulding of plastics (extrusion and compression); Composites: definition, types of composites – polymer matrix composites (PMC) –FRP	6
	ELECTROCHEMISTRY AND CORROSION Electrochemical cells – reversible and irreversible cells - EMF- Single electrode potential – Nernst equation (derivation only) – Conductometric titrations. Chemical corrosion – Pilling – Bedworth rule – electrochemical corrosion – different types –galvanic corrosion – differential aeration corrosion – corrosion control – sacrificial anode and impressed cathodic current methods - protective coatings – paints – constituents and functions.	6
III	Conductometric titration of strong acid vs strong base (HClvsNaOH).	3
	Conductometric titration (Mixture of strong acid and base).	3
	Conductometric precipitation titration using BaCl ₂ and Na ₂ SO ₄	3
IV	ENERGY SOURCES AND STORAGE DEVICES Introduction- nuclear energy- nuclear fission- controlled nuclear fission- nuclear fusion differences between nuclear fission and fusion- nuclear chain reactions- nuclear reactor power generator- classification of nuclear reactor- light water reactor- breeder reactor. Batteries and fuel cells: Types of batteries- alkaline battery- lead storage battery- lithium battery- fuel cell H ₂ -O ₂ fuel cell applications.	6
	ANALYTICAL TECHNIQUES Beer-Lambert's law – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (block diagram only) – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – estimation of nickel by atomic absorption spectroscopy.	6
V	Determination of iron content of the water sample using spectrophotometer. (1,10 phenanthroline / thiocyanate method).	3
Total Instructional Hours		45

**COURSE
OUTCOMES**

After the completion of the course, the learner will be able to

CO1: Differentiate hard and soft water and to solve the related problems on water purification and its significance in industries and daily life

CO2: Acquire the basic knowledge of polymers, composites and FRP and their significance.

CO3: Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion, its consequences to minimize corrosion to improve industrial design.

TEXT BOOKS:

T1 P.C.Jain and Monica Jain, "Engineering Chemistry" DhanpatRai Pub. Co., New Delhi (2018)

T2 Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, DhanpatRai Publications (P) Ltd., New Delhi, 2015.

REFERENCE BOOKS:

R1 B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2012).

R2 - S.S.Dara "A Text book of Engineering Chemistry" S.Chand& Co. Ltd., New Delhi (2017).



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Programme	Course code	Name of the course	L	T	P	C
B.E.	19CS1151	PYTHON PROGRAMMING AND PRACTICES	2	0	2	3

COURSE OBJECTIVES

1. To know the basics of algorithmic problem solving
2. To read and write simple Python programs
3. To develop Python programs with conditionals and loops and to define Python functions and call them
4. To use Python data structures — lists, tuples, dictionaries
5. To do input/output with files in Python

Unit	Description	Instructional hours
I	ALGORITHMIC PROBLEM SOLVING Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation(pseudo code, flow chart, programming language), algorithmic problem solving, simple strategiesfor developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert acard in a list of sorted cards, guess an integer number in a range. Towers of Hanoi	9
II	DATA, EXPRESSIONS, STATEMENTS Python interpreter and interactive mode; values and types: int, float, boolean, string, and list;variables, expressions, statements, tuple assignment, precedence of operators, comments;modules and functions, function definition and use, flow of execution, parameters and arguments. Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.	7+2(P)
III	CONTROL FLOW, FUNCTIONS Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: returnvalues, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search. LISTS, TUPLES, DICTIONARIES Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, listparameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations andmethods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, merge sort, histogram.	5+4(P)
IV	FILES, MODULES, PACKAGES Files and exception: text files, reading and writing files, format operator; command line arguments,errors and exceptions, handling exceptions, modules, packages. Illustrative programs: word count, copying file contents.	3+6(P)
V	FILES, MODULES, PACKAGES Files and exception: text files, reading and writing files, format operator; command line arguments,errors and exceptions, handling exceptions, modules, packages. Illustrative programs: word count, copying file contents.	5+4(P)
Total instructional hours		45

**COURSE
OUTCOMES**

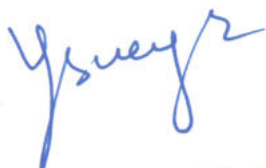
After the completion of the course, the learner will be able to
CO1 - Develop algorithmic solutions to simple computational problems
CO2 - Read, write, execute by hand simple Python programs
CO3 - Structure simple Python programs for solving problems and Decompose a Python program into functions
CO4 - Represent compound data using Python lists, tuples, dictionaries
CO5 - Read and write data from/to files in Python Programs.

TEXT BOOKS:

- T1 Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.6.2, Shroff Publishers, First edition (2017).
T2 S. Annadurai, S.Shankar, I.Jasmine, M.Revathi, Fundamentals of Python Programming, Mc-Graw Hill Education (India) Private Ltd, 2019

REFERENCE BOOKS:

- R1: Charles Dierbach, —Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
R2: Timothy A. Budd, —Exploring Python1, Mc-Graw Hill Education (India) Private Ltd., 2015
R3: Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016



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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19HE1071	VALUE ADDED COURSE I: LANGUAGE COMPETENCY ENHANCEMENT COURSE- I	0	0	2	1

(COMMON TO ALL BRANCHES)

- Course Objective**
1. To enhance student language competency
 2. To train the students in LSRW skills
 3. To develop student communication skills
 4. To empower the trainee in business writing skills.
 5. To train the students to react to different professional situations

Unit	Description	Instructional Hours
	Listening	
I	Listening to technical group discussions and participating in GDs. listening to TED talks. Listen to Interviews & mock interview. Listening short texts and memos.	3
	Reading	
II	Reading articles from newspaper, magazine. Reading comprehension. Reading about technical inventions, research and development. Reading short texts and memos.	3
	Writing	
III	E-mail writing: Create and send email writing (to enquire about some details, to convey important message to all, to place an order, to share your joy and sad moment). Reply for an email writing.	3
	Speaking	
IV	To present a seminar in a specific topic (what is important while choosing or deciding something to do). To respond or answer for general questions (answer for your personal details, about your family, education, your hobbies, your aim etc.,).	3
	Speaking	
V	Participate in discussion or interactions (agree or disagree express your statement with a valid reason, involve in discussion to express your perspective on a particular topics).	3
Total Instructional Hours		15

- Course Outcome**
- CO1- Trained to maintain coherence and communicate effectively.
 - CO2- Practiced to create and interpret descriptive communication.
 - CO3- Introduced to gain information of the professional world.
 - CO4- acquired various types of communication and etiquette.
 - CO5- Taught to improve interpersonal and intrapersonal skills.

TEXT BOOKS:

- T1 Norman Whitby, "Business Benchmark-Pre-intermediate to Intermediate", Cambridge University Press, 2016.
- T2 Raymond Murphy, "Essential English Grammar", Cambridge University Press, 2019

REFERENCE BOOKS:

- R1: Meenakshi Raman and Sangeetha Sharma, "Technical Communication- Principles and Practice", Oxford University Press, 2009.


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SEMESTER II

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19HE2101	BUSINESS ENGLISH FOR ENGINEERS	3	0	0	3

(COMMON TO ALL BRANCHES)

- Course Objective**
1. The learner gets started with business communication.
 2. It trains the students to react to different professional situations.
 3. The student will get familiarize to managerial skills
 4. It empowers business writing skills.
 5. The trainee will learn to interpret and expertise different content.

Unit	Description	Instructional Hours
I	Listening and Speaking – listening and discussing about programme and conference arrangement Reading –reading auto biographies of successful personalities Writing Formal & informal email writing, Recommendations Grammar and Vocabulary - Editing a passage(punctuation and spelling), Adjectives & adverbs	9
II	Listening and Speaking - listening to TED talks Reading - Making and interpretation of posters Writing - Business letters: letters giving good and bad news, Thank you letter, Grateful & pleased Grammar and Vocabulary - Active & passive voice, Spotting errors (Teses. , Preposition, Articles)	9
III	Listening and Speaking -travel arrangements and experience Reading - travel reviews Writing - Business letters (Placing an order, making clarification & complaint letters). Grammar and Vocabulary - Direct and Indirect speech,	9
IV	Listening and Speaking - Role play - Reading - Sequencing of sentence Writing - Business report writing (marketing, investigating) Grammar and Vocabulary - Connectors, Gerund & infinitive	9
V	Listening and Speaking - Listen to Interviews & mock interview Reading - Reading short stories, reading profile of a company - Writing - Descriptive writing (describing one's own experience) Grammar and Vocabulary - Business vocabulary.	9
Total Instructional Hours		45

COURSE OUTCOMES

After the completion of the course, the learner will be able to

CO1: Introduced to different modes and types of business communication.

CO2: Practiced to face and react to various professional situations efficiently.

CO3: learnt to practice managerial skills.

CO4: Familiarized with proper guidance to business writing.

CO5: Trained to analyze and respond to different types of communication

TEXT BOOKS:

T1 Norman Whitby, "Business Benchmark-Pre-intermediate to Intermediate".Cambridge University Press. 2014.)

T2 Michael Mc Carthy, "Grammar for Business", Cambridge University Press, 2009

REFERENCE BOOKS:

R1 Rajeevan kaval. "English Grammar just for you", Oxford University Press 2015.

R2 Bill Mascull, "Business Vocabulary in use: Advanced 2nd Edition", Cambridge University Press, 2009.


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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19MA2101	DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLES (AERO, AUTO, MCT, MECH, CIVIL, FT & AGRI)	3	1	0	4

- Course Objectives**
1. Describe some methods to solve different types of first order differential equations.
 2. Solve ordinary differential equations of certain types using Wronskian technique.
 3. Use the effective mathematical tools for the solutions of partial differential equations.
 4. Describe the construction of analytic functions and conformal mapping.
 5. Illustrate Cauchy's integral theorem and calculus of residues

Unit	Description	Instructional Hours
	FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS	
I	Equations of the first order and of the first degree – Homogeneous equations – Exact differential equations – Linear equations – Equations reducible to the linear form – Bernoulli's equation.	12
	ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER	
II	Second order linear differential equations with constant and variable co-efficients – Cauchy – Euler equations – Cauchy – Legendre equation – Method of variation of paramers.	12
	PARTIAL DIFFERENTIAL EQUATIONS	
III	Formation of partial differential equations by the elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations of the form $f(p,q)=0$, Clairaut's type : $z = px+qy +f(p,q)$ – Lagrange's linear equation.	12
	COMPLEX DIFFERENTIATION	
IV	Functions of complex variables – Analytic functions – Cauchy's – Riemann's equations and sufficient conditions (excluding proof) – Construction of analytic functions – Milne –Thomson's method – Conformal mapping $w = A+z$. Az , $1/z$ and bilinear transformations.	12
	COMPLEX INTEGRATION	
V	Cauchy's integral theorem – Cauchy's integral formula –Taylor's and Laurent's series (statement only) –Residues - Cauchy's Residue theorem.	12
Total Instructional Hours		45+15

- COURSE OUTCOMES**
- CO1: Apply few methods to solve different types of first order differential equations.
CO2: Develop sound knowledge of techniques in solving ordinary differential equations.
CO3 Solve Partial Differential Equations using various methods.
CO4: Infer the knowledge of construction of analytic functions and conformal mapping.
CO5: Evaluate real and complex integrals over suitable closed paths or contours.

TEXT BOOKS:

- T1 Ravish R Singh, Mukul Bhatt, "Engineering Mathematics", McGraw Hill education (India) Private Ltd.,Chennai,2017.
- T2 Veerarajan T, "Engineering Mathematics", McGraw Hill Education(India) Pvt Ltd, New Delhi, 2016

REFERENCE BOOKS:

- R1 Bali N.P & Manish Goyal, "A Text book of Engineering Mathematics", 8th Edition, Laxmi Pub. Pvt. Ltd. 2011.
- R2 Grewal B.S, "Higher Engineering Mathematics", 42nd Edition. Khanna Publications, Delhi. 2012.
- R3 Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage learning,2012.
- R4 Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley and Sons, 2006.
- R5 Wylie & Barrett, "Advanced Engineering Mathematics", McGraw Hill Education, 6th edition, 2003.



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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19AG2104	PRINCIPLES OF FOOD SCIENCES	3	0	0	3

- Course Objectives**
1. To give Introduction on Food Science
 2. To understand various cooking methods.
 3. To learn about cooking qualities
 4. To Study about food additives and quality tests

Unit	Description	Instructional Hours
I	Introduction to Food Science Definition of food. Nutrients - macro and micro constituents. Functions of foods. Food groups. Food Science - Definition - objectives and applications.	9
II	Methods of cooking and sensory evaluation of foods Methods of cooking - moist heat, dry heat and combination methods. Nutrient losses during cooking and processing. Sensory evaluation of foods - methods and applications.	9
III	Cooking qualities of foods Nutritive value, Factors affecting during cooking of foods- Cereals, pulses, nuts and oilseeds, vegetables, milk, meat, fish, egg and poultry. Spices and condiments – types – use in cookery	9
IV	Properties of foods Gelatinization, denaturation, colloids, emulsion, foam, sol, gel, fermentation, crystallization, enzymatic and non - enzymatic browning of foods. Antinutritional factors in foods	9
V	Food additives Classification and role - preservatives, antioxidants, chelating agents, flour improvers, artificial sweeteners, flavours, colours, nutrient enhancement, stabilizers, emulsifier firming agent, leavening and releasing agent. Food fortification - enrichment - need - application in foods. Cooking quality tests - cereals, pulses, vegetables, meat, poultry and fish - Gelatinization of starch - Denaturation of protein, stages of sugar cookery – formation of emulsion - enzymatic and non-enzymatic browning. Leavening agents - clarifying agents - foam and its stability. Food enrichment.	9
Total Instructional Hours		45

The students completing the course will have:

COURSE OUTCOMES

CO1: The students will be able to learn about food science, cooking methods and its quality
CO2: The students will be able to identify the preservation techniques in various food.
CO3: Understand the importance of Cooking qualities of foods
CO4: Understand the Properties of foods and its role
CO5: Understand the Classification and role food additives.

TEXT BOOKS:

- T1 Potter, N. 2005. Food Science. CBS Publishers and Distributors, Delhi.
- T2 Srilakshmi, B. 2005. Food Science. New Age International (P) Ltd., Publishers, New Delhi

REFERENCE BOOKS:

- R1 Benion, M. 1970. Introductory Foods, 8th Edn., The MacMillan Co.London
- R2 Swaminathan, M. 1995. Food Science and Experimental Foods, Ganesh and Co., Madras.
- R3 Bernard, W.M. 1997. Chocolate, cocoa and confectionery: Science and Technology (Third Edition) CBS Publishers and distributors, New Delhi.
- R4 Meyer, L.H. 1991, Food Chemistry, Affiliated East-West Press Pvt.Ltd., New Delhi.
- R5 Desrosier, N.W. and J.N. Desrosier. 2002.The technology of food preservation (4th edition). CBS Publishers and Distributors. New Delhi.



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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19PH2151	MATERIAL SCIENCE	2	0	2	3

Course Objective
The student should be able to
1. Acquire fundamental knowledge of semiconducting materials which is related to the engineering program
2. Extend the knowledge about the magnetic materials
3. Explore the behavior of super conducting materials
4. Gain knowledge about Crystal systems
5. Understand the importance of ultrasonic waves

Unit	Description	Instructional Hours
I	SEMICONDUCTING MATERIALS Introduction – Intrinsic semiconductor – Compound and elemental semiconductor - direct and indirect band gap of semiconductors. Carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination. Optical properties of semiconductor – Light through optical fiber(Qualitative).	6
	Determination of band gap of a semiconductor	3
	Determination of acceptance angle and numerical aperture in an optical fiber	3
II	MAGNETIC MATERIALS Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti ferromagnetic materials – Ferrites and its applications.	6
	B – H curve by Magnetic hysteresis experiment	3
III	SUPERCONDUCTING MATERIALS Superconductivity: properties(Messiner effect, effect of magnetic field, effect of current and isotope effects) – Type I and Type II superconductors –High Tc superconductors – Applications of superconductors –Cryotron and magnetic levitation.	6
IV	CRYSTAL PHYSICS Crystal systems - Bravais lattice - Lattice planes - Miller indices - Interplanar spacing in cubic lattice - Atomic radius, Coordination number and Packing factor for SC, BCC and FCC crystal structures.	6
	ULTRASONICS Production – Magnetostrictive generator – Piezoelectric generator – Determination of velocity using acoustic grating – Cavitations – Viscous force – co-efficient of viscosity. Industrial applications – Drilling and welding – Non destructive testing – Ultrasonic pulse echo system.	6
V	Determination of velocity of sound and compressibility of liquid – Ultrasonic wave	3
	Determination of Coefficient of viscosity of a liquid –Poiseuille’s method	3
Total Instructional Hours		45

COURSE OUTCOMES
After completion of the course the learner will be able to
CO1: Understand the purpose of acceptor or donor levels and the band gap of a semiconductor
CO2: Interpret the basic idea behind the process of magnetism and its applications in everyday
CO3: Discuss the behavior of super conducting materials
CO4: Illustrate the types and importance of crystal systems
CO5: Evaluate the production of ultrasonics and its applications in NDT

TEXT BOOKS:

- T1 Rajendran V, Applied Physics, Tata McGraw Hill Publishing Company Limited, New Delhi, 2017.
T2 T2- Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, DhanpatRai Publications (P) Ltd., New Delhi, 2015.

REFERENCE BOOKS:

- R1 Arthur Beiser "Concepts of Modern Physics" Tata McGraw Hill, New Delhi – 2015
R2 M.N Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company Ltd., New Delhi 2016
R3 Dr. G. Senthilkumar "Engineering Physics – II" VRB publishers Pvt Ltd., 2016



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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CY2151	ENVIRONMENTAL STUDIES	2	0	2	3
Course Objective	<ol style="list-style-type: none"> To study about the natural resources, exploitation and its conservation To gain knowledge on the importance of environmental education, ecosystem and biodiversity. To acquire knowledge about environmental pollution – sources, effects and control measures of environmental pollution. To find and implement scientific, technological, economic and political solutions to environmental problems. To be aware of the national and international concern for environment and its protection. 					

Unit	Description	Instructional Hours
I	<p>NATURAL RESOURCES</p> <p>Renewable and Non renewable resources - Forest resources: Use and over-exploitation, deforestation, timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture – Energy resources: Renewable and non renewable energy sources, use of alternate energy sources – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and Desertification- role of an individual in conservation of natural resources.</p>	6
II	<p>ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY</p> <p>Importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem - energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: types and value of biodiversity – hot-spots of biodiversity – threats to biodiversity– endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.</p>	6
III	<p>ENVIRONMENTAL POLLUTION</p> <p>Definition – causes, effects and control measures of: Air pollution- Water pollution – Water quality parameters- Soil pollution - Noise pollution- Marine pollution - Nuclear hazards – role of an individual in prevention of pollution</p>	6
IV	<p>SOCIAL ISSUES AND THE ENVIRONMENT</p> <p>From unsustainable to sustainable development – urban problems related to energy- environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- Current Environmental issues at Country level – management of municipal solid waste. Global issues – Climatic change, acid rain, greenhouse effect and ozone layer depletion – Disaster Management.</p>	6
V	<p>HUMAN POPULATION AND THE ENVIRONMENT</p> <p>Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- GIS-remote sensing-role of information technology in environment and human health – Case studies.</p>	6
Total Instructional Hours		45

COURSE OUTCOMES	<p>After completion of the course the learner will be able to</p> <p>CO1: Develop an understanding of different natural resources including renewable resources.</p> <p>CO2: Realise the importance of ecosystem and biodiversity for maintaining ecological balance.</p> <p>CO3: Understand the causes of environmental pollution and hazards due to manmade activities.</p> <p>CO4: Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues.</p> <p>CO5: Gain knowledge about the importance of women and child education and know about the existing technology to protect environment</p>
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TEXT BOOKS:

- T1 Anubha Kaushik and C. P. Kaushik, "Environmental Science and Engineering", Fourth edition, New Age
- T2 S. Annadurai and P.N. Magudeswaran, "Environmental studies", Cengage Learning India Pvt.Ltd, Delhi, 2018

REFERENCE BOOKS:

- R1 Erach Bharucha, "Textbook of environmental studies" University Press (I) Pvt.ltd, Hyderabad, 2015
- R2 G.Tyler Miller, Jr and Scott E. Spoolman "Environmental Science" Thirteenth Edition, Cengage Learning, 2010.
- R3 Gilbert M. Masters and Wendell P. Ela "Introduction to Environmental Engineering and Science", 3rd edition, Pearson Education, 2013



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Programme	Course code	Name of the course	L	T	P	C
B.E.	19IT2151	PROGRAMMING IN C	2	0	2	3

Course objectives
1. To develop C Programs using Basic programming constructs
2. To develop C programs using Arrays and Strings
3. To develop applications in C using Functions, Pointers and Structures
4. To do Input / Output and File handling in C
5. To develop C Programs using Basic programming constructs

Unit	Description	Instructional hours
I	Basics of C Programming Structure of C program - C programming: Data Types –Keywords – Variables - Operators: Precedence and Associativity - Expressions – Input / Output statements Decision making statements - Looping statements – Pre-processor directives - Compilation process Programs using decision - making and Looping Constructs.	5+4(P)
II	Arrays And Strings Introduction to Arrays: Declaration, Initialization – One dimensional array – Two dimensional arrays – String operations and String functions Programs Using Arrays and string functions.	5+4(P)
III	Functions And Pointers Introduction to functions: Function prototype, function definition, function call - Parameter passing: Pass by value, Pass by reference – Recursion – Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Pointer to pointers – pointer to strings Programs Using Functions and Pointers Structures and Unions Structure - Nested structures – Pointer to Structures – Array of structures – Self-referential structures – Dynamic memory allocation – Typedef-Unions – Union of Structures Programs Using Structures and Unions.	5+4(P)
IV	File Processing Files – Types of file processing: Sequential access, Random access – Sequential access file - Random access file – Command line arguments Programs Using File concepts	7+2(P)
Total instructional hours		45

COURSE OUTCOMES
After completion of the course the learner will be able to
CO1 - Select appropriate data types and control structures for solving a given problem.
CO2 - Develop applications using arrays and strings
CO3 - Understand the importance of functions, pointers and dynamic memory allocation.
CO4 - Understand the Concepts of structures to develop applications in C using

TEXT BOOKS:

- T1 Balagurusamy – “Programming in ANSI C”, Tata McGraw Hill, 7th Edition,201. ISBN 13: 9789339219666
- T2 ReemaThareja, — “Programming in C”, Oxford University Press, Second Edition, 2016. ISBN 9780199456147

REFERENCE BOOKS:

- R1 Ashok.N.Kamthane,RajKamal ,“ Computer Programming and IT”, Pearson Education (India),2012, ISBN - 9788131799604
- R2 Paul Deitel and Harvey Deitel, —“C How to Program”, Eighth edition,2012, Pearson PublicationISBN– 9780132990448
- R3 Kernighan, B.W and Ritchie,D.M. —The C Programming language. Second Edition, Pearson Education, 2012 ISBN 13: 9789332549449
- R4 Yashavant P. Kane tkar. “ Let Us C”, BPB Publications, 15th Edition , July 201, ISBN-13:978-8183331630


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Programme	Name of the Course	L	T	P	C
B.E.	19ME2001 ENGINEERING PRACTICES LABORATORY	0	0	4	2

Course Objective To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical and Electrical Engineering.

GROUP A (CIVIL & MECHANICAL)

S.No	Description of the Experiments
CIVIL AND MECHANICAL ENGINEERING PRACTICES	
1	Preparation of Single pipe line and Double pipe line connection by using valves, taps, couplings, unions, reducers and elbows.
2	Arrangement of bricks using English Bond for one brick thick wall for right angle corner junction and T- junction
3	Arrangement of bricks using English Bond for one and a half brick thick wall for right angle corner and T- junction
4	Preparation of arc welding of Butt joints, Lap joints and Tee joints.
5	Practice on sheet metal Models– Trays and funnels
6	Hands-on-exercise in wood work, joints by sawing, planning and cutting.
7	Practice on simple step turning, taper turning and drilling.
8	Demonstration on Smithy operation.
9	Demonstration on Foundry operation.
10	Demonstration on Power tools.

GROUP B (ELECTRICAL)

S.No	Description of the Experiments
ELECTRICAL ENGINEERING PRACTICES	
1	Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2	Fluorescent lamp wiring.
3	Stair case wiring.
4	Measurement of Electrical quantities – voltage, current, power & power factor in single phase circuits.
5	Measurement of energy using single phase energy meter.
6	Soldering practice using general purpose PCB.
7	Measurement of Time, Frequency and Peak Value of an Alternating Quantity using CRO and Function Generator.
8	Study of Energy Efficient Equipment's and Measuring Instruments.

Total Practical Hours 45

After completion of the course the learner will be able to

COURSE OUTCOMES

CO1:Fabricate wooden components and pipe connections including plumbing works.
CO2:Fabricate simple weld joints.
CO3:Fabricate different electrical wiring circuits and understand the AC Circuits.
CO4:Determine the level of DO in a water sample.
CO5:Identify and estimate the different types of alkalinity in water sample.
CO6:Estimate the amount of copper in a water sample.
CO7:Determine the metal ion content using instrumental methods


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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19HE2071	LANGUAGE COMPETENCY ENHANCEMENT COURSE II (COMMON TO ALL BRANCHES)	0	0	2	1

- Course Objective
1. To introduce to business communication.
 2. To train the students to react to different professional situations.
 3. To make the learner familiar with the managerial skills
 4. To empower the trainee in business writing skills.
 5. To learn to interpret and expertise different content.

Unit	Description	Instructional Hours
I	Listening and Speaking – listening and discussing about programme and conference arrangement Reading –reading auto biographies of successful personalities Writing Formal & informal email writing, Recommendations Grammar and Vocabulary - Business vocabulary, Adjectives & adverbs.	3
II	Listening and Speaking - listening to TED talks Reading - Making and interpretation of posters Writing - Business letters: letters giving good and bad news, Thank you letter, Congratulating someone on a success” Grammar and Vocabulary - Active & passive voice, Spotting errors (Tenses, Preposition, Articles).	3
III	Listening and Speaking -travel arrangements and experience Reading - travel reviews Writing - Business letters (Placing an order, making clarification & complaint letters). Grammar and Vocabulary - Direct and Indirect speech.	3
IV	Listening and Speaking - Role play - Reading - Sequencing of sentence Writing - Business report writing (marketing, investigating) Grammar and Vocabulary - Connectors, Gerund & infinitive.	3
V	Listening and Speaking - Listen to Interviews & mock interview Reading - Reading short stories, reading profile of a company - Writing - Descriptive writing (describing one’s own experience) Grammar and Vocabulary - Editing a passage(punctuation, spelling & number rules).	3
Total Instructional Hours		15

- Course Outcome
- CO1- Introduced to different modes and types of business communication.
CO2- Practiced to face and react to various professional situations efficiently.
CO3- learnt to practice managerial skills.
CO4- Familiarized with proper guidance to business writing.
CO5- Trained to analyze and respond to different types of communication.

TEXT BOOKS:

- T1 Norman Whitby, “Business Benchmark-Pre-intermediate to Intermediate”, Cambridge University Press,
T2 Ian Wood and Anne Willams, “Pass Cambridge BEC Preliminary”, Cengage Learning press 2015.

REFERENCE BOOKS:

- R1 Michael Mc Carthy, “Grammar for Business”, Cambridge University Press, 2009.
R2 Bill Mascull, “Business Vocabulary in use: Advanced 2nd Edition”, Cambridge University Press, 2009.
R3 Frederick T. Wood, “Remedial English Grammar For Foreign Students”, Macmillan publishers, 2001.



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SYLLABUS

SEMESTER III

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16MA3111	FOURIER ANALYSIS AND Z TRANSFORMS	3	1	0	4

- Course Objective**
1. Introduce Fourier series which is central to many applications in engineering.
 2. Apply the effective tools for the solutions of one dimensional boundary value problems.
 3. Apply the effective tools for the solutions of two dimensional heat equations.
 4. Acquaint with Fourier transform techniques used in wide variety of situations.
 5. Develop Z transform techniques for discrete time systems.

Unit	Description	Instructional Hours
I	FOURIER SERIES Dirichlet's conditions- General Fourier Series – Odd and Even Functions – Half range sine and cosine series – Change of Interval - Parseval's Identity - Harmonic analysis.	12
II	BOUNDARY VALUE PROBLEMS Classification of PDE - Solutions of one dimensional wave equation - One dimensional equation of heat conduction (excluding insulated edges).	12
III	TWO DIMENSIONAL HEAT EQUATIONS Steady state solution of two dimensional equation of heat conduction in infinite plate and semi circular plate.	12
IV	FOURIER TRANSFORMS Fourier Transform Pairs - Fourier sine and cosine transforms – Properties - Transforms of Simple functions – Convolution Theorem – Parseval's identity.	12
V	Z - TRANSFORMS AND DIFFERENCE EQUATIONS Z- Transforms - Elementary properties – Inverse Z - transform (using partial fraction and residues) – Convolution theorem(excluding proof)– Solution of difference equations using Z – transform.	12
Total Instructional Hours		60

- Course Outcome**
- CO1: Understand the principles of Fourier series which helps them to solve physical problems of engineering.
- CO2: Obtain the knowledge of Fourier series in solving the boundary value problems.
- CO3: Familiar with the application of Fourier series in solving the two dimensional heat equations.
- CO4: Acquire the knowledge of Fourier transform techniques which extend its applications.
- CO5: Illustrate the Z- transforms for analyzing discrete-time signals and systems.

TEXT BOOKS:

- T1 Veerarajan. T, "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., Second reprint, New Delhi, 2012.
- T2 Bali. N.P and Manish Goyal & Watkins, "Advanced Engineering Mathematics", 7th Edition, Laxmi Publications Pvt Ltd, 2007
- T3 Kandasamy P, Thilagavathy K. and Gunavathy K., "Engineering Mathematics Volume III", S.Chand & Company Ltd., New Delhi, 1996.

T4 Grewal B.S, "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, Delhi, 2018

REFERENCE :

- R1 C.Roy Wylie, " Advance Engineering Mathematics", Louis C. Barret, 6th Edition, Mc Graw Hill Education India Private Limited, New Delhi, 2003.
- R2 Ramana. B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company Limited, New Delhi, 2018.



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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AG3201	SOIL SCIENCE AND ENGINEERING	3	0	0	3

Course Objective To expose the students to the fundamental knowledge on Soil physical parameters, Permeability – Compaction, Bearing Capacity and types and methods of soil survey and interpretative groupings

Unit	Description	Instructional Hours
I	INTRODUCTION AND SOIL PHYSICS Soil - definition - major components –Soil forming minerals and processes- soil profile -Physical properties - texture –density-porosity-consistence-colour- -specific gravity - capillary and non- capillary - plasticity. Soil air - soil temperature - soil water - classification of soil water- Movement soil water. Soil colloids – organic and inorganic matter- Ion exchange- pH – Plant nutrient availability	9
II	SOIL CLASSIFICATION AND SURVEY Soil taxonomy – Soils of Tamil Nadu and India. Soil survey - types and methods of soil survey – Field mapping- mapping units - base maps - preparation of survey reports - concepts and uses - land capability classes and subclasses - soil suitability -Problem soils – Reclamation.	9
III	PHASE RELATIONSHIP AND SOIL COMPACTION Phase relations- Gradation analysis- Atterberg Limits and Indices- Engineering Classification of soil – Soil compaction- factors affecting compaction- field and laboratory methods.	9
IV	ENGINEERING PROPERTIES OF SOIL Shear strength of cohesive and cohesionless - Mohr-Coulomb failure theory- Measurement of shear strength, direct shear, Triaxial and vane shear test- -Permeability- Coefficient of Permeability-Darcy's law-field and lab methods - Assessment of seepage - Compressibility.	9
V	BEARING CAPACITY AND SLOPE STABILITY Bearing capacity of soils - Factors affecting Bearing Capacity- Shallow foundations-Terzaghi's formula- BIS standards - Slope stability-Analysis of infinite and finite slopes- friction circle method- slope protection measures.	9
Total Instructional Hours		45

Course Outcome Upon successful completion of the course, students shall have ability to
CO1: Fundamental knowledge of soil physical parameters.
CO2: The procedures involved in soil survey, soil classification.
CO3: The phase relationship and soil compaction.
CO4: Understand the Engineering properties of soil
CO5: Concepts of bearing capacity and slope stability.

TEXT BOOKS:

- T1 Nyle C. Brady, "The Nature and Properties of Soil", Macmillan Publishing Company, 10th Edition, New York, 2008.
T2 Punmia, B.C., "Soil Mechanics and Foundation" Laxmi Publishers, New Delhi, 2007

REFERENCE BOOKS:

- R1 Edward J. Plaster., "Soil Science", Cengage Learning India Ltd, New Delhi, 2009.
- R2 Arora, K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2007
- R3 Murthy, V.N.S. "Soil Mechanics and Foundation Engineering", UBS Publishers and Distributors, New Delhi, 2007
- R4 Sehgal, S.B., "Text Book of Soil Mechanics", CBS Publishers and Distributors New Delhi, 2007.



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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AG3202	FLUID MECHANICS AND HYDRAULICS	3	1	0	4

- Course Objective**
1. To understand the properties of fluids
 2. To acquire knowledge on fluid flow
 3. To understand the behavior of fluid flow through pipes
 4. To gain knowledge on open channel flows
 5. To gather knowledge on dimensional analysis and study the various types of pumps

Unit	Description	Instructional Hours
	PROPERTIES OF FLUIDS	
I	Properties of fluids – definition – units of measurement - Mass density – specific weight, specific volume – specific gravity - equation of state – perfect gas - Viscosity – vapour pressure – compressibility and elasticity - surface tension – capillarity. Fluid pressure and measurement – simple, differential and micro manometers - Mechanical gauges – calibration. Hydrostatic forces on surfaces – total pressure and centre of pressure – Horizontal - Vertical and Inclined plane surface - Pressure diagram – total pressure on curved surface. Archimedes principles –buoyancy - metacentre – metacentric height.	12
	FLUID FLOW ANALYSIS	
II	Types of fluid flow – velocity and acceleration of a fluid particle - Rotational – irrotational circulation and vorticity - Flow pattern – stream line – equipotential line – stream tube path line – streak line – flow net – velocity potential – stream function. Principles of conservation of mass – energy – momentum – continuity equation in Cartesian co-ordinates - Euler's equation of motion.	12
	FLOW MEASUREMENT	
III	Bernoulli's equation – applications - Venturimeter – orifice meter – nozzle meter - rotameter – elbow meter - pitot tube – Orifice – sharp edged orifice discharging free – submerged orifice – mouth piece - Flow through orifice under variable head – time of emptying a tank with and without inflow. Flow through pipes – laminar and turbulent flow in pipes - Reynold's experiment - Darcy – Weisbach equation for friction head loss – Chezy's formula – Manning's formula – Hazen-William's formula - Major and minor losses in pipes – hydraulic gradient line – energy gradient line. Siphon – water hammer in pipes – gradual and sudden closure of valves	12
	OPEN CHANNEL FLOW	
IV	Types of flow in channel – uniform flow – most economical section of channel – rectangular – trapezoidal. Specific energy and critical depth - momentum in open channel flow – specific force – critical flow – computation. Flow measurement in channels – notches – rectangular, Cipolletti and triangular – float method - Flow measurement in rivers/ streams/ canals – weirs – free and submerged flow – current meter – Parshall flume.	12
	DIMENSIONAL ANALYSIS AND PUMPS	
V	Dimensional analysis – Fundamental dimensions – dimensional homogeneity – Rayleigh's method and Buckingham Pi-Theorem - concept of geometric, kinematic and dynamic similarity. Important non dimensional numbers – Reynolds, Froude, Euler, Mach and Weber - Pump terminology – suction lift, suction head, delivery head, discharge, water horse power – selection of pump capacity. Centrifugal pumps – components – working – types of pumps and impellers - Priming – cavitation – specific speed – characteristic curves - submersible pumps - Jet pump – jet assembly - Other pumps – Air lift pump - reciprocating pump - sludge pump and vacuum pump- Hydraulic ram.	12
	Total Instructional Hours	60

**Course
Outcome**

Upon successful completion of the course, students shall have ability to

CO1: Comprehend the properties of fluids

CO2: Understand the various types of fluid flow

CO3: Calculate the discharge and compute energy losses in pipe flow

CO4: Classify open channel flows and also design the most economical sections for open channel flows

CO5: Select appropriate model to provide solution to a real time problem related to hydraulics and also assess the performance of pumps

TEXT BOOKS:

T1 Streeter V.L., Wylie E. B. and Bedford K. W., "Fluid Mechanics", Tata McGraw Hill Publishing Co. Ltd., 2017.

T2 Modi P. N. and Seth S M., "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House, New Delhi, 2013

T3 Bansal R.K., "Fluid Mechanics & Hydraulic Machines", Laxmi Publications, 2015.

REFERENCE :

R1 Garde, R. J., "Fluid Mechanics through problems", New Age International Publishers (P) Ltd, New Delhi, 2002.

R2 Jagdish Lal, "Hydraulic Machines", Metropolitan Book House, New Delhi, 2000.

R3 Kumar .K.L, "Engineering Fluid Mechanics", Eurasia Publishing House, 2002.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16ME3232	THEORY OF MACHINES AND MECHANISMS	3	0	0	3

- Course Objective**
1. To understand the purpose of kinematics, Kinematic joint and mechanism and to study the relative motion of parts in a machine without taking into consideration the forces involved.
 2. To understand the theories and applications of cams and Flywheels.
 3. To understand applications of different types of gears and gear profiles and its efficiency and gear trains.
 4. To understand principles of friction applied to screw threads, clutches, brakes, belt and rope drives.
 5. To know principles of governors.

Unit	Description	Instructional Hours
	BASICS OF MECHANISMS	
I	Introduction - Links - Pairs - Chain - Mechanism - Machine structure - Degrees of freedom - Four bar chains - Terminology and definition - Planar, Spherical and Spatial Mechanisms - Grashoff's law - Kutzbach criterion - Grubler's criterion for plane mechanism. Inversion of mechanisms - Four bar, single slider crank and double slider crank mechanisms.	9
	CAM AND FLYWHEEL	
II	Types of cams and followers - Follower motion - Uniform, Parabolic, SHM and cycloidal. Cam terminology - Cam profiles construction for roller, flat faced and knife edge follower. Flywheels of engines and punching press- Turning moment diagrams – Fluctuation of energy, speed.	9
	GEARS AND GEAR TRAINS	
III	Law of toothed gearing – Involute and cycloidal tooth profiles – Spur Gear terminology and definitions – Gear tooth action – contact ratio – Interference and undercutting – Non-standard gear teeth – Helical, Bevel, Worm, Rack and Pinion gears – Gear trains – Speed ratio, train value – Parallel axis gear trains – Epicyclic Gear Trains – Differentials – Automobile gear box.	9
	FRICTION AND FRICTION DRIVES	
IV	Surface contacts –Friction in screw threads -Friction clutches -Belt and rope drives, Friction aspects in Brakes.	9
	GOVERNORS	
V	Governors - Types - Centrifugal governors – Porter & Proell governor, Hartnell, Hartung – Characteristics.	9
Total Instructional Hours		45

- Course Outcome**
- CO1: Classify mechanisms and inversions and determine mobility of a mechanism.
CO2: Construct cam profiles for various followers and turning moment diagram for flywheel.
CO3: Classify various gear trains and apply to automation.
CO4: Apply friction principles to clutches, belt, brake and screw.
CO5: Evaluate the sensitivity of governor

TEXT BOOKS:

- T1 Ratan.S.S, "Theory of Machines", Tata McGraw Hill Publishing company Ltd., 2nd Edition, 2005.
T2 Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 3rd Edition, 1984.
T3 Khurmi R.S., "Theory of Machines", Khanna Publishers, Delhi, 2006.

REFERENCE :

- R1 Shigley.J.E, and Uicker.J.J, "Theory of Machines and Mechanisms", McGraw Hill, 1995.
R2 Ghosh.A, and Mallick.A.K, "Theory of Mechanisms and Machines", Affiliated East-West Pvt Ltd., New Delhi, 1988.
R3 Rao.J.S, and Dukkupati.R.V, " Mechanism and Machine Theory", Wiley-Eastern Ltd., New Delhi,1995

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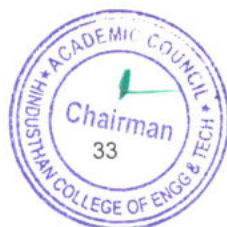
Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16CE3231	SURVEYING AND LEVELLING	3	0	0	3

- Course Objective**
1. To gain knowledge on basic principle and concepts of different surveying methods.
 2. To learn how to use compass to carryout land surveying.
 3. To learn the basics of leveling and its applications.
 4. To explore the types and characteristics of contours.
 5. To understand the concepts of Theodolite survey in linear and angular measurements.

Unit	Description	Instructional Hours
	FUNDAMENTALS AND CHAIN SURVEYING	
I	Definition- Classifications - Basic principles – Equipment and accessories for ranging and chaining – Methods of ranging - well conditioned triangles - computation of cross sectional areas (Simpson's rule and Trapezoidal rule) Aligning, Ranging and Chaining Computation of area of the plot using Chain traversing	9
	COMPASS AND PLANE TABLE SURVEYING	
II	Compass – Basic principles - Types - Bearing systems and conversions – Sources of Errors - Local attraction - applications - Plane table and its accessories - Merits and demerits. Computation of included angle between stations using Compass Traversing Plane table Surveying - Radiation Method Plane table Surveying – Intersection Method	9
	LEVELLING	
III	Levelling- Principles and theory of Levelling - Datum - Bench Marks – Temporary and Permanent Adjustments- Methods of Levelling - Sources of errors in Levelling Fly levelling using Dumpy Level (Height of Instrument and Rise & Fall method).	9
	CONTOURING	
IV	Contouring - Methods – Characteristics and uses of contours - Plotting – Methods of interpolating contours – Earthwork calculations - Capacity of reservoirs - Mass haul diagrams. Grid Contouring.	9
	THEODOLITE AND MODERN SURVEYING	
V	Theodolite – components of theodolite - Temporary and permanent adjustments - Heights and distances by single plane and double method. Computation of area by Theodolite Traverse Introduction to Total Station- Global Positioning System (GPS)	9
Total Instructional Hours		45

- Course Outcome**
- Upon successful completion of the course, students shall have ability to
- CO1: Carryout preliminary surveying to prepare a layout of a given area.
CO2: Apply compass surveying and plane table surveying.
CO3: Understand the basics of leveling and measure the elevations.
CO4: Plot contours and also calculate the capacity of reservoirs.
CO5: To carry out linear and angular measurements using theodolite


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TEXT BOOKS:

- T1 Punmia, B. C., "Surveying", Vol.1, Laxmi Publications, New Delhi, 2015.
T2 Chandra A.M., "Plane Surveying", New Age International Publishers, 2015.

REFERENCE :

- R1 Alak De, "Plane Surveying", S. Chand & Company Ltd., 2000.
R2 Bannister and S. Raymond, R. Baker, "Surveying", 7th Edition, Pearson Education Ltd., 2009.
R3 Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Hall of India, 2010.



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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16ME3233	THERMODYNAMICS	3	1	0	4

- Course Objective**
1. To learn about the energy conversion.
 2. To study the energy degradation in thermodynamic systems.
 3. To learn the behavior of pure substances and working principle of steam power cycles.
 4. To study the properties of atmospheric air and its applications.
 5. To study the concepts, laws and methodologies and integrate it into analysis of cyclic processes and IC engines.

Unit	Description	Instructional Hours
FIRST LAW OF THERMODYNAMICS		
I	Basic concepts- Zeroth law of thermodynamics, First law of thermodynamics –application to closed and open systems – steady and unsteady flow processes. Simple problems on closed and open systems.	12
SECOND LAW OF THERMODYNAMICS		
II	Heat Reservoir, source and sink. Heat Engine, Refrigerator, and Heat pump. Statements of second law and its corollaries. Carnot cycle, Clausius inequality. Concept of entropy. Simple problems on efficiency and Performance	12
PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE		
III	Formation of steam and its thermodynamic properties. Use of Steam Table and Mollier Chart. Determination of dryness fraction. Estimation of steam properties. Rankine cycle. Reheat Cycle and its calculations.	12
GAS MIXTURES AND PROPERTIES OF AIR		
IV	Properties of Ideal and real gases, Equations of state, Gas laws and Gas mixtures. Psychrometric properties, process and Applications. Property calculations of air using psychrometric chart and expressions.	12
GAS POWER CYCLES AND IC ENGINES		
V	Otto, Diesel and Brayton cycles. Simple problems on cycle analysis. IC Engines - Classification - Components and their functions. Working of four stroke SI and CI engines.	12
Total Instructional Hours		60

- Course Outcome**
- Upon successful completion of the course, students shall have ability to
- CO1: Understand the thermodynamic principles and its applications.
CO2: Quantify the energy conversion in various thermal systems.
CO3: Apply the thermodynamic principles for predicting the properties of steam, gas and gas mixtures.
CO4: Apply the psychrometric principles for design of air conditioning systems.
CO5: Understand the process of air standard cycles and IC engine working.

TEXT BOOKS:

- T1 Nag.P.K., "Engineering Thermodynamics", 4th Edition, Tata McGraw-Hill, New Delhi, 2008
T2 Cengel. Y. and MBoles, "Thermodynamics - An Engineering Approach", 7th Edition, TataMcGraw Hill, 2010

REFERENCE BOOKS:

- R1 Natarajan E., "Engineering Thermodynamics: Fundamentals and Applications", Anuragam Publications, 2012.
R2 Holman.J.P., "Thermodynamics", 3rd Edition. McGraw-Hill, 1995.


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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AG3001	FLUID MECHANICS LAB	0	0	4	2

Course Objective Students should be able to verify the principles studied in theory by performing the experiments in lab.

S.NO LIST OF EXPERIMENTS

1 Flow Measurement

- Calibration of Rotameter
- Flow through Venturimeter
- Flow through a circular Orifice
- Determination of mean velocity by Pitot tube
- Flow through a Triangular Notch
- Flow through a Rectangular Notch

2 Losses in Pipes

- Determination of friction coefficient in pipes
- Determination of losses due to bends, fittings and elbows

3 Pumps

- Characteristics of Centrifugal pump
- Characteristics of Submersible pump
- Characteristics of Reciprocating pump

Total Instructional Hours 60

S.NO	LIST OF EQUIPMENTS REQUIRED	REQUIRED QUANTITY
1	Rotameter	1
2	Venturimeter	1
3	Orificemeter	1
4	Pitot tube	1
5	Bernoulli's theorem apparatus	1
6	Triangular notch and Rectangular notch (each (with a lined open channel setup)	1
7	Coefficient of friction apparatus	1
8	Pipe setup with bends, fittings and elbows for estimating minor losses	1
9	Centrifugal pump, Reciprocating pump, Submersible pump, Jet pump – 1 each	1

10	Collecting tank	1
11	Stop watch	1

Upon successful completion of the course, students shall have ability to

Course Outcome

CO1: Understand the fluid properties and its behavior
CO2: To know various flow measuring device and its place of application
CO3: To measure flow in pipes and determine frictional losses.
CO4: The students will be able to develop characteristics of pumps and turbines.
CO5: To Determine losses due to bends, fittings and elbows etc

TEXT BOOKS:

- T1 "Hydraulic Laboratory Manual", Centre for Water Resources, Anna University, 2004.
T2 Modi P.N. and Seth S.M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 2000.

REFERENCE:

- R1 Subramanya, K. "Flow in Open Channels", Tata McGraw - Hill Pub. Co.1992.



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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16CE3031	SURVEYING AND LEVELLING LAB	0	0	4	2

Course Objective To train the student to acquire skill in handling various surveying and leveling instruments effectively.

S.NO LIST OF EXPERIMENTS

- 1 **CHAIN SURVEYING**
Ranging, Chaining and Pacing Chain traversing
- 2 **COMPASS SURVEYING**
Triangulation Problem Compass traversing
- 3 **PLANE TABLE SURVEYING**
Radiation
Intersection - Triangulation problem Plane table traversing
- 4 **THEODOLITE SURVEYING**
Measurement of horizontal & vertical angles Tangential & Stadia Tacheometry
- 5 **LEVELLING**
Fly levelling using Dumpy level Fly levelling using Tilting level Check levelling
Block Levelling Radial Contouring
- 6 **DEMONSTRATION OF TOTAL STATION AND GP**

Total Instructional Hours

60

S.NO	LIST OF EQUIPMENTS REQUIRED	REQUIRED QUANTITY (Nos)
1.	Total Station	3
2.	Theodolites	1
3.	Dumpy level / Filling level	1
4.	Pocket stereoscope	1
5.	Ranging rods	1
6.	Levelling staff	5
7.	Cross staff	5
8.	Chains	6
9.	Tapes	5
10.	Arrows	20
11.	Prismatic Compass	10
12.	Surveyor Compass	2
13.	Survey grade or Hand held GPS	3

Upon successful completion of the course, students shall have ability to

CO1: To acquired practical knowledge on handling of basic survey instruments

Course Outcome CO2: Able to Calculate angles, distances and levels

CO3: Estimate measurement errors and apply corrections

CO4: Able to measure the horizontal distances, difference in elevation.

CO5: Able to estimate cut-fill ratio for land levelling.



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SEMESTER IV

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16MA4112	APPLIED STATISTICS & NUMERICAL METHODS	3	0	2	4

- Course Objective**
1. Determine the measures of central tendency and dispersion along with R studio.
 2. Employ some basic concepts of statistical methods for testing the hypothesis together with R studio.
 3. Analyze the design of experiment techniques to solve various engineering problems accompanying with R studio.
 4. Apply various methods to find the intermediate values for the given numerical data.
 5. Explain concepts of numerical differentiation and numerical integration of the unknown functions.

Unit	Description	Instructional Hours
	MEASURE OF CENTRAL TENDENCY AND DISPERSION	
I	Measure of central tendency – mean, median, mode –Measure of dispersion – range – Quartile deviation – Standard deviation – Coefficient of Variation.	9
	HYPOTHESIS TESTING	
II	Large sample test based on Normal distribution – test of significance for single mean and difference of means -Small sample test – t test for single mean and difference of mean - F distribution for variance, Chi – Square test for independence of attributes – Goodness of fit.	9
	ANALYSIS OF VARIANCE	
III	Introduction, assumptions of analysis of variance, Completely randomized design, Randomized block design, Latin square design.	9
	INTERPOLATION	
IV	Interpolation: Newton’s forward and backward difference formulae Lagrangian interpolation for unequal intervals – Divided difference for unequal intervals : Newton’s divided difference formula.	9
	NUMERICAL DIFFERENTIATION AND INTEGRATION	
V	Differentiation using interpolation formula – Newton’s forward and backward interpolation formulae for equal intervals – Newton’s divided difference formula for unequal intervals - Numerical integration by Trapezoidal and Simpson’s 1/3 and 3/8 rules.	9
Total Instructional Hours		45

S.NO LAB COMPONENTS USING R-STUDIO

- 1 Introduction to R programming
- 2 Application of descriptive statistics – Mean, Median, Mode, variance
- 3 Applications of Box plot, Pie chart, Histogram
- 4 Application of Student t- test
- 5 Application of F test
- 6 Application of Chi – square test
- 7 ANOVA – completely randomized design
- 8 ANOVA – randomized block design

Instructional Hours - Lab 15

Course Outcome

- CO1: Familiar with Measures of Central Tendency and Measures of Dispersion.
- CO2: Understand the concepts of statistical methods for testing the hypothesis.
- CO3: Apply Design of Experiment techniques to solve various engineering problems
- CO4: Understand the concept of interpolation in both cases of equal and unequal intervals
- CO5: Identify various methods to perform numerical differentiation and integration

TEXT BOOKS:

- T1 Gupta, S.C., & Kapoor, V.K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, Reprint 2011.
- T2 M.K.Jain, S.R.K.Iyengar, R.K.Jain, "Numerical methods for Scientific and Computation", Fifth Edition, 2007

REFERENCE:

- R1 Walpole. R.E., Myers. R.H., Myers. S.L., and Ye. K., "Probability and Statistics for Engineers and Scientists", 8th Edition, Pearson Education, Asia, 2007.
- R2 Grewal B.S. and Grewal J.S. "Numerical Methods in Engineering and Science ", 6th Edition, Khanna publishers, New Delhi 2014.
- R3 S.K.Gupta, "Numerical Methods for Engineers" , New Age International Pvt.Ltd Publishers, 2015.



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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AG4201	UNIT OPERATIONS IN AGRICULTURAL PROCESSING	3	0	0	3

Course Objective	
	<ol style="list-style-type: none"> 1. The students would be exposed to the fundamental knowledge in Evaporation and concentration. 2. To understand Filtration, Sedimentation, Processing, Sieve analysis, 3. To grab knowledge about minimal processing, 4. To get awareness about contact equilibrium separation process, and 5. To learn Crystallization and Distillation in processing of agricultural produce.

Unit	Description	Instructional Hours
I	<p>EVAPORATION AND CONCENTRATION Unit operations in food processing – conservation of mass and energy – overall view of an engineering process – dimensions and units – dimensional and unit consistency – dimensionless ratios – evaporation – definition – liquid characteristics – single and multiple effect evaporation – performance of evaporators and boiling point elevation – capacity – economy and heat balance – types of evaporators – once through and circulation evaporators – short tube evaporators and long tube evaporators – agitated film evaporator</p>	9
II	<p>MECHANICAL SEPARATION Filtration – definition – filter media – types and requirements – constant rate filtration – constant pressure filtration – filter cake resistance – filtration equipment – rotary vacuum filter – filter press – sedimentation – gravitational sedimentation of particles in a fluid – Stoke’s law, sedimentation of particles in gas – cyclones – settling under sedimentation and gravitational sedimentation – centrifugal separations – rate of separations – liquid – liquid separation – centrifuge equipment.</p>	9
III	<p>SIZE REDUCTION Size reduction – grinding and cutting – principles of comminuting – characteristics of comminuted products – particle size distribution in comminuted products – energy and power requirements in comminuting – crushing efficiency – Rittinger’s, Bond’s and Kick’s laws for crushing – size reduction equipments – crushers – jaw crusher, gyratory crusher – crushing rolls – grinders – hammer mills – rolling compression mills – attrition, rod, ball and tube mills – construction and operation.</p>	9
IV	<p>CONTACT EQUILIBRIUM SEPARATION Contact equilibrium separation processes – concentrations – gas-liquid and solid-liquid equilibrium equilibrium concentration relationships – operating conditions – calculation of separation in contact equilibrium processes – gas absorption – rate of gas absorption – stage – equilibrium gas – absorption equipment – properties of tower packing – types – construction – flow through packed towers – extraction – rate of extraction – stage equilibrium extraction – equipment for leaching coarse solids – intermediate solids – basket extractor – extraction of fine material – Dorr agitator – continuous leaching – decantation systems – extraction towers – washing – equipments</p>	9
V	<p>CRYSTALLISATION AND DISTILLATION Crystallization – Equilibrium – Rate of crystal growth – stage – Equilibrium crystallization – Crystallizers – Equipment – Classification – Construction and operation – Crystallizers – Tank – Agitated batch – Swenson-Walker and Vacuum crystallizers – Distillation – Binary mixtures – Flash and differential distillation –</p>	9

Steam distillation –Theory-Continuous distillation with rectification –Vacuum distillation - Batch distillation-Operation and process-Advantages and limitation-Distillation equipments- Construction and operation-Factors influencing the operation.

Total Instructional Hours **45**

At the end of the study the student will have knowledge on

CO1: Fundamentals of various unit operations involved in Agricultural Processing.

CO2: The liquid characteristics and performance of single and multiple effect evaporation

Course Outcome CO3: Classification of the filter media, its requirements and sedimentation of particles in a fluid.

CO4: Size reduction equipment and calculating the power requirements.

CO5: The equilibrium separation processes and importance of crystallization and distillation in agricultural processing.

TEXT BOOKS:

- T1 Earle, R.L., "Unit operations in Food Processing", Pergamon Press, Oxford, U.K, 1985.
- T2 McCabe, W.L., and Smith, J.C., "Unit Operations of Chemical Engineering", Mc-Graw-Hill Inc., Kosaido Printing Ltd., Tokyo, 1990.
- T3 Geankoplis, C.J. "Transport Processes and Separation Process Principles", 4th Edition, Prentice Hall, 2003.

REFERENCE :

- R1 Coulson, J.M and J.F. Richardson, "Chemical Engineering", Volume I to V. The Pergamon Press. New York, 1999.
- R2 Albert Ibarz and Gustavo V. Barbosa-Cánovas. "Unit Operations in Food Engineering", CRC Press LLC, Florida, 2003.


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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AG4202	FARM TRACTORS	3	0	0	3

- Course Objective**
1. To introduce the students about basics of tractor which include classification of tractors and components of the engine.
 2. To retrieve basic knowledge about engine systems and working principles of cooling system, lubrication system, fuel systems and electrical systems of tractors.
 3. To study about working principle of transmission system of tractor and its components.
 4. To learn about components of hydraulic system of tractor and its working principle.
 5. To acquire knowledge on Power tiller, Bull dozers, testing of tractors, performance of various machines

Unit	Description	Instructional Hours
	TRACTORS	
I	Classification of tractors - Tractor engines – construction of engine blocks, cylinder head and crankcase - features of cylinder, piston, connecting rod and crankshaft – firing order combustion chambers.	9
	ENGINE SYSTEMS	
II	Valves-inlet and outlet valves – valve timing diagram. Air cleaner- exhaust – silencer. Cooling systems - lubricating systems - fuel system – governor-electrical system.	9
	TRANSMISSIONSYSTEMS	
III	Transmission - clutch - gear box - sliding mesh - constant mesh - synchro mesh. Differential, final drive and wheels. Steering geometry - steering systems - front axle and wheel alignment. Brake - types - system.	9
	HYDRAULIC SYSTEMS	
IV	Hydraulic system - working principles, three point linkage - draft control - weight transfer, theory of traction - tractive efficiency – tractor chassis mechanics - stability - longitudinal and lateral. Controls - visibility – operators seat.	9
	POWER TILLER, BULL-DOZER AND TRACTOR TESTING	
V	Power tiller - special features - clutch - gear box - steering and brake. Makes of tractors, power tillers and bulldozers. Bulldozer- salient features – turning mechanism, track mechanism. components – operations performed by bulldozers. Types of tests- test procedure - need for testing & evaluation of farm tractor -Test code for performance testing of tractors and power tillers.	9
	Total Instructional Hours	45

- Course Outcome**
- At the end of the study the student will have knowledge on
- CO1: The students will be able to understand the various equipments and mechanizations used in the farm.
- CO2: The students will have the knowledge on earth moving machineries, tractor classification and tillage implements.
- CO3: The students will able to understand various engine systems and its working principle.
- CO4: The student will able to understand various implements used in agriculture farm for various purposes
- CO5: The students will get basic idea about testing procedures of various farm machinery equipments.

TEXT BOOKS:

- T1 Jain, S.C. and C.R. Rai, "Farm tractor maintenance and repair", Standard publishers and distributors, New Delhi, 1999.
- T2 Barger, E.L., J.B. Liljedahl and E.C. McKibben, "Tractors and their Power Units", Wiley Eastern Pvt. Ltd., New Delhi, 1997.
- T3 Domkundwar A.V. "A Course in internal combustion engines", Dhanpat Rai & Co. (P) Ltd., Educational and Technical Publishers, Delhi, 1999.

REFERENCE :

- R1 Black, P.O. "Diesel engine manual", Taraporevala Sons & Co., Mumbai, 1996.
- R2 Grouse, W.H. and Anglin, D.L, "Automotive mechanics", Macmillan McGraw- Hill, Singapore, Indian Standard Codes for Agricultural Implements Published by ISI, New Delhi, 1993.
- R3 Jagadeeshwar Sahay, "Elements of Agricultural Engineering", Standard Publishers Co., New Delhi, 2010.



**Chairman - BoS
AGRI - HiCET**



**Dean (Academics)
HiCET**

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AG4203	HYDROLOGY AND WATER RESOURCES ENGINEERING	3	0	0	3

- Course Objective**
1. To give an exposure to the students about the climatic parameters
 2. To introduce the student to the concept of hydrological aspects of water availability and requirements
 3. The students will be able to quantify, control and regulate the water resources.
 4. To develop analytical skills on spatial analysis, rainfall data and designing water reservoirs
 5. To study direct and indirect effect on agriculture scenario of particular area, giving main focus on water availability, distribution and circulation.

Unit	Description	Instructional Hours
I	PRECIPITATION AND ABSTRACTIONS Hydrological cycle- Meteorological measurements – Requirements, types and forms of precipitation - Rain gauges-Spatial analysis of rainfall data using Thiessen and Isohyetal methods-Interception - Evaporation. Horton’s equation, pan evaporation measurements and evaporation suppression - Infiltration-Horton’s equation - double ring infiltrometer, infiltration indices.	10
II	RUNOFF Watershed, catchment and basin - Catchment characteristics - factors affecting runoff - Run off estimation using empirical - Strange’s table and SCS methods – Stage discharge relationships- flow measurements- Hydrograph – Unit Hydrograph – IUH	8
III	FLOOD AND DROUGHT Natural Disasters-Flood Estimation- Frequency analysis- Flood control- Definitions of droughts- Meteorological, hydrological and agricultural droughts- IMD method-NDVI analysis- Drought Prone Area Programme(DPAP)	9
IV	RESERVOIRS Classification of reservoirs, General principles of design, site selection, spillways, elevation –area capacity – storage estimation, sedimentation – life of reservoirs – rule curve	8
V	GROUNDWATER AND MANAGEMENT Origin- Classification and types - properties of aquifers- governing equations – steady and unsteady flow - artificial recharge - RWH in rural and urban areas	10
Total Instructional Hours		45

- The students completing the course can
- Course Outcome**
- CO1: Understand the key drivers on water resources, hydrological processes and their integrated behaviour in catchments
- CO2: Able to construct and apply a range of hydrological models to surface water and groundwater problems including Hydrograph, Flood/Drought management, artificial recharge etc.
- CO3: Able to conduct Spatial analysis of rainfall data and design water storage reservoirs
- CO4: Understand the concept and methods of ground water management.
- CO5: Analyze and utilize the runoff effectively for the benefit of stakeholders in catchment area.

TEXT BOOKS:

- T1 Subramanya .K. "Engineering Hydrology"- Tata McGraw Hill, 2010
- T2 Jayarami Reddy .P. "Hydrology", Tata McGraw Hill, 2008.
- T3 Linsley, R.K. and Franzini, J.B. "Water Resources Engineering". McGraw Hill International Book Company, 1995

REFERENCE BOOKS

- R1 David Keith Todd. "Groundwater Hydrology", John Wiley & Sons, Inc. 2007
- R2 Ven Te Chow, Maidment, D.R. and Mays, L.W. "Applied Hydrology", McGraw Hill International Book Company, 1998.
- R3 Raghunath .H.M., "Hydrology". Wiley Eastern Ltd.. 1998.



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**Dean (Academics)
HiCET**

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AG4204	IRRIGATION AND DRAINAGE ENGINEERING	3	0	0	3

- Course Objective**
1. To train the students and develop basic understanding of soil water plant relationship
 2. At the completion of the course the students should be able to understand the necessity of planning an irrigation system to provide water at the right time and right place.
 3. To train the students and develop basic knowledge about how to design appropriate method of water application in varied situations.
 4. To understand the basic concepts for planning, design and management of land drainage works in cultivated areas.
 5. To train the students about the reclamation of the agricultural lands suffering from excessive water application and problematic soils.

Unit	Description	Instructional Hours
I	WATER RESOURCES AND IRRIGATION REQUIREMENT Water Resources- River basins-Development and Utilization in India and Tamil Nadu-Irrigation – duty and delta - Rooting characteristics - Moisture use of crop, Evapotranspiration - ET plot - Crop water requirement - Effective rainfall - Scheduling - Irrigation requirement - Irrigation frequency, Irrigation efficiencies	9
II	METHODS OF IRRIGATION Methods of Irrigation – Surface and Subsurface methods – Drip and Sprinkler - Hydraulics and design - Erodible and non-erodible, Kennedy's and Lacey's theories, Materials for lining water courses and field channel, Water control and diversion structure - Underground pipeline irrigation system	9
III	DIVERSION AND IMPOUNDING STRUCTURES Head works –Weirs and Barrage –Types of impounding structures - Factors affecting, location of dams -Forces on a dam -Design of Gravity dams- Earth dams, Arch dams – Spillways -Energy dissipaters.	9
IV	CANAL IRRIGATION AND COMMANDAREA DEVELOPMENT Classification of canals- Alignment of canals – Design of irrigation canals– Regime theories - Canal Head works – Canal regulators - Canal drops – Cross drainage works – Canal Outlet, Escapes –Lining and maintenance of canals - Excess irrigation and waterlogging problem - Command area - Concept, Components of CADP - On Farm Development works, Farmer's committee - its role for water distribution and system operation - rotational irrigationsystem.	9
V	AGRICULTURAL DRAINAGE Agricultural drainage - Drainage coefficient; principles of flow through soils, Darcy's law – infiltration theory, Surface drainage systems - Subsurface drainage - Design of subsurface drainage - Pipe materials - mole drains, drainage wells, Leaching requirements - irrigation and drainage water quality - recycling of drainage water for irrigation.	9
Total Instructional Hours		45

- Course Outcome**
- The students completing the course will have
- CO1: The students will have knowledge and skills on Planning, design, operation and management of reservoir system.
- CO2: The student will gain knowledge on different methods of irrigation
- CO3: The student will able to understand various diversion and impounding structures.
- CO4: The student will grab knowledge about the command area development and canal irrigation system.

CO5: The students will retrieve basic idea about reclamation of the soils under water logged conditions and salinity problems.

TEXT BOOKS:

- T1 Dilip Kumar Majumdar., "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.
- T2 Michael, A.M., "Irrigation Engineering", Vikas Publishers, New Delhi, 2008.
- T3 Garg, S.K., "Irrigation Engineering", Laxmi Publications, New Delhi, 2008.
- T4 Ritzema, H.P., "Drainage Principles and Applications", Publication No. 16, International Institute of Land Reclamation and Improvement, Netherlands, 1994.
- T5 Kessler, J., "Drainage Principles and Applications", Vol. II and IV, International Institute of Land Reclamation and Improvement, Netherlands, 1979.

REFERENCE :

- R1 Murthy, V.V.N., "Land and water management", Kalyani publishing, New Delhi, 1998.
- R2 Bhattacharya, A.K., and Michael, A.M., "Land Drainage – Principles, Methods and Applications", Konark Publishers Pvt. Ltd., New Delhi, 2003.
- R3 Basak, N.N., "Irrigation Engineering", Tata McGraw-Hill Publishing Co, New Delhi, 2008.

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**Dean (Academics)
HiCET**

Programme	Course code	Name of the course	L	T	P	C
B.E.	16AG4231	STRENGTH OF MATERIALS	3	0	0	3

COURSE OBJECTIVES

1. To provide the basic concepts and principles of strength of materials.
2. To understand the stresses developed in bars, compounds bars, beams, shafts, cylinders and spheres.
3. To understand deformation of solids, learn deflection of beams, torsion formula
4. To analyze the behavior of simple structural elements under simple loadings
5. To give an ability to apply the knowledge of strength of materials on engineering applications and design problems.

UNIT	DESCRIPTION	Instructional Hours
I	STRESS, STRAIN AND DEFORMATION OF SOLIDS Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants – Volumetric strains - Thin shells - circumferential and longitudinal stresses in thin cylinders - deformation of thin cylinder – stresses in spherical shells – Deformation of spherical shells.	9
II	ANALYSIS OF PLANE TRUSSES Determinate and indeterminate plane trusses – determination of member forces by method of joints, method of sections and method of tension coefficient	9
III	TRANSVERSE LOADING AND STRESSES IN BEAM Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over-hanging beams. Theory of simple bending– bending stress distribution – Shear stress distribution - Flitched beams – carriage springs.	9
IV	TORSION Torsion formula - stresses and deformation in circular and hollows shafts – Stepped shafts– Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs - carriage springs.	9
V	DEFLECTION OF BEAMS Computation of slopes and deflections in determinate beams - Double Integration method – Macaulay’s method – Area moment method – Conjugate beam method.	9
Total Instructional Hours		45

Upon completion of this course, the students can able to

CO1: apply mathematical knowledge to calculate the deformation behavior of simple structures.

Course Outcome CO2: critically analyze problem and solve the problems related to structural elements
CO3: analyze the deformation behavior for different types of loads

CO4: design and conduct experiments, as well as to analyze and interpret data

CO5: design a component to meet desired needs within realistic constraints of safety

TEXT BOOKS:

- T1 Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., 2007
T2 Jindal U.C., "Strength of Materials", Asian Books Pvt. Ltd., New Delhi, 2007
T3 Ferdinand P. Beer, Russell Johnson, J.r. and John J. Dewole, "Mechanics of Materials", Tata McGraw Hill Publishing ,co. Ltd., New Delhi, 2005.

REFERENCE :

- R1 Egor. P.Popov, "Engineering Mechanics of Solids" Prentice Hall of India, New Delhi, 2001
R2 Subramanian R., "Strength of Materials", Oxford University Press, Oxford Higher Education Series, 2007.
R3 Hibbeler, R.C., "Mechanics of Materials", Pearson Education, Low Price Edition, 2007


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**Dean (Academics)
HiCET**

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AG4001	SOIL SCIENCE LAB	0	0	4	2

- Course Objective**
1. Students will able to impart the knowledge of basic properties of soil
 2. Students should be able to verify various quality aspects of soil and water studied in theory by performing experiments in lab.
 3. Students will able to investigate soil characteristics
 4. Students will able to understand soil and properties for a multitude of objectives
 5. Be able to evaluate soils for their sensitivity to impacts related to natural environmental changes and those influenced by man.

S.NO LIST OF EXPERIMENTS

- 1 Identification of rocks and minerals
- 2 Collection and processing of soil samples
- 3 Determination of soil moisture, EC and pH
- 4 Field density determination by Core Cutter and Sand Replacement method
- 5 Specific gravity determination by Pycnometer
- 6 Textural analysis of soil by International Pipette method
- 7 Grain size analysis by using Mechanicalshaker
- 8 Determination of Organic carbon
- 9 Estimation of Gypsum requirements

Total Instructional Hours 30

The students completing the course will have

CO1: Students will be able to describe the various mineral and organic components of soils, including how changes in various quantities affect soil physical and chemical properties

CO2: Students will understand pedogenesis and how different parent materials create soils with varying properties.

Course Outcome

CO3: Students will understand water retention and movement in soils, especially as it relates to plant water availability

CO4: Students will develop a basic understanding of soil chemistry, including pH and CEC, especially how they relate to nutrient availability and, when feasible, adjustments, such as liming, that can improve conditions for plant growth.

CO5: Students will develop an introductory understanding of soil taxonomy, including the favorable traits and limitations of the various soil orders.

REFERENCE BOOKS

- R1 Punmia, B.C, "Soil Mechanics and Foundation Engineering", Laxmi Publishers, New Delhi. 2007
R2 "Laboratory Manual" Centre for Water Resources, Anna University, Chennai.2012.


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**Dean (Academics)
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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AG4002	IRRIGATION FIELD LAB	0	0	4	2

- Course Objective**
1. To expose the students in various meteorological instruments
 2. To study various aspects of soil moisture dynamics
 3. To evaluate surface irrigation systems and design modern irrigation systems like drip, sprinkler irrigation systems
 4. To determine various irrigation efficiencies, distribution uniformity
 5. To verify the principles studied in theory by performing the experiments in lab.

S.NO LIST OF EXPERIMENTS

- 1 To study various instruments in the Meteorological Laboratory
- 2 Determination of infiltration rate using double ring and digital infiltrometer
- 3 Design of Drip irrigation system
- 4 Design of sprinkler irrigation system
- 5 Measurement of flow properties in open irrigated channels (flumes, notches)
- 6 Evaluation of surface irrigation
- 7 Determination of uniformity coefficient for drip irrigation
- 8 Determination of uniformity coefficient for sprinkler system (catch can method)
- 9 To conduct experiment on disc filter for micro irrigation systems

Total Instructional Hours 60

S.NO	LIST OF EQUIPMENTS REQUIRED	REQUIRED QUANTITY
1.	Meteorological lab with Cup counter anemometer, Sunshine recorder, Open pan vaporimeter, Stevenson's screen - Dry bulb, wet bulb thermometers, recording and non- recording type rain gauge etc	Each 1
2.	Double ring infiltrometer	1
3.	Digital infiltrometer	1
4.	Parshall flume, cut throat flume	1
5.	V notch, Rectangular notch and trapezoidal notch	Each 1
6.	Drip irrigation system with all accessories	
7.	Sprinkler irrigation system with all accessories	
8.	Required number of stop watches	
9.	Weight balance	1

The students completing the course can

CO1: gain the knowledge on various meteorological instruments and understanding the concept of different irrigational systems in the laboratory tests.

**Course
Outcome**

CO2: understand concept of different methods for estimation of evapotranspiration

CO3: understand about irrigation management

CO4: design various irrigation system

CO5: able to schedule irrigation system

REFERENCE BOOKS

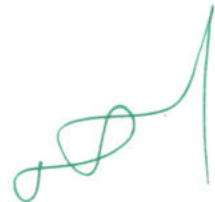
R1 Michael, A.M., "Irrigation Theory and Practice", Vikas Publishing House, New Delhi, 1999.

R2 Asawa, G.L., "Irrigation Engineering", New Age International Private Limited, New Delhi, 1996.

R3 "Laboratory Manual", "Centre for Water Resources, Anna University, Chennai.



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**Dean (Academics)
HiCET**

CO'S, PO'S & PSO'S MAPPING

Academic Year : 2019-2020

Semester – I

COURSE CODE & NAME : 19HE1101/ TECHNICAL ENGLISH

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	2	-	1	2	1	2	3	1	3	3	2
CO2	1	2	1	1	1	2	1	1	1	3	1	2	2	3
CO3	1	2	1	1	1	2	1	1	2	3	1	2	2	2
CO4	1	1	-	1	1	1	1	1	2	3	1	2	3	3
CO5	-	1	1	1	1	1	1	2	2	3	1	2	2	2
Avg	1	1.4	1	1.2	1	1.4	1.2	1.2	1.8	3	1	2.2	2.4	2.4

COURSE CODE & NAME : 19MA1102/ CALCULUS AND LINEAR ALGEBRA

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO2	3	3	3	2	3	-	-	-	-	-	-	2	2	2
CO3	3	3	3	3	3	-	-	-	-	-	-	2	2	3
CO4	3	3	3	3	3	-	-	-	-	-	-	2	1	2
CO5	3	3	3	3	3	-	-	-	-	-	-	2	2	1
Avg	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2

COURSE CODE & NAME : 19ME1101/BASICS OF CIVIL AND MECHANICAL ENGINEERING

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	-	-	1	-	-	-	-	-	1	3	3
CO2	3	1	1	-	-	1	-	-	-	-	-	1	3	2
CO3	3	1	1	-	-	1	-	-	-	-	-	1	2	2
CO4	3	1	1	-	-	1	-	-	-	-	-	1	3	2
CO5	3	1	1	-	-	1	-	-	-	-	-	1	3	2
Avg	3	1	1	-	-	1	-	-	-	-	-	1	2.8	2.2

COURSE CODE & NAME : 19PH1151/ APPLIED PHYSICS

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	1	1	-	-	-	-	-	1	2	1
CO2	3	3	1	1	2	-	-	-	-	-	-	1	3	3
CO3	3	2	1	2	2	-	-	-	-	-	-	1	3	3
CO4	3	2	3	2	3	1	-	-	-	-	-	1	2	2
CO5	3	2	3	2	2	2	-	-	-	-	-	1	2	3
Avg	3	2.2	2	1.6	2	1.3	-	-	-	-	-	1	2.4	2.4

COURSE CODE & NAME : 19CY1151/ CHEMISTRY FOR ENGINEERS

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	2	1	1	-	-	-	-	1	1	1
CO2	3	2	2	-	2	1	-	-	-	-	-	1	1	-
CO3	3	2	2	-	2	1	1	-	-	-	-	1	1	-
CO4	3	2	2	2	2	1	-	-	-	-	-	1	1	1
CO5	3	2	2	-	2	1	-	-	-	-	-	1	1	1
Avg	3	2	2	2	2	1	1	-	-	-	-	1	1	1

COURSE CODE & NAME : 19CS1151/PYTHON PROGRAMMING PRACTICES

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	-	2	-	-	-	-	-	-	2	2	2
CO2	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO3	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO4	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO5	2	3	3	-	2	-	-	-	2	-	-	2	2	2
Avg	2	3	3	-	2	-	-	-	2	-	-	2	2	2

Semester –II (R 2019)

COURSE CODE & NAME : 19HE2101/ BUSINESS ENGLISH FOR ENGINEERS

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	1	1	2	1	2	2	3	-	3	1	-
CO2	2	1	1	1	1	2	2	2	2	3	-	2	-	1
CO3	2	2	1	1	1	2	2	2	2	3	1	3	1	-
CO4	2	2	1	1	2	2	2	2	3	3	1	3	1	1
CO5	1	1	1	1	1	2	2	1	2	3	1	3	1	1
Avg	1.6	1.6	1	1	1.2	2	1.8	1.8	2.2	3	1	2.8	1	1

COURSE CODE & NAME : 19MA2101/ DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLES

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO3	3	3	3	3	3	-	-	-	-	-	-	2	2	2
CO4	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO5	3	3	3	3	3	-	-	-	-	-	-	2	2	2

Avg	3	3	3	2.4	2.4	-	-	-	-	-	-	2	2	2
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COURSE CODE & NAME : 19AG2104/ PRINCIPLES OF FOOD SCIENCES

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2			1	2	1		1				2	2
CO2	1	2	1	1	1	1							2	1
CO3	1	1	3		1	2							2	3
CO4	1	2	1	1	2	1							1	2
CO5	1	1	1	1	1	2	1		1				1	2
Avg	1	1.6	1.5	1	1.2	1.6	1		1				1.6	2

COURSE CODE & NAME : 19PH2151/ MATERIAL SCIENCE

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	1	-	-	-	-	-	1	2	1
CO2	3	3	1	1	2	-	-	-	-	-	-	1	2	2
CO3	3	2	1	2	2	-	-	-	-	-	-	1	2	3
CO4	3	3	1	2	2	1	-	-	-	-	-	1	2	2
CO5	3	2	2	3	2	1	2	-	-	-	-	1	2	3
Avg	3	2.4	1.2	1.8	1.8	1	2	-	-	-	-	1	2	2.2

COURSE CODE & NAME : 19CY2151/ ENVIRONMENTAL STUDIES

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	2	3	3	2	-	-	2	-	-
CO2	2	-	-	-	-	2	3	3	2	-	-	2	-	-
CO3	2	1	1	-	-	2	3	3	2	-	-	2	-	-
CO4	2	1	2	-	-	2	3	3	2	-	-	2	-	-
CO5	2	1	2	-	-	2	3	3	2	-	-	2	-	-

Avg	2	1	1.7	-	-	1	2	3	2	-	-	2	-	-
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COURSE CODE & NAME : 19IT2151/ PROGRAMMING IN C

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	-	2	-	-	-	-	-	-	2	2	2
CO2	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO3	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO4	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO5	2	3	3	-	2	-	-	-	2	-	-	2	2	2
Avg	2	3	3.0	-	2	-	-	-	-	-	-	2	2	2

COURSE CODE & NAME : 19ME2001/ ENGINEERING PRACTICES

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	3	-	3	-	1	-	1	-	-	-	1	2
CO2														
CO3														
CO4														
CO5														
Avg	3		3		3				1				1	2

Semester –III (R 2019)

COURSE CODE & NAME : 19MA3102/ FOURIER ANALYSIS AND TRANSFORMS

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	-	-	-	-	-	-	2	2	2
CO2	3	3	3	3	3	-	-	-	-	-	-	2	2	1
CO3	3	3	3	3	2	-	-	-	-	-	-	2	2	1
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	1
CO5	3	3	3	3	3	-	-	-	-	-	-	2	2	1
Avg	3	3	3	3	2.6	-	-	-	-	-	-	2	2	1.2

COURSE CODE & NAME: 16AG3201 - SOIL SCIENCE AND ENGINEERING

PO&PSO	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
C01	3		3			3	3	2	1		1	3	3	1
C02	3	2						2		1	1	2	3	2
C03	1		1	2	2	1			2			3	3	2
C04	2	1			2		1	2	1			1	3	2
C05	3	2	1	3		2	1	1	2	3	2	2	3	3
Avg	2	1	2	2	2	2	2	1	1	2	1	2	3	2

COURSE CODE & NAME: 16AG3202 - FLUID MECHANICS AND HYDRAULICS

PO&PSO	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
C01	2	2	2									2	3	1
C02	3	3	3	3			2		2	1	1	2	3	2
C03	3	3	3	3			2		2	1	1	2	3	2
C04	1		2	2								2	3	2
C05	1											2	3	3
Avg	2	2	3	3			2		2	1	1	2	2	2

COURSE CODE & NAME: 16ME3232 - THEORY OF MACHINES AND MECHANICS

PO&PSO	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
C01	2	2	2									2	3	1
C02	3	3	3	3			2		2	1	1	2	3	2
C03	3	3	3	3			2		2	1	1	2	3	2
C04	1		2	2								2	3	2
C05	1											2	3	3
Avg	2	2	3	2			2		2	1	1	2	3	2

COURSE CODE & NAME: 16CE3231 - SURVEYING AND LEVELING

PO&PSO	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
C01	2	1	1	2	1	2	1	1				1	1	1
C02	2	1	1	2	1	2	1	1				1	1	1
C03	3	1	2	3	2	3	1	1				1	1	2
C04	3	2	2	2	2	3	2	1				2	1	2
C05	3	2	3	2	3	3	2	2				32	1	3
Avg	2	2	2	2	2	2	1	1				1	1	2

COURSE CODE & NAME: 16ME3233 - THERMODYNAMICS

PO&PSO	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
C01	3	2	2										3	2
C02	3		2			2							3	2
C03		1	2	2										3
C04	3		2									2		3
C05	1	3	3	3								2		3
Avg	3	1	2	2		2						2	3	3

COURSE CODE & NAME: 16AG3001 FLUID MECHANICS LABORATORY

PO&PSO	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
C01	1	-	1	-	-	-	1	-	-	-	2	2	3	1

C02	1	1	2	-	2	-	-	-	1	1	2	2	2	2
C03	1	2	2	1	1	-	-	-	1	1	2	2	2	2
C04	1	1	1	-	1	-	-	-	1	1	2	2	1	3
C05	1	3	1	-	1	-	-	-	1	1	2	2	1	3
Avg	1	1	1	1	1		1		11	1	2	2	2	2

COURSE CODE & NAME: 16CE3031 - SURVEYING AND LEVELING LABORATORY

PO&PSO	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
C01	2	1	1	2	1	2	1	1				1	1	1
C02	2	1	1	2	1	2	1	1				1	1	1
C03	3	1	2	3	2	3	1	1				1	1	2
C04	3	2	2	2	2	3	2	1				2	1	2
C05	3	2	3	2	3	3	2	2				2	1	3
Avg	2	1	2	2	1	2	1	1				1	1	2

Semester – IV

COURSE CODE & NAME : 16MA4112/ APPLIED STATISTICS AND NUMERICAL METHODS

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	2	-	-	-	-	-	-	2	3	2
CO2	3	3	3	2	1	-	-	-	-	-	-	3	2	2
CO3	3	3	3	1	1	-	-	-	-	-	-	2	2	2
CO4	3	3	3	3	3		-	-	-	-	-	2	2	2
CO5	3	3	3	3	3		-	-	-	-	-	2	2	2
Avg	3	2.8	3	2	2	0	0	0	0	0	0	2.2	2.2	2

COURSE CODE & NAME: 16AG4201 - UNIT OPERATIONS IN AGRICULTURAL PROCESSING

PO&PSO	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
CO1	3	2	1	1	1	1		2		3	2		3	1
CO2	2	2	1	1			2		3			1	2	1
CO3	3	1	1	1	3		2		1		1	1	2	2
CO4	3	1	1	1		2		3		3		1	1	2
CO5	3	2	1	1		3		2	3	1		1	1	1
Avg	3	2	1	1	2	2	2	2	2	2	1	1	2	1

Course Code & Name : 16AG4202 FARM TRACTORS

PO&PSO	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
CO1	3		3			3	3	2	1		1	3	1	1
CO2	3	2		2				2		1	1	2	1	1
CO3	1		1		2	1			2			3	1	2
CO4	2	1		3	2		1	2	1	3		1	1	2
CO5	3	2	1			2	1	1	2	1	2	2	1	3
Avg	2.4	1.	1.6	2.5	2	2	1.6	1.75	1.5	1.6	1.3	2.2	1	1.8

Course Code & Name : 16AG4203 HYDROLOGY AND WATER RESOURCES ENGINEERING

PO&PSO	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
CO1	3	2	2	3	1		2	2					3	2
CO2	3	3	2	2	3	2	2						3	2
CO3	2	1	2	2	2	2	3						2	3
CO4	3		2		1	2						2	2	3
CO5	2	3	3	2	3							2	2	3

Avg	2.6	2.25	2.2	2.25	2	2	2.33	2				2	2.4	2.6
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Course Code & Name : 16AG4204 IRRIGATION AND DRAINAGE ENGINEERING

PO&PSO	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
CO1	1	1										1	1	1
CO2	3	3	3	3			1		3		3	2	3	2
CO3	1	1											1	2
CO4	3	3	2	2			1		2			2	2	3
CO5	2	2	1									1	1	2
Avg	2	2	2	2.5	0	0	1	0	2.5	0	3	1.5	1.6	2

Course Code & Name : 16ME4231 STRENGTH OF MATERIALS

PO&PSO	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
CO1	2	2	2									2	3	1
CO2	3	3	3	1	2	1	2		2	1	1	2	3	2
CO3	3	3	3	1	2	1	2		2	1	1	2	3	2
CO4	1		1	2	2	1						2	3	2
CO5	1											2	3	3
Avg	2	2.6	2.	1.3	2	1	2	0	2	1	1	2	3	2

COURSE CODE & NAME : 16AG4001 SOIL SCIENCE LABORATORY

PO&PSO	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
CO1	3		3			3	3	2	1		1	3	1	1
CO2	3	2		2				2		1	1	2	1	1
CO3	1		1		2	1			2			3	1	2
CO4	2	1		3	2		1	2	1	3		1	1	2
CO5	3	2	1			2	1	1	2	1	2	2	1	3
Avg	2	1	1	2	2	2	1	1	1	1	1	2	1	1

COURSE CODE & NAME : 16AG4002 IRRIGATION FIELD LABORATORY

PO&PSO	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
CO1	1	1										1	1	1
CO2	3	3	3	3			1		3		3	2	3	2
CO3	1	1											1	2
CO4	3	3	2	2			1		2			2	2	3
CO5	2	2	1									1	1	2
Avg	2	2	2	2.5	0	0	1	0	2.5	0	3	1.5	1.6	2

MAPPING OF COURSE OUTCOME AND PROGRAMME OUTCOME:

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E AGRICULTURE ENGINEERING (UG)

REGULATION-2019

Year	Sem	Course code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	
I	I	19HE1101 & Technical English	1	1	1	1	1	1	1	1	2	3	1	2	2	2	
		19MA1102 & Calculus and Linear Algebra	3	3	3	3	3	-	-	-	-	-	-	-	2	2	2
		19ME1101 & Basics of Civil and Mechanical Engineering	3	1	1	-	-	1	-	-	-	-	-	-	1	3	2
		19PH1151 & Applied Physics	3	2	2	2	2	1	-	-	-	-	-	-	1	2	2
		19CY1151 & Chemistry for Engineers	3	2	2	2	2	1	1	-	-	-	-	-	1	1	1
		19CS1151 & Python programming and practices	2	3	3	-	2	-	-	-	-	2	-	-	2	2	2
I	II	19HE2101 & Business English for Engineers	2	2	1	1	1	2	2	2	2	3	1	3	1	1	
		19MA2101 & Differential Equations and Complex Variables	3	3	3	2	2	-	-	-	-	-	-	-	2	2	2
		19AG2104 & Principles of Food Science	1	1	1	1	1	1	1	1	-	1	-	-	-	1	2

		19PH2151 & Material Science	3	2	1	2	2	1	2	-	-	-	-	1	2	2	
		19CY2151 & Environmental studies	2	1	1	-	-	1	2	3	2	-	-	2	-	-	
		19IT2151 & Programming in C	2	3	3	-	2	-	-	-	-	-	-	2	2	2	
		19ME2001 & Engineering Practices	3	-	3		3	-	-	-	1	-	-	-	1	2	
II	III	19MA3102 & Fourier Analysis and Transforms	3	3	3	1	1	2	-	-	-	-	-	2	2	2	
		19AG3201 & Soil Science and Engineering	2	1	2	2	2	2	2	2	1	1	2	1	2	1	1
		19AG3202 & Fluid Mechanics and Hydraulics	2	2	1	1	2	1	1	1	1	-	2	-	1	2	1
		19AG3203 & Principles and practices of Crop Production	1	1	1	1	1	-	1	-	1	1	1	2	2	2	2
		19AG3251 & Unit Operations in Agricultural Processing	3	2	1	1	2	2	2	2	2	2	2	1	1	2	1
		19AG3001 & Field Crop Production Practical	1	1	1	1	1	-	1	-	1	1	1	2	2	2	2
		19AG3002 & Soil Science Laboratory	3	2	2	2	2	2	2	1	1	1	1	1	2	1	1
II	IV	19AG4201 & Farm Tractors	2	1	1	2	2	1	1	2	1	1	1	2	1	2	
		19AG4202 & Thermodynamics	3	1	2	2	-	2	-	-	-	-	-	-	2	3	3
		19AG4203 & Irrigation and Drainage Engineering	2	1	2	2	-	-	1	-	2	-	3	1	1	1	2
		19AG4251 & Bio-Energy Resource Technology	2	3	2	1	2	1	2	0	2	1	1	2	3	2	2
		19AG4252 & Surveying	3	1	2	2	2	3	1	1	1	0	0	0	1	1	1

		and Leveling															
		19AG4001 & Irrigation Field Laboratory	2	2	2	3	0	0	1	0	3	0	3	1	2	2	
III	V	19AG5201 & Farm Machinery and Equipment	2	2	3	3	2	1	2	2	0	0	1	3	2	3	
		19AG5202 & Refrigeration and Cold Chain Management	2	3	2	1	2	1	2	0	2	1	1	2	3	2	
		19AG5203 & Theory of Machines	2	2	2	2	2	1	1	1	1	1	1	1	2	2	
		19AG5301 & Systems Analysis and Soft Computing in Agricultural Engineering	2	2	2	1	2	1	1	1	1	1	1	1	2	2	1
		19AG5302 & Sustainable Agriculture and Food Security	2	2	2	1	2	1	2	1	2	1	1	2	2	2	
		19AG5303 & CDM and Carbon Trading Technology	2	2	2	2	2	1	1	1	1	1	1	1	2	2	
		19AG5304 & IOT in Agricultural Systems	2	1	2	2	2	1	1	1	1	2	1	2	2	2	
		19AG5305 & Ergonomics and Safety in Agricultural Engineering	2	1	2	1	2	1	2	1	2	1	1	2	2	2	
		19AG5251 & Groundwater and Well Engineering	3	2	2	2	3	2	2	2	-	-	-	2	2	3	
		19AG5252 & Soil and Water Conservation Engineering	2	2	3	3	2	2	3	1	2	2	2	3	3	2	
19AG5001 & Operation and Maintenance	2	2	2	3	2	-	1	0	3	0	3	2	2	2			

		of Farm Machinery Laboratory															
		19AG5002 & CAD for Agricultural Engineering	3	2	2	2	3	2	2	2				2	2	2	
III	VI	19AG6201 Hydrology and Water Resources Engineering	3	2	2	2	2	2	2	2	-	-	-	2	2	3	
		19AG6202 Solar and Wind Energy Engineering	2	2	2	3	-	1	2	1	-	-	1	2	2	2	2
		19AG6181 Professional Ethics	2	3	2	1	2	1	2	-	2	1	1	2	3	2	2
		19AG6301 Climate change and adaptation	2	2	2	1	2	1	2	1	2	1	1	2	2	2	2
		19AG6302 Heat and Mass Transfers for Agricultural Engineers	1	2	2	1	1	2	1	-	1	-	-	-	2	2	2
		19AG6251 Food and Dairy Engineering	1	2	2	1	1	2	1	-	1	-	-	-	2	2	2
		19AG6252 ICT in Agricultural Engineering	2	2	2	2	1	2	2	-	1	2	2	2	2	2	2
		19AG6701 Industrial Training	3	2	2	3	-	2	-	-	-	-	-	-	2	3	3
		19AG6303 Disaster Management	2	2	1	2	2	2	2	2	1	1	1	1	2	2	2
		19AG6304 Horticultural Crop Processing	2	1	2	2	2	2	2	2	2	3	3	2	2	1	1
19AG6305 Organic Farming Technologies	2	2	1	3	1	1	2	1	2	2	2	2	2	2	1		
19AG6401 Modern Agricultural Practices	2	2	3	3	2	1	2	2	2	-	-	3	2	2	3		
IV	VII	19AG7201 Agricultural Extension	1	1	1	1	1	1	-	-	-	-	-	2	1	2	

		19AG7202 Remote Sensing and Geographical Information System	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		19AG7251 Precision Farming and Protected Cultivation	3	2	2	3	-	2	-	-	-	-	-	2	3	3
		19AG7001 Renewable Energy Laboratory	2	3	2	1	2	2	2	-	2	1	1	2	2	2
		19AG7002 GIS Laboratory for Agricultural Engineers	2	2	1	1	2	1	2	-	2	1	1	2	3	2
		19AG7901 Innovative Project	1	1	1	-	-	1	-	1	1	1	1	1	1	2
		19AG7301 Post-Harvest Technology	2	2	1	2	1	1	2	1	1	2	2	1	1	1
		19AG7302 Dairy Process Technology	2	2	2	1	1	2	2	1	1	2	1	2	2	1
		19AG7303 Storage and Packaging Technology	3	2	1	3	2	2	2	2	1	2	1	1	2	2
		19AG7304 Process Engineering of Fruits and Vegetables	1	2	1	2	2	2	2	2	2	2	2	2	2	1
		19AG7305 Fat and Oil Processing	1	2	2	2	2	2	2	1	2	1	1	2	2	1
		19AG7401 Urban Agriculture and organic farming	1	1	1	1	-	-	-	-	-	-	-	2	1	2
IV	VIII	19AG8901 Project work	1	2	1	-	-	1	-	1	1	1	1	1	1	2
		19AG8301 Agricultural Business Management and Entrepreneurship	2	2	1	1	2	2	2	2	1	2	1	2	1	1

	19AG8302 On-Farm Water Management	1	2	2	2	2	2	2	2	1	2	2	3	3	1	1
	19AG8303 Intellectual Property Rights	2	2	2	2	2	2	3	2	1	2	2	3	1	2	
	19AG8304 Agricultural Waste Management	1	2	1	2	2	2	2	2	2	2	2	2	2	2	
	19AG8305 Energy Conservation in Agro based Industry	1	2	2	2	2	2	2	1	2	1	1	2	2	1	
	19AG8306 Special Farm Equipment's	2	2	1	1	2	2	2	2	1	2	1	2	1	1	
	19AG8307 Mechanics of Tillage and Traction	2	2	2	2	2	2	3	2	1	2	2	3	1	2	
	19AG8308 Watershed Hydrology and Management	1	2	2	2	2	2	2	1	2	2	3	3	1	1	
	19AG8309 Micro Irrigation System	2	2	3	3	2	1	2	2	2	-	-	3	2	3	
	19AG8310 Agriculture Economics and Farm Management	2	2	1	3	1	1	2	1	2	2	2	2	2	1	