

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.TECH. FOOD TECHNOLOGY



CHOICE BASED CREDIT SYSTEM

Curriculum & Syllabus
2018-2019

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

IM1: To provide academic excellence in technical education through novel teaching methods.

IM2: To empower students with creative skills and leadership qualities.

IM3: To produce dedicated professionals with social responsibility.



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VISION AND MISSION OF THE DEPARTMENT

VISION

To be an excellent Department in training students to become professional Food Technologist who is technically capable of working in food operations sector and discovering licensed food products which could benefit the Eco-friendly society.

MISSION

- M1. To impart students with a vibrant technical and analytical skills.
- M2. To provide students with leadership quality and also the knowledge to handle all the problems relating Food Industry.
- M3. To develop the research and development activities of students to explore the quality food products.


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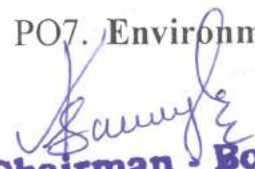



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PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

- PO1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- PO6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO7. **Environment and sustainability:** Understand the impact of the professional


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engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

- PO8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.


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PROGRAM SPECIFIC OUTCOMES (PSOs)

- PSO 1. Ensure food safety and quality by using the technical skills and other emerging techniques.
- PSO 2. Design and develop the safest food products and equipments needed for the eco-friendly society.
- PSO 3. Integrate various concepts of food processing operations and come out with the best solution for the complex issues in food sector.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- PEO 1. Utilize the principles of food science and Engineering to face various professional career challenges.
- PEO 2. Analyze and create new food products and process for real world application with technical feasibility.
- PEO 3. Exhibit professional and managerial capabilities with ethical conduct for continuous learning.


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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.TECH. FOOD TECHNOLOGY
REGULATION-2016**

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

SEMESTER I

S.No.	COURSE CODE	COURSE TITLE	Course Category	L	T	P	C	CIA	ESE	Total
1	16MA1101	Engineering Mathematics – I	BS	3	1	0	4	25	75	100
2	16PH1101	Engineering Physics	BS	3	0	0	3	25	75	100
3	16CY1101	Engineering Chemistry	BS	3	0	0	3	25	75	100
4	16HE1101R	Essential English for Engineers – I	HS	3	1	0	4	25	75	100
5	16GE1103	Problem Solving and Python Programming	ES	3	0	0	3	25	75	100
6	16GE1102	Engineering Graphics	ES	2	0	4	4	25	75	100
7	16PS1001	Physical Sciences Lab – I	ES	0	0	2	1	50	50	100
8	16GE1004	Problem Solving and Python Programming Lab	ES	0	0	4	2	50	50	100
9	16GE1002	Engineering Practices Laboratory	ES	0	0	4	2	50	50	100
10	16GE1003	Value Added Course – Language Competency Enhancement Course – I	EEC	0	0	2	1	0	100	100
TOTAL				17	2	16	27	300	700	1000

SEMESTER II

S.No.	COURSE CODE	COURSE TITLE	Course category	L	T	P	C	CIA	ESE	Total
1	16MA2102	Engineering Mathematics – II	BS	3	1	0	4	25	75	100
2	16PH2102	Physics of Materials	BS	3	0	0	3	25	75	100
3	16FT2101	Fundamentals of Biochemistry	PC	3	0	0	3	25	75	100
4	16HE2102R	Essential English For Engineers - II	HS	3	1	0	4	25	75	100
5	16GE2101	Engineering Mechanics	ES	3	1	0	4	25	75	100
6	16CY2102	Environmental Science	BS	3	0	0	3	25	75	100
7	16PS2001	Physical Sciences Lab – II	ES	0	0	2	1	50	50	100
8	16FT2001	Biochemistry Lab	PC	0	0	4	2	50	50	100
9	16GE2001	Value Added Course – Language Competency Enhancement Course - II	V/A/EEC	0	0	2	1	0	100	100
TOTAL				18	3	8	25	250	650	900

(L – Lecture, T – Tutorial, P – Practical, C – Credit, CIA – Continuous Internal Assessments, ESE – End Semester Examinations)

Continuous Internal Assessment (CIA) only.

**NCM (Non Credit Mandatory Course)

S Audit Course

@@ MOOC Course (Credit Transfer Course if any approved by Dean Office) -Minimum of 45 Hours from recognized MOOC portal like SWAYAM. Assessment with Score/Credit and Certificate is mandatory.

Colour :



Credit Distribution

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	27	25	25	25	23	24	22	16	187



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SYLLABUS

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16MA1101	ENGINEERING MATHEMATICS-I (MATRICES AND CALCULUS)	3	1	0	4

- Course Objective
1. Develop the skill to use matrix algebra techniques that is needed by engineers for practical applications.
 2. Find curvature, evolutes and envelopes using the concept of differentiation.
 3. Solve ordinary differential equations of certain types using Wronskian technique.
 4. Familiarize the functions of several variables which are needed in many branches of engineering.
 5. Understand the concept of double and triple integrals.

Unit	Description	Instructional Hours
	MATRICES	
I	Eigen values and Eigen vectors of a real matrix- Properties of Eigen values and Eigen vectors (without proof)- Cayley- Hamilton Theorem (excluding proof)- Orthogonal matrices- Diagonalization of matrices by orthogonal transformation-Reduction of a quadratic form to canonical form by orthogonal transformation.	12
	DIFFERENTIAL CALCULUS	
II	Curvature in Cartesian co-ordinates - Radius and Centre of curvature - Circle of curvature - Involute and Evolute (parabola, ellipse, cycloid, asteroïd) - Envelopes - single parameter and two parameter family of curves.	12
	ORDINARY DIFFERENTIAL EQUATIONS	
III	Second and higher order linear differential equations with constant coefficients and with RHS of the form e^{ax} , x^n , $\sin ax$ or $\cos ax$, $e^{ax}f(x)$ and $xf(x)$ where $f(x)$ is $\sin bx$ or $\cos bx$ - Method of variation of parameters - Linear differential equations with variable coefficients (Euler's equation)	12
	FUNCTIONS OF SEVERAL VARIABLES	
IV	Total differentiation (excluding implicit functions) - Partial derivatives of composite functions - Taylor's series for functions of two variables- Maxima and minima of functions of two variables - Lagrange's method of undetermined multipliers - Jacobians.	12
	MULTIPLE INTEGRALS	
V	Double integrals in Cartesian co-ordinates-Change of order of integration-Area enclosed by the plane curves (excluding surface area)- Triple integrals in Cartesian co-ordinates - Volume of solids using Cartesian co-ordinates.	12
	Total Instructional Hours	60

- Course Outcome
- CO1: 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
- CO2: Apply the concept of differentiation to find the radius, centre and circle of curvature of any curve
- CO3: Develop sound knowledge of techniques in solving ordinary differential equations that model engineering problems
- CO4: Identify the maximum and minimum values of surfaces.
- CO5: Computation of area of a region in simpler way by changing the order of integration and evaluation of triple integrals to compute volume of three dimensional solid structures

I SEMESTER

TEXT BOOKS:

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

REFERENCE BOOKS :

- R1-Bali N.P & Manish Goyal, "A Textbook 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-Sivarama Krishna Das P and Rukmangadachari E., "Engineering Mathematics" Vol I, Second Edition, Pearson publishing, 2011.

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.TECH.	16PH1101	ENGINEERING PHYSICS	3	0	0	3

- Course Objective
1. Illustrate the fundamental knowledge in mechanical properties of matter and thermal physics.
 2. Gain knowledge about laser and their applications.
 3. Conversant with principles of optical fiber, types and applications of optical fiber.
 4. Discuss the architectural acoustics and applications of Ultrasonics.
 5. Extend dual nature of matter and the Necessity of quantum mechanics to explore the behavior of sub atomic particles.

Unit	Description	Instructional Hours
	PROPERTIES OF MATTER AND THERMAL PHYSICS	
I	Elasticity – Hooke's law – Stress-strain diagram - Relation between three moduli of elasticity (qualitative) – Poisson's ratio – Bending moment – Depression of a cantilever – Derivation of Young's modulus of the material of the beam by Uniform bending – I-shaped girder. Modes of heat transfer – Thermal conductivity – Newton's law of cooling - Lee's disc method - Conduction through compound media (series and parallel).	9
	LASER AND APPLICATIONS	
II	Spontaneous emission and stimulated emission – Population inversion – Pumping methods – Derivation of Einstein's coefficients (A&B) – Types of lasers – Nd:YAG laser, CO2 laser, Semiconductor lasers (homojunction and heterojunction) – Laser Applications – Industrial applications: laser welding, laser cutting, laser drilling – Holography – Construction and reconstruction of images.	9
	FIBER OPTICS AND APPLICATIONS	
III	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) – Crucible-crucible technique for fiber fabrication – Sources (LED and LASER) and detectors (p-i-n photodiode and avalanche photodiode) for fiber optics - Fiber optical communication link –Fiber optic sensors – Temperature and displacement sensors.	9
	ACOUSTICS AND ULTRASONICS	
IV	Classification of sound – Weber-Fechner law – Sabine's formula (no derivation) - Absorption coefficient and its determination –Factors affecting acoustics of buildings and their remedies. Ultrasonic Production – Magnetostrictive generator – Piezoelectric generator – Determination of velocity using acoustic grating – Non destructive testing – Ultrasonic pulse echo system.	9
	QUANTUM PHYSICS AND APPLICATIONS	
V	Black body radiation – Planck's theory (derivation) –Compton effect experimental verification only - Matter waves – Physical significance of wave function – Schroedinger's wave equations – Time independent and time dependent wave equations –Particle in a box (One dimensional) – Scanning electron microscope – Transmission electron microscope.	9
Total Instructional Hours		45

- Course Outcome
- CO1: Enhance the fundamental knowledge in Properties of Matter and Thermal Physics.
 - CO2: Understand the advanced technology of LASER in the field of Engineering and medicine.
 - CO3: Exposed the fundamental knowledge of Optical fiber in the field of communication Engineering.
 - CO4: Understand the production of ultrasonics and its applications in NDT.
 - CO5: Impart the fundamental knowledge on Quantum Physics.

TEXT BOOKS:

- T1 - Rajendran V, Applied Physics, Tata McGraw Hill Publishing Company Limited, New Delhi, 2011.
T2- Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, DhanpatRai Publications (P) Ltd., New Delhi, 2013.

REFERENCE BOOKS:

- R1 - Arthur Beiser "Concepts of Modern Physics" Tata McGraw Hill, New Delhi – 2010
R2 - M.N Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company Ltd., New Delhi 2014
R3 - Dr. G. Senthilkumar "Engineering Physics – I" VRB publishers Pvt Ltd , 2013


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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16CY1101	ENGINEERING CHEMISTRY	3	0	0	3
Course Objective	<ol style="list-style-type: none"> The student should be conversant with boiler feed water requirements, related problems and water treatment techniques. The student should be conversant with the principles of polymer chemistry and engineering applications of polymers and composites The student should be conversant with the principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells. To acquaint the student with important concepts of spectroscopy and its applications. To acquaint the students with the basics of nano materials, their properties and applications 					
Unit	Description	Instructional Hours				
	WATER TECHNOLOGY					
I	Hard water and soft water- Disadvantages of hard water- Hardness: types of hardness, calculations, estimation of hardness of water – EDTA method - scales and sludges – boiler corrosion – priming and foaming – caustic embrittlement; Conditioning methods of hard water – External conditioning - demineralization process- Internal conditioning - domestic water treatment: screening, sedimentation, coagulation, filtration, disinfection – chlorine – UV method; desalination: definition, reverse osmosis.	9				
	POLYMER & COMPOSITES					
II	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, Teflon – moulding of plastics (extrusion and compression); rubber: vulcanization of rubber, synthetic rubber – butyl rubber, SBR; composites: definition, types of composites – polymer matrix composites – FRP.	9				
	ENERGY SOURCES AND STORAGE DEVICES					
III	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- solar energy conversion- solar cells- wind energy. Batteries and fuel cells: Types of batteries- alkaline battery lead storage battery- nickel-cadmium battery- lithium battery- fuel cell H ₂ -O ₂ fuel cell applications.	9				
	ANALYTICAL TECHNIQUES					
IV	Beer-Lambert's law – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (block diagram only) – estimation of iron by colorimetry – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – interferences - estimation of nickel by atomic absorption spectroscopy.					
	NANOMATERIALS					
V	Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: definition, carbon nanotubes (CNT), types of carbon nano tubes – single walled and multi walled carbon nanotubes – synthesis of carbon nanotubes: chemical vapour deposition – laser ablation – arc-discharge method; properties of CNT: mechanical, electrical, thermal and optical properties; applications of carbon nanotubes in chemical field, medicinal field, mechanical field and current applications.	9				
	Total Instructional Hours	45				
Course Outcome	<ol style="list-style-type: none"> Illustration of the basic parameters of water, different water softening processes and effect of hard water in industries. Knowledge on basic properties and application of various polymers and composites as an engineering material. Summarize the various energy sources and energy storage devices Analyze various analytical skills in handling various machines, instruments, apart from understanding the mechanism involved. Describe the basic properties and application of nanomaterials. 					
	TEXT BOOKS					
	T1 - P.C.Jain and Monica Jain, "Engineering Chemistry" DhanpatRai Pub, Co., New Delhi (2015).					
	T2 - O.G.Palanna, "Engineering chemistry" McGraw Hill Education India (2017).					

REFERENCES

- R1 - B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).
R2 - B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2005).
R3 - S.S.Dara "A Text book of Engineering Chemistry" S.Chand&Co.Ltd., New Delhi (2010).


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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16HE1101R	ESSENTIAL ENGLISH FOR ENGINEERS – I	3	1	0	4

- Course Objective**
- ✓ It fulfills the necessary skills needed in today's global workplaces.
 - ✓ Student will be able to interpret and illustrate formal communication.
 - ✓ It empowers students in choosing right lexical techniques for effective presentation
 - ✓ It equips the learner to analyze and list out things in logical order
 - ✓ The learner develops the ability to create and integrate ideas in a professional way.

Unit	Description	Instructional Hours
I	Getting to know people – Introduction – Talking about jobs (Present Simple) – Talking about working conditions(Adverb of Frequency) - Talking about company history and structure (Past simple, Prepositions of Time) – Talking about company activities (Connectors of addition and contrast, Present Continuous) – Focus on language – Parts of Speech – Gerund and Infinitives – Instruction- General Vocabulary .	12
II	Vocabulary practice – (Telephoning Leaving and taking messages) – requests and obligation – Describing trends (Adjectives and Adverbs) – Talking about company performance (present perfect and past simple. Reasons and consequences) – Reading Test Practice Describing products Dimensions, (Comparatives and Superlatives, Question formation) – Talking about product development (Sequencing words, Present continuous and going to) – Articles – Prepositions- Synonyms – Antonyms- Recommendations- Interpretation of a chart .	12
III	Talking about business equipment (Giving Instruction) – Letter Phrases- Writing Test Practice- Talking about facilities(Asking for and giving direction)- Presentation on a general topic -Talking about traffic and transport(making predictions)- Discussion on current affairs – Tenses- Present –Past-Future-Forms of verbs- Word techniques- Formation-Prefixes-Suffixes.	12
IV	Talking about conference arrangement(checking and confirming) – Talking about a conference before, after, when, until etc. – Listening Test Practice- talking about production process – passive- Talking about quality control Conditional 1 (real) (Making suggestions) – Itinery- Jumbled sentences- Paragraph writing- Essay writing – Checklist- Letter to Inviting Dignitaries – Accepting invitation- Declining Invitation.	12
V	Talking about call centers, insurance and changes in working practices (future possibility/probability)- Talking about banking- Speaking Test practice – Talking about delivery services (preposition of Time)- Talking about trading (Tense review)- Talking about recruitment conditional 2 (hypothetical) – talking about job applications (indirect questions) – Reading, Writing and Listening Test – Job application Letter and Resume Writing- Permission letters.	12
Total Instructional Hours		60

- Course Outcome**
- CO1 - Recognize different parts of speech for better usage.
 - CO2 - Interpret and illustrate formal communication
 - CO3 - Choosing right lexical techniques for effective presentation.
 - CO4 - Analyze and list out things in logical order.
 - CO5 - Create and integrate ideas in a professional way.

TEXT BOOKS:


- T1 - NormanWhitby, Cambridge English: Business BENCHMARK Pre-intermediate to Intermediate – 2nd Edition. 2014.
- T2 - Ian Wood and Anne Willams. "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, New Delhi.
2005R3 - Kamallesh 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.TECH.	16GE1103	PROBLEM SOLVING AND PYTHON PROGRAMMING	3	0	0	3

- Course Objective**
- To know the basics of algorithmic problem solving
 - To read and write simple Python programs.
 - To develop Python programs with conditionals and loops.
 - To define Python functions and call them.
 - To use Python data structures – lists, tuples, dictionaries.
 - To do input/output with files in Python.

UNIT	DESCRIPTION	TOTAL INSTRUCTIONAL HOURS
I	ALGORITHMIC PROBLEM SOLVING Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudocode, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: To find the greatest among three numbers, prime numbers, find minimum in a list, 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, compute Simple interest for a given amount, Factorial of a given number, distance between two points.	9
III	CONTROL FLOW, FUNCTIONS Conditionals: Boolean values and operators, conditional (if), alternative (if -else), chained conditional (if-clif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, 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.	9
IV	LISTS, TUPLES, DICTIONARIES Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing -list comprehension; Illustrative programs: selection sort, insertion sort, histogram.	9
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, copy file.	9
	TOTAL INSTRUCTIONAL HOURS	45

- Course Outcome**
- Upon completion of the course, students will be able to
- CO1: Develop algorithmic solutions to simple computational problems
 - CO2: Structure simple Python programs for solving problems.
 - CO3: 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 –Ashok NamdevKamthane ,Amit Ashok Kamthane ,” Programming and Problem solving with Python” McGrawHill Education

T2-Sheetal Taneja, “Python Programming A Modular Approach With Graphics,Database,Mobile and Web Applications, PEARSON .

REFERENCE BOOKS:


R1 - ReemaThareja” Python Programming Using Problem Solving Approach “ OXFORD.

R2-E.Balagurusamy, “Problem solving and Python Programming” McGrawHill Education.


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Programme B.TECH.	Course Code 16GE1102	Name of the Course ENGINEERING GRAPHICS	L 2	T 0	P 4	C 4
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Course Objective
1. To provide drafting skills for communicating the Engineering concepts and ideas.
2. To expose to BIS and International standards related to engineering drawings.

Unit	Description	Total Hours
	PLANE CURVES Importance of engineering drawing, drafting instruments, drawing sheets – layout and folding, Lettering and dimensioning, BIS standards and scales.	
I	Geometrical constructions, Construction of ellipse, parabola and Hyperbola by eccentricity method, construction of cycloids and involutes of square and circle – Drawing of tangents and normal to the above curves.	15
	PROJECTIONS OF POINTS, LINES AND PLANE SURFACES Introduction to Orthographic projections- Projection of points. Projection of straight lines inclined to both the planes, Determination of true lengths and true inclinations by rotating line method.	
II	Projection of planes (polygonal and circular surfaces) inclined to both the planes by rotating object method (First angle projections only).	15
	PROJECTIONS OF SOLIDS Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is perpendicular and inclined to one plane and objects inclined to both the planes by rotating object method.	
III	SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES Sectioning of simple solids with their axis in vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – Obtaining true shape of section.	15
IV	Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinder and cone. Development of lateral surfaces of truncated solids. Intersection of solids-cylinder vs cylinder.	15
	ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS Isometric views and projections of simple and truncated solids such as - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions.	
V	Free hand sketching of multiple views from a pictorial drawing. Perspective projection of solids in simple position using visual ray method.	15
Total Instructional Hours		75

Course Outcome
CO1: Draw the orthographic and isometric views of regular solid objects including sectional views.
CO2: Recognize the International Standards in Engineering Drawing practices.
CO3: Draw the section of solids and development of surfaces of the given objects.
CO4: Draw the isometric projections and perspective projections of the given solids.
CO5: Introduce CAD software to draw simple two dimensional drawings.

TEXT BOOKS:

T1 - K.Venugopal, V.Prabu Raja, "Engineering Drawing, AutoCAD, Building Drawings", 5th Edition New Age International Publishers, New delhi 2016.

T2 - K.V.Natarajan, "A textbook of Engineering Graphics", Dhanalaksmi Publishers, Chennai.

REFERENCE BOOKS:

R1 - BasantAgrawal and C.M.Agrawal, "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi 2008.

R2 - K. R. Gopalakrishnan, "Engineering Drawing" (Vol. I & II), Subhas Publications, Bangalore, 1998.

R3 - M.B.Shah and B.C.Rana, "Engineering Drawing", Pearson Education, India, 2005.

R4 - N.S. Parthasarathy, Vela Murali, "Engineering Drawing", Oxford University press, India 2015.


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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.TECH.	16PS1001	PHYSICAL SCIENCES LAB – I	0	0	2	1
		PHYSICS LAB - I				

- Course Objective**
1. Evaluate the particle size of micro particles and acceptance angle of fibres.
 2. Employ instrumental method to determine Young's modulus of a beam of metals.
 3. Apply the concept of diffraction and getting ability to calculate the wavelength of the mercury spectrum

Expt. No.	Description of the Experiments
1.	Determination of Wavelength, and particle size using Laser
2.	Determination of acceptance angle and numerical aperture in an optical fiber.
3.	Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
4.	Determination of wavelength of mercury spectrum – spectrometer grating
5.	Determination of thermal conductivity of a bad conductor – Lee's Disc method
6.	Determination of Young's modulus by Non uniform bending method
7.	Determination of specific resistance of a given coil of wire – Carey Foster's Bridge.
8.	Post office box Measurement of an unknown resistance

TOTAL PRACTICAL HOURS 30

- Course Outcome**
- CO1: Point out the particle size of micro particles and acceptance angle of fibres using diode laser.
 CO2: Assess the Young's modulus of a beam using non uniform bending methods.
 CO3: Illustrate the concept of diffraction and getting ability to calculate the wavelength of the mercury spectrum using spectrometer.
 CO4: Identify the velocity of ultrasonic's in the given liquid.
 CO5: Illustrate phenomena of thermal conductivity of a bad conductor.

CHEMISTRY LAB-I

- Course Objective**
1. Acquire practical skills in the determination of water quality parameters.
 2. Acquaint the students with the determination of molecular weight of a polymer by viscometry.
 3. Acquaint the students with the estimation of chemical substances using instrumental analysis techniques.

Expt. No.	Description of the Experiments
1.	Preparation of molar and normal solutions and their standardization.
2.	Estimation of total, permanent and temporary hardness of Water by EDTA
3.	Determination of chloride content of water sample by argentometric method.
4.	Determination of available chlorine in bleaching powder.
5.	Conductometric titration of strong acid vs strong base (HCl vs NaOH).
6.	Conductometric titration (Mixture of weak and strong acids)
7.	Conductometric precipitation titration using BaCl ₂ and Na ₂ SO ₄
8.	Determination of molecular weight and degree of polymerization using viscometry.
9.	Estimation of iron content of the water sample using spectrophotometer. (1,10 phenanthroline / thiocyanate method).


Total Practical Hours 30

- Course Outcome**
- CO1: Estimate the different types of hardness in a water sample.
 CO2: Determine the chloride content of water sample.
 CO3: Calculate the strength of acid using conductometric titrations.
 CO4: Calculate the strength of strong and weak acid using conductometric titrations.
 CO5: Estimate the amount of salt using conductometric precipitation titrations.


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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.TECH.	16GE1004	PROBLEM SOLVING AND PYTHON PROGRAMMING LAB	0	0	4	2

- Course Objective**
1. To write, test, and debug simple Python programs.
 2. To implement Python programs with conditionals and loops.
 3. Use functions for structuring Python programs.
 4. Represent compound data using Python lists, tuples, dictionaries.
 5. Read and write data from/to files in Python.

Ex.No	DESCRIPTION	TOTAL INSTRUCTIONAL HOURS
1	Compute the GCD of two numbers.	3
2	Find the square root of a number	3
3	Exponentiation (power of a number)	3
4	Find the factorial of a given number	3
5	Print prime numbers from 1 to n numbers	3
6	Find the maximum of a list of numbers	3
7	Linear search , Binary search	3
8	Selection sort, Insertion sort	3
9	First n prime numbers	3
10	Multiply matrices	3
11	Programs that take command line arguments(word count)	3
12	Find the most frequent words in a text read from a file	3
13	Simulate bouncing ball using Pygame	3
TOTAL INSTRUCTIONAL HOURS		45

- Course Outcome**
- CO1: Write, test, and debug simple Python programs.
CO2: Implement Python programs with conditionals and loops.
CO3: Develop Python programs step-wise by defining functions and calling them.
CO4: Use Python lists, tuples, dictionaries for representing compound data.
CO5: Read and write data from/to files in Python.

PLATFORM NEEDED: Python 3 interpreter for Windows/Linux


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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16GE1002	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, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)

Expt. No.	Description of the Experiments
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I CIVIL ENGINEERING PRACTICE

Study of plumbing and carpentry components of Residential and Industrial buildings.

(A) PLUMBING WORKS:

- 1 Study on pipe joints, its location and functions: Valves, taps, couplings, unions, reducers, elbows in household fittings.
- 2 Study of pipe connection requirements for pumps.
- 3 Preparation of plumbing line sketches for water supply and sewage works.
Hands-on-exercise:
- 4 ➤ Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
- 5 Demonstration of plumbing requirements of high-rise buildings.

(B) CARPENTRY USING POWER TOOLS ONLY:

- 1 Study of the joints in roofs, doors, windows and furniture.
- 2 Hands-on-exercise in wood works by sawing, planing and cutting.

II MECHANICAL ENGINEERING

(A) Welding:

- 1 Preparation of arc welding of Butt joints, Lap joints and Tee joints

(B) Machining:

- 1 Practice on Simple step turning and taper turning
- 2 Practice on Drilling Practice

(C) Sheet Metal Work:

- 1 Practice on Models– Trays, cone and cylinder.

DEMONSTRATION

(D) Smithy

- Smithy operations: Upsetting, swaging, setting down and bending.
- Demonstration of – Production of hexagonal headed bolt.

(E) Gas welding

(F) Foundry Tools and operations.

GROUP B (ELECTRICAL & ELECTRONICS)


S.No	Description of the Experiments	Total Practical Hours
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 RLC circuit.	
5	Measurement of energy using single phase energy meter.	
ELECTRONICS ENGINEERING PRACTICES		
1	Study of Electronic components and equipments – Resistors - colour coding	
2	Measurement of DC signal - AC signal parameters (peak-peak, RMS period, frequency) using CRO.	
3	Study of logic gates AND, OR, NOT and NAND.	
4	Soldering practice – Components Devices and Circuits – Using general purpose PCB.	
5	Measurement of average and RMS value of Half wave and Full Wave rectifiers.	

Course
Outcome

CO1: Fabricate wooden components and pipe connections including plumbing works.
CO2: Fabricate simple weld joints.
CO3: Fabricate electrical and electronics circuits.


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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.TECH.	16GE1003	VALUE ADDED COURSE I: LANGUAGE COMPETENCY ENHANCEMENT COURSE-I (COMMON TO ALL BRANCHES)	0	0	2	1

Course Objective	<ul style="list-style-type: none"> ✓ To enhance student language competency ✓ To identify individual students level of communication skills ✓ To develop English Vocabulary and spoken communication skills. ✓ To revive the fundamentals of English Grammar.
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Unit	Description	Instructional Hours
I	Listening Language of Communication- English listening- Hearing Vs Listening- Verbal and Non-verbal communication – Listening strategies-Sounds of English.	3
	Reading	
III	English Language Enhancement – Indianism in English – Role of Reading in effective communication – Techniques for good reading (skimming and scanning) Reading articles from newspaper, magazine. Reading and interpreting a passage.	3
	Speaking	
III	Common errors in Pronunciation – Signposts in English (Role play) – Public Speaking skills – Social Phobia – Eliminating fear – Common etiquette of speaking - Debate and Discuss.	3
	Writing	
IV	Writing genre – Enhancement of basic English Vocabulary; Parts of Speech, Noun, Verbs, and Tenses – combining sentences, sentence formation and completion.	3
	Art of Communication	
V	Communication process – Word building and roleplay – Exercise on English Language for various situations through online and offline activities.	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.
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REFERENCE BOOKS :

1. Verbal Ability and Reading Comprehension by Arun Sharma, 9th edition, Tata Mc. graw Hill
2. Word Power Made Easy by Norman Lewis, – Print, 1 June 2011.
3. High School English Grammar by Wren and Martin, S.CHAND Publications. 1 January 2017.
4. Practical course in Spoken English by J.K. Gangal, PHI Learning , Second edition, 1 January 2018.


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II SEMESTER

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16MA2102	ENGINEERING MATHEMATICS-II (VECTOR CALCULUS, COMPLEX VARIABLES, AND LAPLACE TRANSFORMS)	3	1	0	4

- Course Objective
1. Learn the basics of vector calculus comprising gradient, divergence, Curl and line, surface, volume integrals.
 2. Understand analytic functions of complex variables and conformal mappings.
 3. Know the basics of residues, complex integration, and contour integration
 4. Apply Laplace transform techniques to solve linear differential equations.
 5. Know the effective mathematical tools for the solutions of partial differential equations that model several physical problems in mathematical physics

Unit	Description	Instructional Hours
	VECTORCALCULUS	
I	Gradient, divergence and curl—Directional derivative—Irrotational and solenoidal vector fields— Vector integration—Green’s theorem in a plane, Gauss divergence theorem and Stokes’ theorem (excluding proofs)— Simple applications involving cubes and rectangular parallelepipeds.	12
	ANALYTIC FUNCTIONS	
II	Analytic function -Cauchy-Riemann equations -sufficient conditions (excluding proof) – Harmonic - conjugate harmonic functions– Construction of analytic functions (Milne-Thompson method)—Conformal mapping: $w = z + cz, 1/z$ and bilinear transformation without problems related to the concept of conformal mapping.	12
	COMPLEX INTEGRATION	
III	Complex integration—Statements of Cauchy’s integral theorem – Taylor’s and Laurent’s series expansions - Singular points—Residues—Cauchy’s residue theorem – Evaluation of real definite integrals as contour integrals around unit circle.	12
	LAPLACETRANSFORM	
IV	Laplace transform—Basic properties –Transforms of derivatives and integrals of functions—Transforms of unit step function and impulse function—Transform of periodic functions. Inverse Laplace transform—Convolution theorem (without proof) – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.	12
	PARTIAL DIFFERENTIAL EQUATIONS	
V	Formation of partial differential equations by 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- Linear homogeneous partial differential equations of second and higher order with constant coefficient.	12
	Total Instructional Hours	60

- Course Outcome
- CO1: Know the gradient, divergence, and curl of vectors useful for engineering application like fluid flow, electricity, and magnetism.
- CO2: Test the analyticity to construct the analytic function and transform complex functions from one plane to another plane graphically.
- CO3: Evaluate real and complex integrals over suitable closed paths or contours.
- CO4: Know the applications of Laplace transform and its properties and to solve certain linear differential equations using Laplace transform technique.
- CO5: Solve the engineering problems using Partial Differential Equations.

TEXT BOOKS:


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

REFERENCE BOOKS:

- R1-Bali N P & Manish Goyal, "A Textbook 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-Sivarama Krishna Das P and Rukmangadachari E., "Engineering Mathematics" Vol II, Second Edition, Pearson publishing, 2011.
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.TECH.	16PH2102	PHYSICS OF MATERIALS	3	0	0	3

- Course Objective**
1. Gain knowledge about conducting materials.
 2. Provide fundamental knowledge of semiconducting materials which is related to the engineering program.
 3. Extend the properties of magnetic materials, applications and super conducting materials.
 4. Defend the various types of dielectric materials and their uses.
 5. Expose the students to smart materials and the basis of nano technology.

Unit	Description	Instructional Hours
I	CONDUCTING MATERIALS Introduction – Conductors – Classical free electron theory of metals – Electrical and thermal conductivities – Wiedemann–Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi function – Density of energy states – Carrier concentration in metals.	9
II	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 – Extrinsic semiconductor - derivation of carrier concentration in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration – Hall effect –Determination of Hall coefficient – Applications.	9
III	MAGNETIC & SUPERCONDUCTING MATERIALS 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. Superconducting Materials : Superconductivity ; properties(Messiner effect, effect of magnetic field, effect of current and isotope effects) – Type I and Type II superconductors – BCS theory of superconductivity(Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.	9
IV	DIELECTRIC & COMPOSITES MATERIALS Introduction – Electrical susceptibility – dielectric constant – polarization - electronic, ionic, orientation and space charge polarization –internal field – Clausius – Mosotti relation (derivation) – dielectric loss and dielectric breakdown (qualitative)	9
V	Introduction to composites materials – types of composites materials – polymer, metallic and ceramic matrix composites (qualitative). Application in surgery, sports equipment. SMART MATERIALS AND NANOTECHNOLOGY New Engineering Materials: Metallic glasses – preparation, properties and applications – shape memory alloys (SMA) – characteristics, properties of NiTi alloy applications. Nano Materials: Synthesis - plasma arcing – Chemical vapour deposition – properties of nanoparticles and applications. – Carbon nano tubes – fabrication – pulsed laser deposition - Chemical vapour deposition - properties & applications.	9
Total Instructional Hours		45

- Course Outcome**
- CO1: Illustrate the electrical / thermal conductivity of conducting materials.
CO2: Understand the purpose of the acceptor or donor levels and the band gap of a semiconductor.
CO3: Interpret the basic idea behind the process of magnetism and applications of magnetic materials in everyday life
CO4: Identify and compare the various types of dielectric polarization and dielectric breakdown.
CO5: Evaluate the properties and applications of various advanced engineering materials and develop the new ideas to synthesis Nanomaterials.

TEXT BOOKS:

T1 - S.O.Pillai "Solid State Physics" New Age International Publishers, New Delhi – 2011

T2- Rajendran V "Materials Science" McGraw-Hill Education" New Delhi -2016.

REFERENCE BOOKS:

R1 – William D Callister, Jr "Material Science and Engineering" John Wiley and Sons, New York, 2014.

R2 -Raghavan, V. "Materials Science and Engineering – A First Course" Prentice Hall of India, New Delhi 2016.

R3 -Dr. G. Senthilkumar "Engineering Physics – II" VRB publishers Pvt Ltd., 2013


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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16FT2101	FUNDAMENTALS OF BIOCHEMISTRY	3	0	0	3
Course Objective	1. To enable students learn the fundamentals of Biochemical Processes and Biomolecules.					
Unit	Description	Instructional Hours				
	INTRODUCTION TO BIOMOLECULES					
I	Basic principles of organic chemistry, role of carbon, types of functional groups, biomolecules, chemical nature of water, pH and biological buffers.	9				
	STRUCTURE AND PROPERTIES OF IMPORTANT BIOMOLECULES					
	Carbohydrates (mono, di, oligo& polysaccharides) mutarotation, glycosidic bond, reactions of monosaccharides and reducing sugars Starch, glycogen, cellulose and chitin. Proteoglycans, glycosaminoglycans. hyaluronic acid, chondroitin sulfate.					
	Lipids: Fatty acids, glycerol, triacylglycerol, saponification, iodination, hydrogenation, phospholipids, glycolipids, sphingolipids. Inherited metabolic disorders of Lipid-metabolism-Tay-Saach's disease, Niemann-Pick's disease and Gaucher's disease. Cholesterol, steroids, Bile acids and salts, Gluco-and Mineralo-corticosteroids, Aldosterone, cortisone and synthetic derivative-prednisolone. Androgens-testosterone, Estrogens- estrone, estradiol and progesterone. Prostaglandins and their functions. LDL, HDL and VLDL. Cardiovascular disease and correlation with circulating lipid and lipoprotein concentration Amino Acids, Peptides, and Proteins. Classification based on side-chain properties. Structures, hierarchy of organization primary, secondary, tertiary and quaternary structures, glycoproteins, lipoproteins. Determination of primary structure. Nucleic acids: Purines, pyrimidines, nucleosides, nucleotides, Chargaff's Rules. Base pairing, A-T and G-C, mRNA, rRNA and tRNA., Watson-Crick structure of DNA. reactions, properties, Tm and hypochromicity, Measurement of DNA and RNA. Nucleoprotein complexes.	9				
	METABOLISM CONCEPTS					
III	Functions of Proteins, Enzymes, introduction to biocatalysts, metabolic pathways, primary and secondary metabolites. Interconnection of pathways and metabolic regulation.	9				
	INTERMEDIARY METABOLISM AND REGULATION					
IV	Glycolysis, TCA cycle, gluconeogenesis, pentose phosphate shunt, glyoxalate shunt, fatty acid synthesis and oxidation, reactions of amino acids, deamination, transamination and decarboxylation, urea cycle, Bioenergetics - High energy compounds, electronegative potential of compounds, respiratory chain, ATP cycle, calculation of ATP yield during oxidation of glucose and fatty acids.	9				
	CASE STUDIES					
V	Case study on overproduction of primary and secondary metabolites - glutamic acid, threonine, lysine, methionine, isoleucine, propionic acid and ethanol.	9				
	Total Instructional Hours	45				
Course Outcome	<ol style="list-style-type: none"> 1. To ensure students have a strong foundation in the structure and reactions of Biomolecules. 2. Evaluate the importance of carbohydrates, proteins, fat, minerals, vitamins and water in food. 3. To correlate Biochemical processes with Biotechnology applications 4. To introduce them to metabolic pathways of the major biomolecules. 5. Apply the principles and process for the production of primary and secondary metabolites. 					
TEXT BOOKS	T1 - Lehninger Principles of Biochemistry 6 th Edition by David L. Nelson, Michael M. Cox					

- T2 - Satyanarayana, U. and U. Chakerapani, "Biochemistry" 3rd Rev. Edition, Books & Allied (P) Ltd., 2006.
T3 - Rastogi, S.C. "Biochemistry" 2nd Edition, Tata McGraw-Hill, 2003.
T4 - Conn, E.E., et al., "Outlines of Biochemistry" 5th Edition, John Wiley & Sons, 1987.
T5 - Outlines of biochemistry, 5th Edition: By E E Conn, P K Stumpf, G Bruening and R Y Doi. pp 693.
John Wiley and Sons, New York. 1987.

REFERENCES

- R1 - Berg, Jeremy M. et al. "Biochemistry", 6th Edition, W.H. Freeman & Co., 2006.
R2 - Murray, R.K., et al "Harper's Illustrated Biochemistry", 27th Edition, McGraw-Hill, 2006.
R3 - Voet, D. and Voet, J.G., "Biochemistry", 3rd Edition, John Wiley & Sons Inc., 2004.



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Programme B.TECH.	Course Code 16HE2102R	Name of the Course ESSENTIAL ENGLISH FOR ENGINEERS – II	L 3	T 1	P 0	C 4
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- Course Objective**
- ✓ The learner will be introduced to global corporate culture and professional communication.
 - ✓ It helps the students to focus on organizing professional event and documentation.
 - ✓ The student will be able to describe the events and process in an effective way.
 - ✓ It trains the student to analyze the problems and to find solution to it.
 - ✓ The learner will be familiar with business communication.

Unit	Description	Instructional Hours
I	Introduction- talking about teamwork- Making arrangements- Improving Communication in spoken language – Taking and leaving Voice mail messages (present Tense, Past Tense and Present Perfect) Talking about Business Hotel- (Speaking Activity) Talking about Corporate Hospitality- Formal and Informal Language – Making accepting and declining invitations (Auxiliary Verb, Countable or Uncountable Nouns) – Focus on Language – Definitions and Extended Definitions- Reading comprehension.	12
II	Talking about orders – Clarity Written Language – Phone and Letter Phrases – Talking about Company Finances – Conditional 1 and 2 – Managing Cash-Flow (Intention and Arrangements Conditional 1 and 2) – Talking about Brands and Marketing – Ethical Banking- Talking about Public Relations – Organizing a PR Event – Describing Duties and Responsibilities – (Future Tense and Articles) – Reported Speech – Modal Verbs and Passive, Impersonal Passive Voice- interpretation of posters or advertisements.	12
III	Talking about relocation – Report Phrases – Talking about Similarity and difference- Giving Directions- Asking for Information and Making Suggestions – Talking about Location (Comparatives and Superlatives, Participles) – Talking about Company Performances- Describing Trends – Describing Cause and Effect – Talking about Environmental Impact – Discussing Green Issues – Language of Presentations (Adjectives and Adverbs, Determiners)- Homophones – Homonyms- Acronyms-Abbreviations- British and American words.	12
IV	Talking about Health and Safety – Expressing Obligation- Discussing Regulations- Talking about personnel Problems – Passives – Talking about Problem at Work (modal Verbs, Passives)- Talking about Expenses Claims- Talking about Air Travel (Relative Pronoun, Indirect Questions) – E-mail Writing – Note completion- Transcoding.	12
V	Talking about staff Benefits- Talking about Appraisal Systems (gerunds and Infinitives, Reported Speech) – Talking about Marketing Disasters – Expressing hypothetical Situations- Talking about entering Foreign Market (Conditional 3, Grammar review) – Letter for calling quotations, Replying for quotations – Placing an order and Complaint and reply to a complaint.	12
Total Instructional Hours		60

- Course Outcome**
- CO1: Introduced corporate culture and professional communication.
 - CO2: It focused on organizing a professional event and its documentation.
 - CO3: Improved the ability to describe the events and process in an effective way
 - CO4: Trained to analyze the problems and to find solution to it.
 - CO5: Practiced to make business communication.

TEXT BOOKS:


- T1 - NormanWhitby, Cambridge English: Business BENCHMARK Pre-intermediate to Intermediate – 2nd Edition. 2014.
- T2 - Ian Wood and Anne Williams. "Pass Cambridge BEC Preliminary", Cengage Learning press 2013.

REFERENCE BOOKS :

- R1 - Communication Skills for Engineers, SunithaMisra&C.Murali Krishna, Pearson Publishers
- R2 - Technical Communication, Daniel G. Riordan, Cengage learning publishers.
- R3 - KamalleshSadanan "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.TECH.	16GE2101	ENGINEERING MECHANICS	3	1	0	4

COURSE OBJECTIVES:

1. To understand basic concepts and force systems in a real-world environment.
2. To understand the static equilibrium of particles and rigid bodies both in two dimensions.
3. To understand the moment of surfaces and solids.
4. To understand the effect of static friction on equilibrium.
5. To understand the dynamic equilibrium equation.

STATICS OF PARTICLES

I Introduction to engineering mechanics - Classifications, force vector, Law of mechanics, System of forces, transmissibility, Force on a particle – resultant of two forces and several concurrent forces – resolution of a force – equilibrium of a particle — forces in space – equilibrium of a particle in space. 12

EQUILIBRIUM OF RIGID BODIES

II Free body diagram, moment of a force – varignon's theorem – moment of a couple – resolution of a force and a couple. Support reactions of the beam. 12

CENTROID, CENTRE OF GRAVITY AND MOMENT OF INERTIA

III Centroids of simple plane areas, composite areas, determination of moment of inertia of composite plane figures, polar moment of inertia-radius of gyration – mass moment of inertia of simple solids. 12

FRICTION

IV Laws of dry friction – angles of friction- angle of repose-coefficient of static and kinetic friction – Friction in inclined plane, Ladder friction, Screw friction– rolling resistance – belt friction. 12

DYNAMICS OF PARTICLES

V Rectilinear and Curvilinear motion, -Newton's II law – D'Alembert's principle- Energy - potential energy kinetic energy-conservation of energy-work done by a force -work energy method, Impulse momentum method, Impact of bodies, Translation and rotation of the particles. 12

Total Instructional Hours 60

Upon completion of the course students can be able to

- Course Outcomes
- CO1: Define and illustrate the basic concepts of force system.
 - CO2: Identify the resultant force and couple, support reactions of the beam.
 - CO3: Calculate the Centre of gravity and moment of inertia of an object.
 - CO4: Examine the friction force of particles and objects for Impending Motion.
 - CO5: Determine the Displacement, velocity and acceleration of particles and objects

TEXT BOOKS:

- T1. F.P.Beer, and Jr. E.R.Johnston., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 11th Edition, Tata McGraw-Hill Publishing company, New Delhi (2018).
T2. NH.Dubey, "Engineering Mechanics", Tata Mcraw Hill, New Delhi, 2016.

REFERENCE BOOKS:

1. R.C.Hibbeller, and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education 2010.
2. S.S.Bhavikatti, and K.G.Rajashekarappa, "Engineering Mechanics", New Age International (P) Limited Publishers, 2015.
3. P. Jaget Babu, "Engineering Mechanics", Pearson Education, India Ltd, 2016.


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Programme B.TECH.	Course Code	Name of the Course	L	T	P	C
	16CY2102	ENVIRONMENTAL SCIENCE	3	0	0	3
Course Objective	1. To gain knowledge on the importance of environmental education, ecosystem and biodiversity. 2. To acquire knowledge about environmental pollution – sources, effects and control measures of environmental pollution. 3. To find and implement scientific, technological, economic and political solutions to environmental problems. 4. To study about the natural resources, exploitation and its conservation 5. To be aware of the national and international concern for environment and its protection.					

Unit	Description	Instructional Hours
I	ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY Importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers- 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: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.	9
II	ENVIRONMENTAL POLLUTION Definition – causes, effects and control measures of: Air pollution – Air pollution standards – control methods- Water pollution – Water quality parameters- Soil pollution - Marine pollution - Noise pollution- Thermal pollution - Nuclear hazards–role of an individual in prevention of pollution – pollution case studies.	9
III	NATURAL RESOURCES Forest resources: Use and over-exploitation, deforestation, case studies- 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 – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, 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 – Equitable use of resources for sustainable lifestyles.	9
IV	SOCIAL ISSUES AND THE ENVIRONMENT From unsustainable to sustainable development – urban problems related to energy-energy conversion – electrical energy calculations- environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- Current Environmental issues at Country level – management of municipal sewage, municipal solid waste, Hazardous waste and Bio-medical waste – Global issues –Climatic change, Acid rain, greenhouse effect and Ozone layer depletion. Disaster management: floods, earthquake, cyclone and landslides.	9

HUMAN POPULATION AND THE ENVIRONMENT

V	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.	9
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Total Instructional Hours 45

CO1: Understand the natural environment and its relationships with human activities.

CO2: Characterize and analyze human impacts on the environment

CO3: Apply systems concepts and methodologies to analyze and understand interactions between

Course social and environmental processes

Outcome CO4: Reflect critically about their roles and identities as citizens, consumers and environmental actors

in a complex, interconnected world.

CO5: Understand and implement scientific research strategies, including collection, management, evaluation, and interpretation of environmental data.

TEXT BOOKS:

T1- AnubhaKaushik and C. P. Kaushik, "Environmental Science and Engineering", Fourth edition, New Age International Publishers, New Delhi, 2014.

T2 – Deeksha Dave and S.S.Katewa, "Textbook of Environmental Studies", Second Edition, Cengage Learning, 2012.

REFERENCES:

R1 - Trivedi R.K. "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.

R2 - G.Tyler Miller, Jr and Scott E. Spoolman"Environmental Science" Thirteenth Edition, Cengage Learning, 2010.

R3 - Gilbert M. Masters, "Introduction to Environmental Engineering and Science", 2nd edition, Pearson Education, 2004.



Chairman, Board of Studies

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FT - HiCET**



Dean – Academics

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16PS2001	PHYSICAL SCIENCES LAB – II PHYSICS LAB-II	0	0	2	1

Course Objective

1. Evaluate the band gap of a semiconductor.
2. Apply the concept of interference and calculate the thickness of thin wire.
3. Acquire the practical skills in Young's modulus by uniform bending method.

Expt. No.	Description of the Experiments
1.	Determination of Young's modulus by uniform bending method
2.	Determination of band gap of a semiconductor
3.	Determination of Coefficient of viscosity of a liquid –Poiseuille's method
4.	Determination of Dispersive power of a prism – Spectrometer
5.	Determination of thickness of a thin wire – Air wedge method
6.	Determination of Rigidity modulus – Torsion pendulum
7.	Magnetic hysteresis experiment
8.	Calibration of ammeter using potentiometer

TOTAL PRACTICAL HOURS 30

Course Outcome

CO1: Experiment involving the physical phenomena of the Rigidity modulus of wire.
CO2: Determine the band gap of a semiconductor and variation of Energy Gap (E_g) with temperature.
CO3: Assess the Young's modulus of a beam using non uniform bending method.
CO4: Explain the concept of interference and calculate the thickness of thin wire and other fine objects.
CO5: Experiment provides a unique opportunity to validate Dispersive power of a prism using Spectrometer.

CHEMISTRY LAB – II

Course Objective

1. Acquire practical skills in the quantitative analysis of water quality parameters.
2. Acquire practical skills in the instrumental methods for quantitative estimation of metal ion content.
3. Gain knowledge in determination of rate of corrosion.

Expt. No.	Description of the Experiments
1.	Determination of Dissolved Oxygen in water by Winkler's method.
2.	Estimation of alkalinity of water sample by indicator method.
3.	Estimation of hydrochloric acid by pH metry.
4.	Estimation of ferrous iron by Potentiometry.
5.	Estimation of Copper by EDTA
6.	Determination of sodium by flame photometry
7.	Determination of corrosion rate of mild steel by weight loss method.

Total Practical Hours 30

Course Outcome

CO1: Determine the level of DO in a water sample.
CO2: Identify and estimate the different types of alkalinity in water sample.
CO3: Estimate the acidity of water sample using pH metry.
CO4: Estimate the amount of copper in a brass sample.
CO5: Determine the metal ion content using instrumental methods.


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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16FT2001	BIOCHEMISTRY LAB	0	0	4	2

Course Objective To learn and understand the principles behind the qualitative and quantitative estimation of biomolecules (proteins, carbohydrates, lipids, metabolites etc.,) and laboratory analysis of the same in the body fluids.

Expt. No.	Description of the Experiments
1.	General guidelines for working in biochemistry lab (theory)
2.	Units of volume, weight, density and concentration measurements and their range in biological measurements. Demonstration of proper use of volume and weight measurement devices.
3.	Accuracy, precision, sensitivity and specificity (theory)
4.	Preparation of buffer –titration of a weak acid and a weak base.
5.	Qualitative tests for carbohydrates – distinguishing reducing from non-reducing sugars and keto from aldo sugars.
6.	Quantitative method for amino acid estimation using ninhydrin – distinguishing amino from imino acid.
7.	Protein estimation by Biuret and Lowry's methods.
8.	Protein estimation by Bradford and spectroscopic methods.
9.	Extraction of lipids and analysis by TLC.
10.	Estimation of nucleic acids by absorbance at 260 nm and hyperchromic effect (demo)
11.	Enzymatic assay: phosphatase from potato.
12.	Enzymatic assay: estimation of glucose by GOD-POD method after hydrolysis of starch with acid and specificity of the enzymatic method.

Total Practical Hours 60

- | | |
|-----------------------|---|
| Course Outcome | <ol style="list-style-type: none"> 1. Analyze the biomolecules qualitatively and quantitatively in the body fluids 2. Estimate the biomolecules qualitatively and quantitatively in the body fluids 3. Interpret the structure and properties of carbohydrates 4. Analyze and recognize the functional and structural roles of proteins 5. Estimate the concentration of lipids and enzymes in different foods using TLC and enzymatic assay methods |
|-----------------------|---|

TEXT BOOK

- T1 - Practical Biochemistry by R.C. Gupta and S. Bhargavan.
T2 - Introduction of Practical Biochemistry by David T. Phummer. (II Edition)

REFERENCE BOOK

- R1 - Harpers Biochemistry Ed. R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell, Appleton and Lange, Stanford, Connecticut.
R2 - Textbook of Biochemistry with clinical correlations. Ed. Thomas M. Devlin. Wiley Liss Publishers


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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.TECH.	16GE2001	VALUE ADDED COURSE – II: LANGUAGE COMPETENCY ENHANCEMENT COURSE- II (COMMON TO ALL BRANCHES)	0	0	2	1

Course Objective	
	✓ To improve communication skills and Professional Grooming.
	✓ To impart deeper knowledge of English Language and its practical application in different facets of life.
	✓ To equip the techniques of GD, Public Speaking, debate etc.

Unit	Description	Instructional Hours
	Listening	
I	Listening for gist and respond – Listen for detail using key words to extract specific meaning – listen for phonological detail – Listen and identify the main points for short explanations and presentation.	3
	Reading	
II	Strategies for effective reading – read and recognize different text types – Genre and Organization of Ideas – Quantifying reading – reading to comprehend – Interpreting sentences – contrasting, summarizing or approximating	3
	Speaking	
III	Speak to communicate – Make requests and ask questions to obtain personal information – use stress and intonation – articulate the sounds of English to make the meaning understood – speaking to present & Interact – opening and closing of speech.	3
	Writing	
IV	Plan before writing – develop a paragraph: topic sentences, supporting sentences – write a descriptive paragraph – elements of good essay – descriptive, narrative, argumentative – writing emails – drafting resumes – project writing – convincing proposals.	3
	Language Development	
V	Demonstration at level understanding of application of grammar rules – revision of common errors : preposition, tenses, conditional sentences –reference words – pronouns and conjunctions.	3
TOTAL INSTRUCTIONAL HOURS		15


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

REFERENCE BOOKS :

1. Verbal Ability and Reading Comprehension by Arun Sharma, 9th edition, Tata Mc Graw Hill
2. Word Power Made Easy by Norman Lewis. – Print, 1 June 2011.
3. High School English Grammar by Wren and Martin, S. CHAND Publications, 1 January 2017.
4. Practical course in Spoken English by J.K. Gangal, PHI Learning , Second edition, 1 January 2018.


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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.TECH. FOOD TECHNOLOGY



CHOICE BASED CREDIT SYSTEM

Curriculum & Syllabus

2020-2021

CURRICULUM

CO'S, PO'S & PSO'S MAPPING-(R 2016)

Semester – I

16MA1101 Engineering Mathematics – (Matrices and calculus)

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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

16PH1101 Engineering Physics

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO2	3	3	3	3	3	-	-	-	-	-	-	2	2	3
CO3	3	3	3	3	3	-	-	-	-	-	-	2	1	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	1
CO5	3	3	3	2	3	-	-	-	-	-	-	2	2	2
Avg	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2

Course Code & Name : 16HE1101 Essential English for Engineers – I

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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 : 16GE1103 Problem Solving and Python Programming

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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 : 16GE1102 Engineering Graphics

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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 : 16PS1001 Physical Sciences Lab – I

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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 : 16GE1004 Problem Solving and Python Programming Lab

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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	c	1	1	-	-	1	-	-	-	-	-	1	2.8	2.2

Course Code & Name : 16GE1002 Engineering Practices Lab

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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

Course Code & Name : 16MA2101/Engineering Mathematics – II

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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 : 16PH2102 Physics of Materials

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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

Course Code & Name : 16FT2101 Fundamentals of Biochemistry

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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	2
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	1.8

Course Code & Name : 16HE2102 Essential English For Engineers - II

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	3	3	2	2	-	-	-	-	-	-	2	2	1
CO2	3	2	3	2	3	-	-	-	-	-	-	2	1	2
CO3	3	2	3	3	3	-	-	-	-	-	-	3	2	3
CO4	3	3	2	2	2	-	-	-	-	-	-	2	1	2
CO5	2	3	3	3	3	-	-	-	-	-	-	2	2	1
Avg	2.8	2.6	2.8	2.4	2.6	-	-	-	-	-	-	2.2	1.6	1.8

Course Code & Name : 16FT2001 Biochemistry Lab

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	3
CO3	3	3	3	3	2	-	-	-	-	-	-	2	2	2
CO4	3	3	3	3	2	-	-	-	-	-	-	2	2	2
CO5	3	3	3	3	2	-	-	-	-	-	-	2	2	2
Avg	3	3	3	2.6	2	-	-	-	-	-	-	2	2	2.2

Mapping of Course Outcome and Programme Outcome:

Year	Sem	Course code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12
I	I	16MA1101 Engineering Mathematics – I(Matrices and calculus)	1	1.4	1	1.2	1	1.4	1.2	1.2	1.8	3	1	2.2
		16PH1101 Engineering Physics	3	3	3	2.6	2.8	-	-	-	-	-	-	2
		16CY1101 Engineering Chemistry	3	2.2	2	1.6	2	1.3	-	-	-	-	-	1
		16HE1101 English for Engineers – I	3	2	2	2	2	1	1	-	-	-	-	1
		16GE1103 Problem Solving and Python Programming	3	1	1	-	-	1	-	-	-	-	-	1
		16GE1102 Engineering Graphics	2	3	3	-	2	-	-	-	2	-	-	2
		16PS1001 Physical Sciences Lab – I	2.8	3	2.6	1	1	2	1	-	-	1	1	1
		16GE1004 Problem Solving and Python Programming Lab	3	3	3	2.6	2.8	-	-	-	-	-	-	2
		16GE1002 Engineering Practices Lab												
Year	Sem	Course code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12
I	II	16MA2101 Engineering Mathematics – II	1.6	1.6	1	1	1.2	2	1.8	1.8	2.2	3	1	2.8
		16PH2102 Physics of Materials	3	3	3	2.4	2.4	-	-	-	-	-	-	2
		16FT2101 Fundamentals of Biochemistry	3	2.4	1.2	1.8	1.8	1	2	-	-	-	-	1

		16HE2102 Essential English for Engineers - II	2	1	1.7	-	-	1	2	3	2	-	-	2		
		16GE2101 Engineering Mechanics	1	2	1				1			1		1		
		16CY2102 Environmental Science	2	3	3.0	-	2	-	-	-	-	-	-	2		
		16PS2001 Physical Sciences Laboratory – II	3		3		3				1					
		16FT200 Biochemistry Lab														
Year	Sem	Course code & Name	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P O 10	P O 11	P O 12	PS O 1	PSO 2
II	III	16MA3111 Fourier Analysis and Z Transforms	3	2.8	3	1.4	1.4	2	-	-	-	-	-	2. 2	2. 2	2.2
		16FT3201 Fluid Mechanics	2. 8	1.8	1	1.3		1						1	1	1
		16FT3202 Food Process Calculations	2. 8	1.8	1	1.3		1						1	1	1
		16FT3203 Food Microbiology	2. 8	1.8	1	1.3		1						1	1	1
		16FT3204 Food Chemistry	2. 5	2	2.3	2	3	2	2				3		1. 3	2.8
		16FT3001 Food Microbiology Laboratory	2	1.7	1.7	2	2		2					2	2	2
		16FT3002 Food Production Analysis Laboratory	2	1	1	1	2	2	2	-	1	1	-	2	1. 2	0.4
Year	Sem	Course code & Name	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P O 10	P O 11	P O 12	PS O 1	PSO 2
II	IV	16MA4112 Applied Statistics & Numerical Methods	1	1.25	1.75	1	4				1			1. 6	1	2.4
		16FT4201 Engineering Properties of Food Materials	1	1.25	2	1.6	1.5				2			2. 2	3	2.6
		16FT4202 Fundamentals of Heat and Mass Transfer materials	2	1.2	2.2	2.5		2						2	3	2.6
		16FT4203 Food Process Engineering - I	2.8	1.8	1	1.3		2.2	2.8	1.6	2.2	2	2. 6	1. 4		2
		16FT4204 Food Analysis	3	2.8	3	2	2							2. 2	2.2	2

		16HE4101 Total Quality Management	1.6	1.5	2.5	1.7	2					2.6			2.4	2	
		16FT4001 Food Analysis Laboratory	2.2 5	2.75	2.5	1.66	3			1.6						1	2.75
		16FT4001 Food Analysis Laboratory	1	1.25	1.75	1	1					1			1.6	1	2.4
Year	Sem	Course code & Name	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P O 10	P O 11	P O 12	PS O 1	PSO 2	
II	V	16FT5201 Food Process Engineering - II	3	2	3	1	2	2	1.25				1.7 5	1	1	2	
		16FT5202 Food Quality Assurance and Control	1		2.8			2	1	1				1	2.2	1	
		16FT5203 Baking and Confectionery Technology	2.25	2.75	2.5	1.66	3		1.6							1	2.75
		16FT5204	2.5	1.75	2.2	2.5	0	2						1	3	1.8	
		16FT5205 Unit Operations in Food Processing	1	1.25	1.75	1	1					1			1.6	1	2.4
		16FT5306 Milling Technology for Food Materials	1	2	1.2					1.25			1		1	1.6	
		16FT5001 Baking and Confectionery Technology Laboratory	2.25	2	2	2.25			1	1	2			1	2.25	1.5	2.25
		16FT5002 Food Process Engineering Laboratory	2.5	1.75	2.2	2.5									1	3	1.8
Year	Sem	Course code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P O 10	P O 11	P O 12	PSO 1	PSO 2	
III	VI	16FT6201 Dairy Engineering	3	2	3	1	2	2	1.25				1.7 5	1	1	2	
		16FT6202 Food Packaging	3	1	2	2		2							2	3	2.6
		16FT6203 Poultry, Meat and Fish Process Technology	2.5	1.75	2.2	2.5		2							1	3	1.8
		16FT6204 Refrigeration and Cold chain Management	2.3	2	2.25	2.5		2							2	3	2.75

		16FT6301 Beverage Technology	1	2	1.2				1.25			1		1	1.4		
		16FT6401 Traditional Foods	2.2	2.0	1.8	2	-	1	1	2	-	-	1	2	1.4	3	
		16FT6001 Food Packaging and Fruits & Vegetable Processing Laboratory	1.5	1.75	1.75	1	1	1	1		1	1		1	1.25	2	
		16FT6002 Dairy Engineering Laboratory	2	1.5	2	2	2		2					2	2.5	2	
Year	Sem	Course code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P O 10	P O 11	P O 12	PSO 1	PSO 2	
IV	VII	16HE7101 Professional Ethics	2.2	2.8	1.6	2.2	2	2.6	1.4		2	1.8	1	3	3	1.8	
		16FT7201 Food Additives	2.2	2.8	1.6	2.2	2	2.6	1.4		2	1.8	1	3	3		
		16FT7202 Plantation crops & Spices Product Technology	3	2	3	2	1	1	1.25	1	1.5	1	1.75	1	1	1	2
		16FT7306 Technology of Snacks and Extruded Foods	2.2	2.8	1.6	2.2	2	2.6	1.4		2	1.8	1	3	3	1.8	
		16FT7308 Food Process Plant Layout and safety	2.5	1.75	2.4	2.5		2								3	1.8
		16FT7401 Food Product Development	2.8	2.2	1.8	1.8	1.4	2.2	1.4		2	1			3	3	2
		16FT7001 Food Process Equipment Design Laboratory	1.6	1.5	2.5	1.7	2	-	-	-	2.6	-	-	2.4	2	2	
Year	Sem	Course code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P O 10	P O 11	P O 12	PSO 1	PSO 2	
IV	VIII	16FT8306 Waste Management and By-product Utilization in Food Industries	3	2.6	2.5	1.5	2.2	1	1	-	1	-	1.6	2.2	1	1	
		16FT8308 Emerging Non-Thermal Processing of Foods	3	2.6	2.5	1.5	2.2	1	1	-	1	-	1.6	2.2	1	1	