VEER MADHO SINGH BHANDARI UTTARAKHAND TECHNICAL UNIVERSITY

(Formerly Uttarakhand Technical University, Dehradun Established by Uttarakhand State Govt. wide Act no. 415 of 2005)

Suddhowala, PO-Chandanwadi, Premnagar, Dehradun, Uttarakhand (Website- www.uktech.ac.in)

SYLLABUS

For

Bachelor of Technology Programmes

(B.Tech.)

(For admission in 2022-23 and onwards)

[B. Tech. Model Curriculum Structure]

S. No.	Subject Codes	Subject Name	Periods			Sessional Exam			ESE		Subject Total	Credit
			L	T	P	CT	TA	Total	TE	PE		
		Semester-I										
1		First 3 Weeks Mandatory Induction Program for all B. Tech. I Year Students beyond class hours										
2	AHT-001/ AHT-002	Engineering Physics/ Engineering Chemistry	3	1	0	30	20	50	100		150	4
3	AHT-003	Introduction to Engineering Mathematics	3	1	0	30	20	50	100		150	4
4	EET-001/ ECT-001	Basic Electrical Engineering/ Basic Electronics Engineering	3	1	0	30	20	50	100		150	4
5	CST-001/ MET-001	Programming for Problem Solving/ Basic Mechanical Engineering	3	1	0	30	20	50	100		150	4
6	AHP-001/ AHP-002	Engineering Physics Lab/ Engineering Chemistry Lab	0	0	2		25	25		25	50	1
7	EEP-001/ ECP-001	BasicElectricalEngineering Lab/ Basic Electronics Engineering Lab	0	0	2		25	25		25	50	1
8	CSP-001/ MEP-001	Programming for Problem Solving Lab/Basic Mechanical Engineering Lab	0	0	2		25	25		25	50	1
9	MEP-002/ MEP-003	Engineering Graphics & Design Lab/ Workshop Practices Lab	0	1	2		50	50		50	100	2
10	AHP-003/ AHP-004	Introduction to Digital Marketing/ Emerging Technologies in Engineering	0	0	2		25	25		25	50	1
11	AHP-005/ CSP-002	Self Employment and Entrepreneuship Development/ Computer Applications and IOT	0	0	2		25	25		25	50	1
12	AHT-004/ AHP-006	Environmental Studies / English Language Lab	2	0	0	15	10	25	50		75	
			0	0	2			50		25	75	
13	GP-01	General Proficiency						50			50	
14		Internship-I /Mini Project - I	3-4 Weeks internship to be completed at the end of first or second semester during vacation period and its evaluation/ credit to be added in third semester of relevant branch.									
		Total									950	23
		***BRIDGE COURSE FOR B Tech Biotechnology**										
	AHT000	• Basic Mathematics (for bio students)	2	1	0	30	20	50	100		150	0
	BTT001	• Biology for engineers (for math's students)	2	1	0	30	20	50	100		150	0

Abbreviations: **L**-No. of Lecture hours per week, **T**-No. of Tutorial hours per week, **P**-No. of Practical hours per week, **CT**-Class Test Marks, **TA**-Marks of teacher's assessment including student's class performance and attendance, **PS**-Practical Sessional Marks, **ESE**-End Semester Examination, **TE**- Theory Examination Marks, **PE**- Practical External Examination Marks

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[B. Tech. Model Curriculum Structure]

S. No.	Subject Codes	Subject Name	Periods			Sessional Exam			ESE		Subject Total	Credit
			L	T	P	CT	TA	Total	TE	PE		
								Semester-II				
1	AHT-002/ AHT-001	Engineering Chemistry/ Engineering Physics	3	1	0	30	20	50	100		150	4
2	AHT-005	Analytical Mathematics	3	1	0	30	20	50	100		150	4
3	ECT-001/ EET-001	Basic Electronics Engineering/ Basic Electrical Engineering	3	1	0	30	20	50	100		150	4
4	MET-001/ CST-001	Basic Mechanical Engineering/ Programming for Problem Solving	3	1	0	30	20	50	100		150	4
5	AHP-002/ AHP-001	Engineering Chemistry Lab/ Engineering Physics Lab	0	0	2		25	25		25	50	1
6	ECP-001/ EEP-001	Basic Electronics Engineering Lab/ Basic Electrical Engineering Lab	0	0	2		25	25		25	50	1
7	MEP-001/ CSP-001	Basic Mechanical Engineering Lab/ Programming for Problem Solving Lab	0	0	2		25	25		25	50	1
8	MEP-003/ MEP-002	Workshop Practices/ Engineering Graphics & Design Lab	0	1	2		50	50		50	100	2
9	AHP-004/ AHP-003	Emerging Technologies in Engineering/ Introduction to Digital Marketing	0	0	2		25	25		25	50	1
10	CSP-002/ AHP-005	Computer Applications and IOT/ Self Employment and Entrepreneuship Development	0	0	2		25	25		25	50	1
11	AHP-006/ AHT-004	English Language Lab/ Environmental Studies	0	0	2			50		25	75	
			2	0	0	15	10	25	50		75	
12	GP-02	General Proficiency						50			50	
13		Internship-I /Mini Project-I	3-4 Weeks internship to be completed at the end of first or second semester during vacation period and its evaluation/ credit to be added in third semester of relevant branch.									
		Total									950	23

Abbreviations: L-No. of Lecture hours per week, **T**-No. of Tutorial hours per week, **P**-No. of Practical hours per week,

CT-Class Test Marks, **TA**-Marks of teacher's assessment including student's class performance and attendance,
PS-Practical Sessional Marks, **ESE**-End Semester Examination, **TE**- Theory Examination Marks,
PE- Practical External Examination Marks

Syllabus
Engineering Physics (AHT-001)

L:T:P:: 3:1:0   **Credits-4**

Course Objectives:

To explore the basic understanding of wave optics and its applications in modern communication system like Laser and optical fiber communication systems. To comprehend the effect of electric and magnetic field in materials and apply Maxwell's equations to understand electromagnetic wave propagation. To familiarize with the basics of quantum mechanics and its applications. To understand the basics of semiconductors and its application in electronic devices.

Course Outcomes:

1. Learn the principles of physical optics and understand their applicability in daily life.
2. Apply concept of physical optics to understand working of Lasers and optical fiber based communication systems.
3. Comprehend the properties of electromagnetic waves with electric and magnetic behavior of materials.
4. Understand the behavior of microscopic objects using fundamentals of quantum mechanics.
5. Apply and designing of various electronic devices using semiconductor physics.

Syllabus:

UNIT-I   **(8 hours)**
Interference: Coherent sources, conditions of interference, Fresnel's Biprism experiment, displacement of fringes, interference in thin films, wedge shaped film, Newton's rings.
Diffraction: Single and n-slit diffraction, diffraction grating, Raleigh's criterion of resolution, resolving power of grating.

UNIT-II   **(8 hours)**
Polarization: Phenomenon of double refraction, ordinary and extra-ordinary rays, Nicolprism, production and analysis of plane, retardation plates, circularly and elliptically polarized light, optical activity, specific rotation, polarimeter.
Laser: Principle of laser action, Einstein's coefficients, construction and working of He-Ne and Ruby laser and their applications, fundamental ideas about optical fiber, types of fibers, acceptance angle and cone, numerical aperture, propagation mechanism and communication in optical fiber, advantages of optical fiber communication; losses in optical fibers.

UNIT-III   **(8 hours)**
Electromagnetics: Gradient, Divergence and curl, Gauss Theorem, Stokes' theorem, Continuity equation, Ampere'slaw and displacement current, Maxwell's equations in integral and differential forms, electromagnetic wave propagation in free space and conducting media, Poynting theorem.
Magnetic Properties of Materials: Basic concept of para-, dia and ferro-magnetism, Langevin's theory of diamagnetism, phenomenon of hysteresis and its applications.

UNIT-IV   **(8 hours)**
Quantum Mechanics: Introduction to Quantum mechanics, photoelectric effect, Compton effect, Wave nature of Particles, Free-particle wave function and wave-packets, Group Velocity, Phase Velocity and their relation, Uncertainty principle, wave function, properties of wave function, operators, Time-dependent and time independent Schrodinger equation for wave function, Application: Particle in a One dimensional Box.

Syllabus
Engineering Physics (AHT-001)

L:T:P:: 3:1:0   **Credits-4**

UNIT-V   **(8 hours)**
Semiconductor Physics: Introduction to semiconductors, momentum energy diagram for band gap explanation, P and N type semiconductors, direct and indirect band gap materials, Hall effect, barrier formation in P-N junction diode, forward and reverse biasing of P-N junction diode, Shockley equation, photodiode, photovoltaic effect, solar cell, LED and diode laser: construction and materials.

Text Books:
1. H.K. Malik, A.K. Singh, Engineering Physics, TMH, New Delhi. ISBN:9780070671539.
2. A. Beiser, Concept of Modern Physics, McGraw Hill Education. ISBN: 9780070495531
3. Introduction to Modern Physics: F. K. Richtmyer, E.H. Kennard, J.N. Cooper, TMH Pub New Delhi.
4. S.O. Pillai,Solid State Physics:, New Age International Pvt Ltd. ISBN:978-8122436976

Reference Books:

5. C. Kittel,Solid State Physics, Willey ISBN: 978-8126535187
6. David J. Griffith, Introduction to Electrodynamics, PHI Learning, ISBN: 9780138053260

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Syllabus
Engineering Chemistry(AHT-002)

L:T:P:: 3:1:0   **Credits-4**

COURSE OBJECTIVES:

Theobjectiveoftheengineering Chemistry istolay foundation for the application of chemistry in engineering and technology disciplines. The course will build upon chemistry and materials developed in the properties of matter and extend the principles of quantum chemistry to real chemical systems in the inorganic and organic chemistry domain.

Theintroductionofthelatest (R&D oriented)topics like water and corrosion chemistry, Fuel, lubricants, pollution, NMR and MRI spectroscopy willmaketheengineeringstudents upgradedwith the new technologies.

Course Outcomes:
1. To bridge the knowledge of chemical science with technical aspect of Engineering Chemistry.
2. To give technical knowledge of several industries, where Engineering chemistry is used as an integral part, like: Polymer chemistry; Paints, Lubricants; Fuel, Glass etc.
3. To give knowledge of chemical aspect of water and its treatment.
4. To give knowledge of different type of corrosions and pollutions and there minimization.
5. To give brief knowledge of different advance techniques of Instrumental Chemistry, like: Principal of spectroscopy, NMR and MRI spectroscopy. Elementary idea about organic reactions and synthesis of Drugs.

Detailed content of the course:

Unit 1 Atomic and molecular structure: **(8 hours)**
Introduction to atomic theory and initial idea as atomic nuclear models, Heisenberg's uncertainty principle, de Broglie concept, Schrodinger wave equation for hydrogen, VBT and MOT of Di atomic molecules as H_2, O_2, N_2, H_2O, NH_3, XeO_3, XeO_4 etc, Crystal field theory and magnetic properties of transition metal ion, Bonding in metals (Band Theory),

Unit -2 Thermodynamic functions: **(8 hours)**
I and II law of thermodynamics, energy, entropy and free energy, EMF cell potential, Nernst Equation and applications. Acid and base, Use of free energy consideration in metallurgy through Ellingham diagram. Hess law.

Unit-3 Water chemistry and Corrosion: **(8 hours)**
Hardness of water different process of water treatment, Clark's process, Lime-Soda Process, Zeolite process. Reverseosmosis process, Industrial water treatment, alkalinity of water.Theories of corrosion, types of corrosion, mechanism and control.

Syllabus
Engineering Chemistry(AHT-002)

L:T:P:: 3:1:0   **Credits-4**

Unit-4 Chemistry of Engineering materials: **(8 hours)**
Macromolecule and glass: Introduction & classification of polymers, Types of polymerization, Coplymers Classification of polymerization, types of polymerization , Vulcanization, PVC, Polyamides, Polyurethane, Polyethylene, Polypropylene,PET, Resins, PMMA, PAN, Rubber, Conducting and Biodegdrable polymers, Toughened glass, Strengthening of glass.
Fuel and lubricants: Gross & net calorific value, Determination of calorific value using Bomb Calorimeter, Biomass, Biogas and Bio fuel. Introduction to environment and Air Pollution.Introduction of Lubricants, Mechanism of Lubrication Complete fluid, Boundary and Extreme pressure lubrication. Classification of Lubricant, Flash & fire point, Pour point, Cloud point, Aniline point, Viscosity index

Unit-5   **(8 hours)**
Spectroscopic Technique and applications, organic reaction and synthesis of a drug:
Principal of Spectroscopy and selection rule, Electronic vibration and rotational spectroscopy, application, NMR Spectroscopy, MRI
Type of organic reactions, addition elimination, substitution, cyclization(Diels-Alder reaction) Drug synthesis any one(Asprin, Phenacetin, Melubrin and Novalgin).

Suggested Text Books:
1. B.H. Mahan, University Chemistry
2. M.J. Sienko and R.A. Plane, Chemistry: Principal and Applications.
3. C.N.Banwell, Fundamentals of Molecular spectroscopy.
4. B.L.Temble, Kamaluddin and M.S. Krishnan, Engineering Chemistry,NPTEL web book.
5. P.W. Atkins, Physical Chemistry Oxford.
6. Silverstein and Bassler, Spectrometric identification of organic compound, John Wiley and sons.
7. Morrison and BoyD, Organic Chemistry, Pearson Education.
8. Sen Gupta, Organic Chemistry, Oxford.
9. R.N. Goyal and H.Goel, Engineering Chemistry, Ane publication.
10. A.K. Pahari and B.S. Chauhan, Engineering Chemistry, LaxmiPublicaion.
11. S.K. Singh, Fundamental of Engineering Chemistry, New Age.
12. Malik, Tuli and Madan, Selected topics in Inorganic Chemistry, Ramnath publication.
13. Environmental Chemistry by A.K. De, New age international.

Syllabus
Introduction to Engineering Mathematics (AHT-003)

L:T:P:: 3:1:0   **Credits-4**

COURSEOBJECTIVES:

The objective of this course is to familiarize the prospective engineers with techniques of applied mathematics. It aims to equip the students with standard concepts, tools and mathematical software sat an intermediate level that will serve them well towards tackling mathematical problem and applications that they would find useful in their disciplines. Mainly, the objectives are:

1.   To introduce the notion of differential calculus and their related properties and applications.
2.   To present the notion of integral calculus and their properties.
3.   To familiarize with applications of differential and integral calculus.
4.   To develop the essential tool of vector calculus to deal with higher order problems.
5.   To comprehend the idea of matrices and their applications in solving the system of equation.

COURSE OUTCOMES(s):

At the end of this course, the students will be able:
1.   To visualize and conceptualize the engineering problems.
2.   To model the engineering problem mathematically using theory of calculus and matrices.
3.   To determine the solution of the studied engineering problem from application point of view.
4.   To validate the solution.
5.   To implement the solution for engineering problem.

Syllabus:

Unit- 1*: Calculus I(8 hours)
Limit, continuity & differentiability, Rolle's theorem, Mean-value theorems, Expansion of functions by Maclaurin's and Taylor's for one variable, Taylor's theorem for function of two variables, Partial differentiation, Maxima &minima (two and three variables), Method of Lagranges multipliers,

Unit 2*: Calculus II(8 hours)
Definite integral and its properties, Curve tracing, Multiple (double & triple) integral, Change the order of the integration, Change of variables, Beta and Gamma functions and their properties
.
Unit 3: Calculus III (8 hours)
Jacobians, Approximation of error, Applications of definite integrals to evaluate surface areas and volumes of revolutions; Centre of mass, Centre of gravity

Syllabus
Introduction to Engineering Mathematics (AHT-003)

L:T:P:: 3:1:0   **Credits-4**

Unit4: Vector Calculus(8 hours)
Vector and its properties; Scalar and vector point function; Differentiation of vectors; Gradient, Geometrical meaning of gradient, Directional derivative, Divergence and curl, Line integral, Surface integral and Volume integral, Gauss divergence, Stokes and Green theorems (without proof).

Unit 5*: Matrices (8 hours)
Matrix and their types and properties, Rank of a matrix, Consistency of system of linear equations, Solution of simultaneous linear equations by elementary transformations, Eigen values & Eigen vectors, Cayley-Hamilton theorem and its applications to find inverse, Diagonalization of matrices.

*Practical visual demo with mathematical software (MATLAB, Maple, Mathematica, etc (non-evaluative).

Textbooks/References:
1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson,9th Edition.
2. Erwin kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th editon.
3. T. Veerarajan, Engineering Mathematics for first year, Tata McGraw-Hill, 5th edition.
4. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill,Ist edition.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th edition.

Syllabus
Environmental Studies (AHT-004)

L:T:P:: 2:0:0   Credits-0

Course Objectives:

The aim of E.V.S. (environmental studies) is to develop a world population that is aware of and concerned about the environment and its associated problems and which has the knowledge ,Skills, attitudes ,motivations and commitment to work individually and collectively towards solutions of current problems and prevention of new ones. In view of this aim, environmental studies should form an integral part of the educational process, be centered in practical problems and be of an interdisciplinary/multidisciplinary character.

OBJECTIVES of Environmental Studies Subject

- Awareness: To help social groups and individuals acquire awareness of and sensitively to the total environment and it's allied problems.
- Knowledge: To help social groups and individuals gain a variety of experiences and acquire a basic understanding of environment and it's associated problems.
- Attitudes: To help social groups and individuals acquire a set of values and feelings of concern for environment.
- Skills: To help the individuals in acquiring skills for identifying and solving environmental problems.
- Participation: To provide social groups and individuals with an opportunity to be actively involved at all levels in working towards the resolution of environmental problems.

Detailed Content

Unit I –

Introduction: Introduction to environmental studies, Multidisciplinary nature of environmental studies; Scope and importance; the need for environmental education. Concept of sustainability and sustainable development.

Natural Resources:
- Renewable and non-renewable resources: Natural resources and associated problems.
- Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
- Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over 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. Case studies.

Syllabus
Environmental Studies (AHT-004)
L:T:P:: 2:0:0   **Credits-0**

- 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.

Unit II :Ecosystems:
- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem:-
  o Forest ecosystem
  o Grassland ecosystem
  o Desert ecosystem
  o Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit III: Biodiversity and Conservation
- Introduction – Definition : genetic, species and ecosystem diversity.
- Biogeographically 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-sports 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.

Unit IV: Environmental Pollution
Definition
- Cause, effects and control measures of:-
  o Air pollution
  o Water pollution
  o Soil pollution
  o Marine pollution
  o Noise pollution
  o Thermal pollution
  o Nuclear hazards
- Solid waste Management : Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.

Syllabus
Environmental Studies (AHT-004)

L:T:P:: 2:0:0   **Credits-0**

- Pollution casestudies.
- Disaster management : floods, earthquake, cyclone andlandslides.

UNIT V - Social Issues and the Environment
- From Unsustainable to Sustainabledevelopment
- Urban problems related toenergy
- Water conservation, rain water harvesting, watershedmanagement
- Resettlement and rehabilitation of people; its problems and concerns. CaseStudies
- Environmental ethics: Issues and possiblesolutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.
- Wastelandreclamation.
- Consumerism and wasteproducts.
- Environment Protection Act.
- Air (Prevention and Control of Pollution)Act.
- Water (Prevention and control of Pollution)Act
- Wildlife ProtectionAct
- Forest Conservation Act
- Issues involved in enforcement of environmentallegislation.
- Publicawareness.

UNIT VI - Human Population and the Environment
- Population growth, variation amongnations.
- Population explosion – Family WelfareProgramme.
- Environment and human health.
- HumanRights.
- ValueEducation.
- HIV/AIDS.
- Women and ChildWelfare.
- Role of Information Technology in Environment and humanhealth.
- Case Studies. (6lectures)

Note: Introduction and familiarize students with the following

Global Environmental Issues and Environmental Laws
Pollution Tragedies: Love canal, Bhopal Gas, Endosulfan, Minamata and Flint water. UN Initiatives and International agreements: Montreal and Kyoto protocols, Paris Climate Summit (2015) and Convention on Biological Diversity (CBD). Environment Laws: Environment Protection Act (1986); Air (Prevention & Control of Pollution) Act (1981); Forest

Syllabus
Environmental Studies (AHT-004)

L:T:P:: 2:0:0   **Credits-0**

Conservation Act (1980); Water (Prevention and control of Pollution) Act (1974); Wildlife Protection Act (1972).

Field work
1. Visit to a local area to document environmental assets river / forest / grassland / hill /mountain
2. Visit to a local polluted site-Urban / Rural / Industrial /Agricultural
3. Study of common plants, insects,birds.
4. Study of simple ecosystems-pond, river, hill slopes,etc.
5. Plantation at least 2 fruits tree in Surroundings. Pic is totaken.
6. Any useful daily good from wastematerials.
7. Taken at least 5 pics of surrounding by mobile in relation to environmental/socialissues.
8. Development of detailed list of flora and fauna of collegecampus.
9. Manufacturing of any technical prototype/model in relation to Climatic Changemitigation.

Note: Minimum Five activities shall be done by each class and reports shall submit to institute after verification of department

Text Books:

1. Basu, M. and Xavier, S.,Fundamentals of Environmental Studies, Cambridge University Press, 2016.
2. Mitra, A. K and Chakraborty, R., Introduction to Environmental Studies, Book Syndicate,2016.
3. Enger, E. and Smith, B., Environmental Science: A Study of Interrelationships, Publisher: McGraw-Hill Higher Education; 12th edition,2010.
4. Basu, R.N, Environment, University of Calcutta,2000.

Suggested Readings:

1. Odum, E.P., Odum, H.T. & Andrews, J. 1971. Fundamentals of Ecology. Philadelphia:Saunders.
2. Pepper, I.L., Gerba, C.P. &Brusseau, M.L. 2011. Environmental and Pollution Science. AcademicPress.
3. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment,London,Routledge.
4. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ.Press.
5. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
6. McCully, P. 1996. Rivers no more: the environmental effects of dams (pp. 29-64). ZedBooks.
7. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the TwentiethCentury.
8. Ghosh Roy, MK, Sustainalble Development (Environment, Energy and Water Resources), Ane Books Pvt. Ltd.,2011.

Syllabus
Environmental Studies (AHT-004)

L:T:P:: 2:0:0   **Credits-0**

9. Karpagam, M and GeethaJaikumar, Green Management, Theory and Applications, Ane Books Pvt. Ltd.,2010.
10. BalaKrishnamoorthy, Environmental Management, PHI learning PVT Ltd,2012.

Syllabus
Analytical Mathematics (AHT-005)
L:T:P:: 3:1:0   **Credits-4**

COURSE OBJECTIVES:
The objective of this course is to familiarize the prospective engineers with techniques in ordinary, partial differential equations and complex variables.. More precisely, the objectives are:
1.   To introduce effective mathematical tools for the solutions of ordinary and partial differential equations that model physical processes.
2.   To introduce the tools of differentiation and integration of functions of complex variable that are used in various techniques dealing engineering problems.
3.   To acquaint the student with mathematical tools available in sequence and series needed various field of science and engineering.
4.   To develop the tool of Fourier series for learning advanced engineering mathematics.
5.   To formulate the dynamic real-time problem.

COURSE OUTCOMES(s):

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

1. to remember the concept of ordinary differential equations and apply in solving real-life problems.
2. to apply the concept of partial differential equations to evaluate complex engineering problems.
3. to understand to test the convergence of sequence and series.
4. to solve the problems related to complex variable.
5. to design and formulation of mathematical model, and implementation of mathematical tools.

Syllabus:

Unit-1*:First order ordinary differential equations: **(8hours)**
Classication of differential equation, Order and degree, Ordinary differential equations of first order, Variable separable form, Homogeneous differential equations, Exact differential equations, , Linear differential equations, Reducible to homogeneous, exact, and linear equation, Equations not of first degree: Equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Unit- 2*:Ordinary differential equations of higher orders: **(8 hours)**
Linear differential equations of nth order with constant coefficients and variable coefficients, Complementary functions and particular integrals, Solving simultaneous linear differential equations of first degree with constant coefficients, Method of variation of parameters. Applications to engineering problems.

Syllabus
Analytical Mathematics (AHT-005)

L:T:P:: 3:1:0   **Credits-4**

Unit- 3: Sequences and series: (8 hours)
Introduction to sequence and series, tests for convergence: Comparison test; Ratio test; D'Alembert's ratio test, Raabe's test, Logarithmic test, Cauchy root test, Weierstrass-M test, Alternating Series, Uniform Conversions, Fourier series: Half range sine and cosine series, Parseval's theorem.

Unit-4*: Partial differential equations: (8 hours)
Formulation and classification of partial differential equations, Linear and non-linear partial differential equations and their solutions, Homogeneous linear partial differential equation with constants coefficients and its solution. Method of separation of variables, Solutions of one-dimensional wave equation, Heat conduction equations of one and two dimension (without proof).

Unit- 5: Functions of complex variable: (8 hours)
Functions of complex variables: Analytic functions, Harmonic conjugate, Cauchy-Riemann equations (without proof), Complex Integration, Line integral, Cauchy-Goursat theorem (without proof), Cauchy integral formula (without proof), Singular points, poles &residues, Residue theorem, Application of residues theorem for evaluation of real integral (Unit circle).

*Practical visual demo with mathematical software (MATLAB, Maple, Mathematica, etc. (non-evaluative).

Textbooks/References:
1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson, 9th edition.
2. Erwin kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th editon.
3. W.E. Boyce, R.C. DiPrima and D. Meade,Boyce'sElementary Differential Equations and Boundary Value Problems, Wiley India, Global edition.
4. S.L. Ross, Differential Equations, Wiley India, 3rd edition.
5. E.A. Coddington, An Introduction to Ordinary Differential Equations, Dover Publication.
6. J.W. Brown and R.V. Churchill, Complex Variables and Applications, McGraw Hill, 9th edition.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition.

Syllabus
Programming for Problem Solving (CST-001)

L:T:P:: 3:1:0   **Credits-4**

COURSEOUTCOMES
Attheendofthecourse,studentwillbeableto:
1. Formulatesimplealgorithmsforarithmeticandlogicalproblems.
2. Testandexecutetheprogramsandcorrectsyntaxandlogicalerrors.
3. Implementconditionalbranching,iterationandrecursion.
4. Use of functions, arrays,pointers,stringsandstructurestoformulatealgorithmsandprograms.
5. Applyprogrammingtosolveproblemsrelatedtomatrices,Searching,sorting   and Usefilestoperformreadandwriteoperations.

UNIT-I: INTRODUCTION
Introduction to Programming: Computer system, components of a computer system, computing environments, computer languages, creating and running programs, Algorithms, flowcharts.
Introduction to C language: History of C, basic structure of C programs, process of compiling and running a C program, C tokens, keywords, identifiers, constants, strings, special symbols, variables, data types, I/O statements.

UNIT-II: OPERATORS, EXPRESSIONS AND CONTROL STRUCTURES
Operators and expressions: Operators, arithmetic, relational and logical, assignment operators, increment and decrement operators, bitwise and conditional operators, special operators, operator precedence and associativity, evaluation of expressions, type conversions in expressions.
Control structures: Decision statements; if and switch statement; Loop control statements: while, for and do while loops, jump statements, break, continue, goto statements.

UNIT-III: ARRAYS AND FUNCTIONS
Arrays: Concepts, One dimensional array, declaration and initialization of one dimensional arrays, two dimensional arrays, initialization and accessing, multi dimensional arrays, Basic Algorithms: Searching, Basic Sorting Algorithms- Bubble sort, Insertion sort and Selection sort.
Functions: User defined and built-in Functions, storage classes, Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference, Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc, Quick sort or Merge sort.

UNIT-IV: STRINGS AND POINTERS
Strings: Arrays of characters, variable length character strings, inputting character strings, character library functions, string handling functions.
Pointers: Pointer basics, pointer arithmetic, pointers to pointers, generic pointers, array of pointers, functions returning pointers, Dynamic memory allocation.

UNIT-V: STRUCTURES AND FILE HANDLING
Structures and unions: Structure definition, initialization, accessing structures, nested structures, arrays of structures, structures and functions, self referential structures, unions, typedef, enumerations.
File handling: command line arguments, File modes, basic file operations read, write and append, example programs

TEXT BOOKS:
1. Byron Gottfried, Programming with C, Schaums Outline Series, TMH education, 3rd edition 2017.
2. E. Balagurusamy, Programming in ANSI C, TMH education, 6th edition 2012.

Syllabus
Programming for Problem Solving (CST-001)

L:T:P:: 3:1:0   **Credits-4**

REFERENCEBOOKS:

1. W.Kernighan Brian, Dennis M. Ritchie, The C Programming language, PHI learning, 2nd edition, 1998.
2. YashwantKanetkar, Exploring C, BPB publisher, 2nd edition, 2003.
3. Schildt Herbert, C: The complete reference, TMH, 4th edition, 2014.
4. R.S. Bichkar, Programming With C, Universities Press, 2nd edition, 2012.
5. Stephen G. Kochan, Programming in C, Addion Wesley Professional, 4th edition 2014.
6. B.A.Forouzan, R.F.Gillberg, C programming in data structures, Cengage Learning India, 3rd edition 2014.

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Syllabus
Basic Electronics Engineering (ECT-001)

L:T:P:: 3:1:0   **Credits-4**

Course Objectives:
To explore the basic understanding of semi conductor material and its properties. To comprehend the PN Junction diode , zener diode bipolar junction transistors and their characteristics . To familiarize with the basics of field effect transistors and switching theory and logic design. To understand the basics of operational amplifiers and its application

COURSE OUTCOMES:
1. Students will be able to understand the operation and terminal behavior of basic electronic devices.
2. Students will be able to design the biasing circuits of electronics devices.
3. Students will be able to apply the principles of basic amplifier circuits using BJTs and FETs.
4. Students will be able to understand the basic principles of the operational amplifier and digital logicdesign.
5. Students will be able to solve engineering problems related to electronics devices and circuits

UNIT-1:
SEMICONDUCTOR MATERIALS AND PROPERTIES: Group-IV materials, covalent bond, electron-hole concepts, basic concepts of energy bands in materials, forbidden energy gap, intrinsic and extrinsic semiconductors, donors and acceptors impurities, conductivity of semiconductors.
JUNCTION DIODE: p-n junction, depletion layer, V-I characteristics, diode resistance, diode capacitance, Light emitting diode, varactor diode, photo diode, Schottky diode, Tunnel diode.

UNIT-2:
DIODE APPLICATIONS: Rectifiers (half wave and full wave), calculation of ripple factor,efficiency, and transformer utilization factor, capacitor filter, clipping circuits, clamping circuits,voltage multipliers.
BREAKDOWN of DIODES: Breakdown mechanisms (zener and avalanche), breakdown characteristics, zener resistance, zener diode application as shunt voltage regulator.

UNIT-3:
BIPOLAR JUNCTION TRANSISTORS: Basic construction, transistor action, CB, CE, and CC configurations, input/output characteristics, biasing of transistors- fixed bias, emitter bias,and potential divider bias.
TRANSISTOR AMPLIFIERS: Graphical analysis of CE amplifier, concept of voltage and current gain, h-parameter model of BJT at low frequency, calculation of current and voltage gain, input and output resistances of single stage BJT amplifier in CE and CC configurations.

UNIT-4:
FIELD EFFECT TRANSISTORS: Junction field-effect transistor; construction and action, concept of pinch-off, maximum drain saturation current, output and transfer characteristics, CG, CS and CD configurations, self-bias, and fixed-bias circuits. Metal-oxide field-effect transistor; depletion and enhancement type, construction, operation and characteristics, calculation of voltage gain, input and output resistances of single stage FET amplifiers in CG, CS and CD configurations.

UNIT-5:
SWITCHING THEORY AND LOGIC DESIGN: Number systems, conversions ofbases, Boolean algebra, logic gates, concept of universal gate, K-map.
OPERATIONAL AMPLIFIERS: Concept of ideal operational amplifiers, ideal op-amp parameters, inverting, non- inverting and unity gain amplifiers, summing amplifier.

Syllabus
Basic Electronics Engineering (ECT-001)

L:T:P:: 3:1:0   **Credits-4**

BOOKS:
1. Boylestad and Nashelsky, Electronic Devices and Circuit Theory, PHI, 2017.
2. Milman, Halkias & Jit, Electronic Devices and Circuits, TMH, 2007.
3. G. Streetman, and S. K. Banerjee, "Solid State Electronic Devices," Pearson, 2014.
4. D. Neamen, D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education
5. Salivahanan, Electronic Devices and Circuits, TMH, 2012.
6. Deshpande, Electronic Devices and circuits, McGraw-Hill, 2007.
7. Kulshrestha, 'Electronic Devices and Circuits' PHI, 2007.

Syllabus
Basic Electrical Engineering (EET-001)

L:T:P:: 3:1:0   **Credits-4**

Course Objectives:
To explore the engineering knowledge of Electrical, Problem analysis, Design development and solution, Investigation of complex problems, Modern tool usage, Engineer and society, Environment and sustainability. To comprehend the effect of electric and magnetic field in materials,3-phase AC electrical circuits. To understand the Concept of AC/DC machines.

Course Outcomes:

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

1. Analyze the DC circuits and apply network theorems.
2. Analyze the 1-phase and 3-phase AC electrical circuits
3. Analyze the magnetic circuits and transformer.
4. Explain the construction and working principles of basic DC machines and AC machines
5. Describethe protection requirements of domestic power system.

Syllabus:

UNIT 1:(8 hours)

DC Circuits
Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin, Norton Theorems and maximum power transfer theorem. Star to Delta conversion. Time-domain analysis of first order RL and RC circuits.

UNIT 2:(8 hours)

AC Circuits
Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections and power measurement

UNIT 3:(8 hours)

Magnetic circuits and Transformers
Magnetic circuits and materials, BH characteristics, Basic laws of electromagnetism, single phase transformer. ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Introduction to measurements: PMMC and MI meters

Syllabus
Basic Electrical Engineering (EET-001)

L:T:P:: 3:1:0   **Credits-4**

UNIT 4:(8 hours)

Electrical Machines Construction and working principle of DC machines, Types of DC machine, Generation of rotating magnetic fields, Three-phase and single-phase induction motorConstruction, Classification and Principle of Operation, Construction and working principle of synchronous generators

UNIT 5:(6 hours)

Electrical Installations
Generalized layout of Power system, Standard transmission and Distribution Voltages, Concept of Grid. Introduction to LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption

References
1. D.P. Kothari & I.J. Nagrath, Basic Electrical Engineering, Tata McGraw Hill, latest edition.
2. S.N. Singh , Basic Electrical Engineering, P.H.I.,2013
3. M.S. Sukhija, T. K. Nagsarkar, Basic Electrical and electronics engineering, Oxford University press, 2012
4. C.L. Wadhwa, Basic Electrical Engineering. New Age International.
5. B.L. Theraja& A.K Theraja Textbook of Electrical Technology - Vol. 1, S. Chand Publication
6. E. Hughes & I.M. Smith Hughes Electrical Technology Pearson
7. Vincent Del Toro Electrical Engineering Fundamentals

**

There must be small demonstrations on hardware hands-on, e.g., physical experience with R, L, and C components in 1st/2nd Semester.

Demonstration of cut machine models

Visit to local switch boxes and substation

Simulation demo.

Syllabus
Basic Mechanical Engineering (MET-001)

L:T:P:: 3:1:0   **Credits-4**

Course Objectives:

The course objective is to familiarize students with basic concept of thermodynamics, mechanics, IC Engines, measurement and fluid mechanics and to develop ability among the students to solve mathematical problems related to basic mechanical engineering knowledge.

Course Outcomes:

At the end of the course, students will achieve following outcomes:

1: To understand Engineering Mechanics and analysis of forces in simple structures.
2: To give the basic understanding of engineering materials, mechanical properties of materials & basic knowledge of Stress-strain and their analysis.
3: To gain the knowledge of fluid properties, working of hydraulic machines and understanding of mechanical measurement.
4: To gain fundamental knowledge of Engineering Thermodynamics and its analysis.
5: To know the basics of Internal combustion engines and their working.

Syllabus:

Unit I: **(8Hours)**

Engineering Mechanics

Basic concept: Review of laws of motion, transfer of force to parallel position, resultant of planer force system, Free Body Diagrams, Equilibrium, Moment of inertia, Friction.
Trusses: Introduction, Simple Trusses, Determination of forces in simple truss members, Method of joints and Method of section.

Unit II: **(8 Hours)**

Engineering Materials: Classification of engineering materials, Cast iron and Carbon steels, Alloy steels & their applications. Mechanical properties like strength, hardness, toughness, ductility, brittleness, malleability etc.
Simple stress and strain: Introduction to stress and strain, Hook's law, Normal shear stresses, Stress-strain diagrams for ductile and brittle materials, Elastic constants and its relationship.

Unit III: **(8 Hours)**

Measurement: Concept of measurements, errors in measurement, Introduction to measuring instruments for Temperature, Pressure, Velocity and Force and torque measurement
Fluids: Fluid properties, Types of fluids, Newton's law of viscosity, Pascal's law, Bernoulli's Equation, working principle of hydraulic turbines, centrifugal and reciprocating pumps,

Syllabus
Basic Mechanical Engineering (MET-001)

L:T:P:: 3:1:0   **Credits-4**

Unit IV: (8 Hours)

Thermodynamics: Zeroth law, First law: First law of thermodynamics. Processes - flow and non-flow, Control volume, Flow work and non-flow work, Steady flow energy equation, Second law: Limitations of first law of thermodynamics, Essence of second law, Thermal reservoir, Heat engines. COP of heat pump and refrigerator Statements of second law and their equivalence, Carnot cycle.   (8 Hours)

Unit V: (8 Hours)
Internal Combustion Engine: Introduction to I.C. Engines: Two & four stoke S.I. and C.I. engines, its working, Efficiency and mean effective pressure of Otto cycle, Diesel cycle and dual cycle.

Reference Books:
1) I H Shames, Engineering Mechanics, PHI publishing
2) Singh Onkar, Bhavikatti S.S., Chandra Suresh : Introduction to Mechanical Engineering: Thermodynamics, Mechanics and Strength of Materials, New Age International Publishers
3) Dr. R.K.Bansal , Fluid Mechanics & Hydraulic Machines,Laxmi publication
4) A. K. Sawhney and P. Sawhney, A Course In Mechanical Measurements and Instrumentation ,Dhanpat Rai Pub. New Delhi
5) P.K Nag , Engineering Thermodynamics, TMH
6) V Ganesan, Internal Combustion Engines, TMH
7) C M Agrawal, Basic Mechanical Engineering, Wiley Publication.

Syllabus
Basic Electronics Engineering Lab (ECP-001)

L:T:P:: 0:0:2   **Credits-1.0**

Course Objectives:

To introduce the hands-on descriptions of various physical & analytical concept of Electronics devices such as diodes, transistors, operational amplifiers and logic gates and their applications.

Course Outcomes:

1. Students will be able to understand characteristics of various circuits using diode.
2. Students will be able to analyze characteristics of various circuits using BJT.
3. Students will be able to analyze characteristics of various circuits using FET.
4. Students will be able to implement various logic gates and verify their truth-tables.
5. Students will improve skills of team work, technical communication and report writing.

Syllabus:

1. To determine and plot V-I characteristics of P-N junction in both forward biasand reverse bias.
2. To determine and plot the wave shapes of a clipping and champing circuits.
3. To determine the ripple in output of a half wave and a full wave rectifiers atdifferent loads.
4. To determine and plot V-I characteristics of Zener diode in both forward biasand reverse bias.
5. To determine and plot input and output characteristics of an NPN & PNPbipolar junction transistor in common emitter and common base mode.
6. To determine and plot input and output characteristics of a field-effect transistor.
7. To determine and plot input and output characteristics of a metal-oxide-semi conductor field-effect transistor.
8. To determine and plot the frequency response of an amplifier.
9. Realization and verification of the truth table of various logic gates.
10. Realization and verification of the basic logic gates using NAND and NOR gates.
11. To design inverting and non-inverting amplifier using Opamp.

Note: Handouts and manuals are available in the Lab.

Syllabus
Engineering Physics Practical (AHP-001)

L:T:P:: 0:0:2   **Credits-01**

Course Objectives:

To introduce the hands-on descriptions of various physical concepts of optics, mechanics, thermal physics etc with the help of related instruments and devices.

Course Outcomes:

1. To formulate, analyze and solve a multilevel laboratory problems in electromagnetism.
2. To demonstrate experimental comprehension of electric and magnetic field based systems.
3. To analyze the physical principle involved in various instruments.
4. To handle various experiments in the area of optics, mechanics and thermal physics.
5. To think innovatively and improve the creative skills that are essential for engineers.

Syllabus:

Any Twelve Experiments:
1. To determine the wavelength and fringe widths of sodium light by Young's double slit Experiment.
2. To determine the wavelength of sodium light by Newton's rings.
3. To determine the wavelength of sodium light (monochromatic source) with the help of Fresnel's Biprism
4. To determine the wavelength of He-Ne laser using Michelson-Morley interferometer.
5. To determine the separation between the plates of a Fabry-Perot Etalon and the 'order' of interference at the centre of Fabry-Perot fringes.
6. To determine the specific rotation of cane sugar solution with the help of polarimeter.
7. To determine the wavelength of prominent spectral lines of mercury light by plane diffraction grating
8. To determine the numerical aperture of an optical fiber.
9. To determine the wave length of given laser by plane diffraction grating.
10. To determine the Resolving Power of Telescope
11. To determine the residence per unit length of Carey Foster's bridge wire and to determine the specific resistance of a giving wire.
12. To determine the variation of magnetic field along the axis of current carrying coil and then to estimate the radius of the coil.
13. To draw hysteresis curve and hysteresis loss of a given sample of ferromagnetic material and from this to determine magnetic susceptibility and permeability of the given specimen.
    (i) to obtain hysteresis curve (B.H. curve) for a given ferromagnetic material (thin rod or thin wires) on a C.R.O. using a solenoid and then to determine the related magnetic constants from it. *(ii)* To determine hysteresis loss using C.R.O.
14. To calibrate a given voltmeter and ammeter by means of a potentiometer.
15. To study the Hall Effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall Effect set up.
16. To determine the resistivity and energy band gap of a semiconductor (Germanium) using four probe method. *(ii)* To determine the band gap in a semiconductor using a PN junction diode.
17. To determine of V-I characteristics of the diode and determination of the energy gap of the semiconductor.
18. To study V-I characteristics of LED and laser sources and hence to determine the responsibility of photo receiver.
19. To measure the optical loss, fiber length and hence determine the attenuation coefficient of optical fiber at at different wavelengths and to find radius of curvature of the optical fiber.

Syllabus
Engineering Physics Practical (AHP-001)

L:T:P:: 0:0:2   **Credits-01**

20. Comparison of P-I characteristics of LED and ILD and hence determine the region of operations and laser threshold current.
21. To find out the fill factor of given solar cell
22. To verify Stefan's law by electrical method.
23. To determine the numerical aperture and to evaluate V-number of a given optical fiber.
24. To determine the susceptibility of paramagnetic solution (Quinck`s Tube Method).
25. To determine the frequency of A.C. mains with a sonometer using non-magnetic and magnetic wire.
26. To determine the frequency of electrically maintained tuning fork by Melde'sexperiment : transverse and longitudinal modes.

Syllabus
Engineering Chemistry Lab (AHP-002)

L:T:P:: 0:0:2   **Credits-1**

Course Objectives:

This course will provide, students the practical knowledge of quantitative analysis of materials and instrumental methods for developing experimental skills in building technical competence.

Course outcome:

1. To give knowledge of different analytical technique of chemistry
2. To give an idea about volumetric and gravimetric methods of analysis.
3. To give knowledge about several volumetric methods used in several industries like: water, hospitals, dying, metallurgies etc.
4. To give an idea about some of the old and latest instrumental aspects of analysis like: viscometric, Surface tension and conductivity methods.
5. To give an idea about some useful techniques of industries like: Chromatography, Bomb calorimeter, Coal analysis etc.

List of Experiments (Any Ten)

1. Determination of viscosity by Ostwald Viscometer and the molecular weight of a polymer by viscosity measurement.
2. Determination of surface tension of liquid by Stalagmometer.
3. Determination of chloride content of water by Mohr's method.
4. Determination of Cell constant and conductance of a solution using Conductive meter.
5. Determination of saponification/acid value of oil.
6. Synthesis of Aspirin Drug in the lab.
7. Chemical analysis of a given salt.
8. Determination of the partition coefficient of a solute in two immiscible liquids.
9. Determination of adsorption of acetic acid by charcoal.
10. Removal of Hardness of water by Ion exchange column.
11. Determination of Rf value using Paper/Thin layer chromatography.
12. Determination of temporary and permanent hardness of water by complexometric titration.
13. Determination of rate constant of a reaction.
14. To determined the Ferrous content in the supplied sample of iron ore by titrimetric analysis against standard $K_2Cr_2O_7$ solution using $K_3Fe(CN)_6$ as external indicator.
15. To determine the constituents and amount of alkalinity of the supplied water sample.

Suggested Books:

1. Vogel's , Taxtbook of Quantitative Chemical Analysis, ELBS Longman
2. R.N. Goyal and H.Goel, Engineering Chemistry, An epublication

Syllabus
Basic Electrical Lab (EEP-001)

L:T:P:: 0:0:2   **Credits-01**

Course Objectives:

To introduce the hands-on descriptions of various concept of electrical systems and different laws and theorems and to understand the mechanism of DC generator, DC shunt motor, three phase induction motor.

COURSE OUTCOMES:

1. Students will be able to understand characteristics of Maximum power transfer and Superposition theorems.
2. Students will be able to analyze characteristics of efficiency of a single phase transformer by load test.
3. Students will be able to analyze characteristics of Load characteristics of DC generator, control of dc shunt motor.
4. Students will be able to understand KCL and KVL and Thevenin's and Norton's Theorems.
5. Students will improve skills of team work, technical communication and report writing.

Syllabus:

A minimum of 08 experiments from the following:

1. Verification of KCL and KVL.

2. Verification of Thevenin's and Norton's Theorems.

3. Verification of Maximum power transfer and Superposition theorems.

4. Measurement of power in a three phase circuit by two wattmeter method.

5. Measurement of efficiency of a single phase transformer by load test.

6. Determination of parameters and losses in a single phase transformer by OC and SC test.

7. Load characteristics of DC generator.

8. Speed control of dc shunt motor.

9. Study of running and reversing of a three phase induction motor.

10. Calibration of a single phase energy meter.

****Additional or any other experiment may be added based on contents of syllabi.

Syllabus
Programming for Problem Solving Lab (CSP-001)

L:T:P:: 0:0:2   **Credits-1.0**

COURSE OUTCOMES
At the end of the course, student will be able to:
1. Acquire knowledge about the basic concept of writing a program.
2. Understand the Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
3. Learn how to use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
4. Understand the Role of Functions involving the idea of modularity and Understand the Concept of Array and pointers dealing with memory management.
5. Learn Structures and unions through which derived data types can be formed.

S. No.	Name of the program
1	a) Write a C program to find sum and average of three numbers. b) Write a C program to find the sum of individual digits of a given positiveinteger.
2	a) Write a C program to generate the first n terms of the Fibonacci sequence b) Write a C program to generate prime numbers between 1 to n. c) Write a C program to check if the given number is Armstrong or not
3	a) Write a C program to check whether the given number is perfect or not b) Write a C program to check whether the given number is strong or not
4	a) Write a C program to find the roots of a quadratic equation. b) Write a C program perform arithmetic operations using switch statement.
5	a) Write a C program to find factorial of a given integer using non-recursive function b) Write a C program to find factorial of a given integer using recursive function
6	a) Write C program to find GCD of two integers by using recursive function. b) Write C program to find GCD of two integers by using non-recursive function.
7	a) Write a C program to find the largest and smallest number in a list of integers. b) Write a C program to Sort the Array in an Ascending Order. c) Write a C program to find whether the given matrix is symmetric or not.
8	a) Write a C program to perform addition of two matrices. b) Write a C program using function to perform multiplication of two matrices.
9	a) Write a C program to use function to insert a sub-string in to given main stringfrom a given position. b) Write a C program to swap the values of two variables using (i) Call by value (ii) Call by reference
10	a) Write a C program using user-defined functions to determine whether the givenstring is palindrome or not. b) Write a C program that displays the position or index in the main string Swhere the sub string T begins, or - 1 if S doesn't contain T.
11	a) Write C program to count the number of lines, words and characters in a giventext. b) Write a C program to find the sum of integer array elements using pointers.
12	a) Write a C Program to Calculate Total and Percentage marks of a student usingstructure. b) Write a program to open and read a file using file handling.

Syllabus
Programming for Problem Solving Lab (CSP-001)

L:T:P:: 0:0:2   **Credits-1.0**

TEXT BOOKS:
1. C Programming and Data Structures, P.Padmanabham, Third Edition, BS Publications 2. Computer programming in C.V.RAjaraman, PHI Publishers. 3. C Programming, E.Balagurusamy, 3rd edition, TMH Publishers. 4. C Programming, M.V.S.S.N Venkateswarlu and E.V.Prasad,S.Chand Publishers 5. Mastering C,K.R.Venugopal and S.R.Prasad, TMH Publishers.

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Syllabus
Basic Mechanical Engineering Lab (MEP-001)

L:T:P:: 0:0:2   **Credits-1.0**

Course objective:

To help students to able to visualize various concepts and perform on different apparatus to gain the practical knowledge in basic mechanical engineering.

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

1: Understand and explain the functioning of SI and CI engine.

2: Understand the internal operation occurring in working of fluid machines.

3: Perform the impact test (Izod/Charpy) in impact testing machine.

4: Understand various concepts like moment of inertia and coefficient of friction by performing on the apparatus.

5: Perform and study of various measurement instruments.

A minimum of 10 experiments from the following:

1. Study of 2-stroke and 4-stroke I.C.Engine models.
2. Study of Fiat engine and/ or Diesel engine prototype.
3. To conduct the tensile test on a UTM and determine ultimate Tensile strength, percentage elongation for a steel specimen.
4. To conduct the compression test and determine the ultimate compressive strength for a specimen.
5. To conduct the Impact test (Izod / Charpy) on the Impact testing machine and to find the impact strength.
6. To determine the value of acceleration due to gravity by Atwood's Machine apparatus.
7. To verify the principle of moment by Bell Crank Lever Apparatus
8. To determine the moment of inertia of a flywheel apparatus about its axis of rotation
9. To verify Newton's second law of motion by Fletcher's Trolley apparatus
10. To find out coefficient of friction by combined inclined plane & friction slide apparatus
11. To verify the Bernoulli's equation.
12. Study and working of hydraulic turbines and pumps.
13. Study and working of different types of measuring instrument like vernier caliper, micrometer, height gauge, sine bar, dial gauge etc.
14. Identification of twenty five common materials and their application.

Syllabus
Engineering Graphics & Design Lab (MEP-002)

L:T:P:: 0:1:2   **Credits-2**

Course Objective:

All phases of manufacturing or construction require the conversion of new ideas and design concepts into the basic line language of graphics. Therefore, there are many areas (civil, mechanical, electrical, architectural and industrial) in which the skills of the CAD technicians play major roles in the design and development of new products or construction. Students prepare for actual work situations through practical training in a new state-of-the-art computer designed CAD laboratory using engineering software. This course is designed to address:

• To prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

• To prepare you to communicate effectively

• To prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice

Course Outcomes:

At the end of the course, students will achieve following outcomes:

1: Students understand basic knowledge of engineering graphics with using letter writing, different type of scales, lines and dimensions.

2: Student will be able to draw orthographic projections of points, lines, planes and solids.

3: Student will be able to understand principle of isometric projection and develop isometric views by different methods.

4: Students will become familiar with Auto CAD 2-D and 3-D drawings and learn various commands used in Auto CAD.

5: Students will be able to use appropriate computer technology and to work as a team.

Syllabus:

UNIT 1: Introduction to Engineering drawing, usage of drawing instruments, types of lines, lettering, scales, orthographic Projection and dimensioning.

UNIT 2: Projection of points, lines, simple objects and conventions.

UNIT 3: Isometric and oblique views, Auxiliary Views; Development of surfaces of simple Solids such as Prism, Pyramid, Cylinder and Cone.

UNIT 4: Orthographic and sectional viewsof Simple assembly (joints and couplings).

UNIT 5: Introduction to computer aided drafting in engineering drawing, usage of toolbars, setting up and use of Layers, Printing of the documents.

Text/Reference Books:

- N.D. Bhatt, Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
- M.B. Shah &Rana B.C. (2008), Engineering Drawing and Computer Graphics, PearsonEducation
- An Introduction ToAutocad For Begginers by Autodesk.
- K.L. Narayana& P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

Syllabus
Workshop Practices Lab (MEP-003)

L:T:P:: 0:1:2   **Credits-2**

Course objective:

Ability to prepare simple objects using machines and machine tools. To make students aware of fundamental operations of manufacturing an engineering component, enhance visualization and motivate them to innovate.

Course outcomes:

At the end of the course, the student will

1: Have Capability to identify hand tools and instruments for machining and other workshop practices.

2: Obtain basic skills in the trades of fitting, carpentry, welding and machining.

3: Acquire measuring skills, using standard workshop instruments & tools.

4: Gain eye hand co-ordination, enhance psycho motor skills and attitude.

5: Be able to apply basic electrical engineering knowledge for house wiring practice.

Particulars

Tutorial

Manufacturing methods-casting, forming, machining, joining, advanced manufacturing methods, CNC machining and additive manufacturing, Fitting operations and power tools, Electrical and electronics, Study of carpentry tools, equipment's and different joints, Plastic moulding and glass cutting, Metal casting, Welding (arc and gas welding) and brazing

Laboratory

Machine shop

- Study of machine tools in particular lathe machine
- Demonstration of different operations on lathe machine
- Practice of facing, plane turning, step turning, taper turning, knurling and parting.
- Study of quick return mechanism in shaper
- To make a machined-component using lathe with mild steel round bar or hexagonal bar comprising of common turning operations with reference to drawing given in the manual

Fitting and sheet metal shop

- Study of fitting and sheet metal shops tools
- Making perfect male-female joint
- Simple exercise involving drilling/tapping/dieing

Syllabus
Workshop Practices Lab (MEP-003)

L:T:P:: 0:1:2   **Credits-2**

- To make a sheet metal component with galvanized iron sheet as per the drawing provided in the manual having spot welding joint.

  Carpentry
- Study of tools and operation and carpentry joints
- Simple exercise using jack plain
- To prepare half- lap corner joint, mortise and Tenon joints as per drawing provided in the lab manual Simple exercise on woodworking lathe

  Electrical and electronics
- Soldering and desoldering application in electronic equipment's
- Introduction to house wiring and different types of cables
- Types of power supply, types of motors and starters, distribution of power supply and electric wiring symbol

  Welding shop
- Instruction of BI standards and reading of welding drawings
- To prepare Butt and Lap joints using metal arc welding machine as per given manual and drawing Hand on experience with MIG, TIG and gas welding

  Foundry shop
- Study of tools and operations
- Demo of mould preparation
- Practice and preparation of mould of any pattern
- Casting of any simple pattern

  Smithy shop
- Study of tools and operations
- Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering& swaging

  Minor Project:
  To make a minor project by the students in batches comprising the operations performed in different shops

  References:
1. A course in Workshop Technology Vol I and Vol II by Prof. B.S. RaghuwanshDhanpatRai& Co.(P) Ltd.
2. Elements of Workshop Technology Vol I and Vol II by S.K. HajaraChoudhury, A.K. HajaraChoudhury&Nirjhar Roy; Media Promoters & Publishers Pvt. Ltd, Mumbai.
3. Workshop Technology Part 1, Part2 & Part3 by W.A.J. Chapman; CBS Publishers & Distributors, New Delhi.

VEER MADHO SINGH BHANDARI UTTARAKHAND TECHNICAL UNIVERSITY, DEHRADUN

Syllabus
Introduction to Digital Marketing Practical (AHP-003)

L:T:P:: 0:0:2   **Credits-01**

Course Objectives:

- To understand the applications of Digital Marketing.
- To undertake Marketing Campaigns in digital format and how to apply the tools of Digital Marketing to gain competitive advantage in the Market.
- To analyze consumer buying behavior using Web Analytics and offer the right products or services to the right customers.

Course Outcomes:
After completing the lab, the students will be able to:

1. To learn digital marketing tools like search engine optimization and associated analytics.
2. To apply digital marketing tools to: a) improve websites' rankings and optimize it in the process. b) Improve the brand's visibility c) improve brands reach which physically is relatively difficult and less effective.

   3. To analyze relative importance of digital marketing strategies to optimize digital marketing campaign.

   4. To evaluate the performance of different social media in conjunction with overall digital marketing plan.

5. To design search engine optimization and search engine marketing campaigns.

Pre-requisite: Basic knowledge of Computer and Internet.

Syllabus:

1. Digital Marketing Implementation in Business Scenario.

2. Create the Digital Marketing Webpage.

3. Conducting the Search Engine Optimization and Search Engine Marketing.

4. Using Google Analytics to analyze website performance.

5. Creating Promotional banner through Canva.

6. Facebook Promotion using banners.

7. Creating YouTube Channel for Marketing.

Syllabus
Introduction to Digital Marketing Practical (AHP-003)

L:T:P:: 0:0:2   **Credits-01**

8. Twitter Marketing.

9. Instagram Marketing.

10. Email Marketing.

11. Digital Marketing Final Analysis and Report.

Text/Reference Books:

1. **"**Digital Marketing" By Vandana Ahuja, Publisher- Oxford University Press.
2. "Digital Marketing Strategy- An integrated approach to online marketing" by Simon Kingsnorth, Publisher- Kogan Page.
3. "Digital Marketing- A practical approach" by Alan Charlesworth Publisher: Routledge -Taylor & Francis Group.

List of learning Websites:

1.http://www.books.google.co.in/Digital Marketing

2.http://www.investopedia.com

3.http://www.neilpatel.com

4. Different social media websites.

Syllabus

Emerging Technologies and Their Applications in Engineering (AHP-004)

L:T:P:: 0:0:2   **Credits-1.0**

Course Objectives:

The objective of this course is to provide brief knowledge about the emerging technologies of the present time which are changing the world at a speed which humanity has never seen. To name some of the technologies which will be discussed in this course are 3D printing, 5G technology, Virtual reality, Fortification, cyber security and many others.

Course Outcomes: After this course the student will be able

1:- to familiar with 3D printing, Robots, Drones

2:- to know and familiar with the developments in transport system like Hyperloop and Maglev

3:- to understand the need of fast Internet and its application in various fields .Understand about Nanotechnology and ceramics.

4:- to know the basics of Artificial Intelligence and machine learning, Blockchain and quantum computing

5:- to know the augmented reality (AR), virtual reality (VR), Cyber security, satellite technology

Modern Manufacturing: 3D printing, study of 3D printer, generation of stl files, making small objects on 3D printer, basics of Ceramic material

Robotics:-Introduction about different types of robots, Study components of a real robot, Power point presentation on different robotic applications

Drones and their applications in various fields

Scope of developments in transport systems: Hyperloop, Magnetic leviathan (Maglev) by model making or using computer animation

Introduction to 5G technology: Benefits of 5G in IOT and other applications, Comparison with 2G, 3G, 4G

Study of fortification machines for Rice and other cereals with the help of Videos and animation tools

Nanotechnology: Introduction to Nano materials and brief theory of nanotechnology

Artificial Intelligence and Machine learning: Introduction, applications, challenges and threats associated.

Blockchain and Distributed ledger technology: what is blockchain, its application, cryptocurrencies

Quantum computing: its practical application, Building Quantum dice

Electric vehicle: development of simple battery system in laboratory

Syllabus

Emerging Technologies and Their Applications in Engineering (AHP-004)

L:T:P:: 0:0:2   **Credits-1.0**

Other Future trends: Cyber security, Augmented Reality and Virtual Reality, Data sciences

Different types of satellites and their application using videos and Power point presentations.

Referance Books:

1) Mastering Cloud Computing: Foundations and Applications Programming, Book by ChristianVecchiola, Rajkumar Buyya, and S. Thamarai Selvi
2) Daniel Drescher, Blockchain Basics: A Non-Technical Introduction in 25Steps
3) Ian Gibson, Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping and Direct Digital Manufacturing
4) Barry Davies, Build a Drone: A Step-by-Step Guide to Designing, Constructing, and Flying Your Very Own Drone.
5) Simon Haykin, "Communication Systems", 4th Edition, Wiley India
6) K. C. Mahajan, R. Kumar & P. K. Pattnaik, Robotics for Engineers - Concepts and Techniques, Vikas Publishing House
7) Michael A. Nielsen, "Quantum Computation and Quantum Information" Cambridge University Press
8) Joel Grus, "Data Science from Scratch: First Principles with Python", O. Reilly Media

Syllabus
Self-Employment and Entrepreneurship Development (AHP-005)

L:T:P:: 0:0:2   **Credits-01**

SUGGESTED LIST OF EXERCISES/PRACTICALS

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills (outcomes in psychomotor and affective domain) so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

Sr. No.	Practical Exercises (outcomes in Psychomotor Domain)		Approx Hours. Required
1	Preparatory activity:	a) List various types of industries. b) Narrate need of self employment. c) Anticipate importance of entrepreneurship development.	2
2	Creativeness and innovativeness:	a) Teacher will assign any one mechanical feature based (in a group of not more than 5-6 students) item/product,(may be pen, gear, mouse, notebook, chair, table, fan, mobile, bicycle, etc.). List at least ten uses of this item/product other than pre-defined. Think out of box. b) Teacher will assign any one mechanical feature based (in a group of not more than 5-6 students) process, product or service, tangible or intangible, (may be milk packaging, service offers, camera, farm equipments, machine tools, automobiles, tools, travelling bags, material handling, logistics, construction, customer services, etc.), List at least ten innovations of assigned process, product or service. Imagine out of box. c) List at least ten engineering products which have passed through innovativeness.	4
3	Identification of self-employment areas:	a) Teacher will assign this exercise in group of 5-6 students. b) List at least five mechanical feature based areas which have, in group's opinion, self-employment potential. Select any one promising area. c) Develop market survey format for the selected area. d) Perform market survey for self-employment and Entrepreneurship Development nearby to institute e) Describe the outcome. Also narrate the experience. f) It is compulsory to attach photographs of group conducting market survey	4

Syllabus
Self-Employment and Entrepreneurship Development (AHP-005)

L:T:P:: 0:0:2   **Credits-01**

4	Visit report	a) Visit any one near institute:
		    Industries/financial institutions/bank/ Training institute/ Hotel/Farming/Agribusiness etc.
		b) Prepare the visit report which include followings:
		    i. Brief history of organization.
		    ii. Type and details of product /services /support/ assistance being given.
		    iii. Any other information which are useful to be self-employer or entrepreneur.
		    iv. Brochures/technical literature collected from agencies
			4

5	Preparing project feasibility report of assigned product:	a) Teacher will assign any one product (physical or service based) to the group of 5-6 students. b) Prepare project feasibility report (Technical and financial). Specifically include capacity requirement calculations and project set up planning details. Also present the same to whole batch.	8
6	Case analysis and presentations:	Teacher will assign one case of successful entrepreneur and one case of failed entrepreneur to the group of 5-6 students. Student will discuss in group, will analyze and will present the same to whole batch. Student will also prepare the report on analysis. Case may be put up with printed pages but analysis has to be hand written.	6
		Total hours	**28**

Notes:
a) It is compulsory to prepare log book of exercises. It is also required to get each exercise recorded in logbook, checked and duly dated signed by teacher. The component of practical marks is dependent on continuous and timely evaluation of exercises.
b) Term work report must not include any photocopy, printed manual/pages, litho, etc. It must be hand written / hand drawn by student only.
c) For practical ESE part, students are to be assessed for competencies achieved

List of Learning Websites:
   i.   http://www.ediindia.org
  ii.   http://niesbud.nic.in/docs/SelfEmploymentBook.pdf
 iii.   http://smallb.in/
  iv.   http://www.msme.gov.in/
   v.   http://nimsme.org/
  vi.   http://www.nsic.co.in/
 vii.   http://iie.nic.in/
viii.   http://msme.gov.in/guidelines_pmegp_24092008.pdf
  ix.   http://www.entrepreneurshipsecret.com/8-factors-to-be-considered-inproducts-selection/#sthash.goWj3LcV.dpbs

Syllabus
Computer Applications And IoT (CSP-002)

L:T:P:: 0:0:2   **Credits-1.0**

COURSE OUTCOMES

Upon completion of the course students should be able to:

1. Solve basic information systems problems using MS Office products appropriate
   for the solution.
2. Communicate in a business environment using the MS Office product.
3. Understanding DOS commands and Linux programming.
4. Describe and analyze computer hardware, and software.
5. Understanding the concepts of IOT.

S. No.	Name of the program
1	**Experiments on dismantling of PC.** Dismantling the system unit , recognize all major components inside a PC, describe function of each component and define the relationship of internal components.
2	**Experiments on DOS:** **a)** Perform these internal commands. DIR,TYPE,DEL,ERASE,MD,CD,COPY,RMDIR,VER,DATE,TIME,PATH,CLS,RMDIR,VER,DATE,TIME,PATH,CLS,BREAK, SET,EXIT. **b)** Perform external commands. APPEND,CHKDISK,ATTRIB,SYS,EDIT.
3	**Experiments on system utilities** **a)** Explore and describe some system utility like regedit , memory portioning, control panel, window tools. **b)** List various keys in registry and perform experiments to back up a key in registry using regedit.
4	**Experiments on Linux** **a)** Perform an experiment to install any rpm or debian linux distribution **b)** Install rpm and deb packages. **c)** Perform these commands in linux- chmod, su , chown, chgrp ,ls,mkdir,pwd,date,who, find, uname, wc, ifconfig. **d)** Create, open , edit, view file in linux. **e)** Create user and group through CLI.

Syllabus
Computer Applications And IoT (CSP-002)

L:T:P:: 0:0:2   **Credits-1.0**

5	**Experiments on MS Office Word/Open Office Writer:** a) Create a office writer document and using tables distinguish between different types of memories. b) Draft a letter asking for quotations of different peripheral devices for your computer lab and mail the letter using mail merge in MS Word/open office writer. c) Create a MS Word/open office writer document and implement macro function. d) Create a template and draw a basic block diagram of computer & using graphs compare the performance of different laptop/notebook PC.
6	**Experiments on MS Office Excel/Open Office Calc:** Create a database of students, which contains marks obtained by students of a class in different subjects and then calculate maximum, minimum, average andsum of marks in each subject. Also calculate % of each student using functions and formulas in MS Excel/Open Office Calc also draw pie chart and bar graph also.
7	**Experiments on MS Office Power Point/Open Office Impress:** Make a simple presentation on your college, use 3D effects , animation on network topologies.
8	**Experiments on IoT:** Basic Components of IOT, Interaction with the Internet, Major Components of Internet of Things devices: Control Units, Sensors , Communication modules, Power Sources, Communication Technologies: RFID, Bluetooth, Zigbee, WiFi, RF Links, Mobile Internet, Wired Communication. a) Familiarization of Ardunio/ Raspberry Pi and perform necessary software installation. b) To interface LED/Buzzer with Ardunio / Raspberry Pi and write a program to turn on LED for 1 sec.

Syllabus
English Language Lab (AHP-006)

L:T:P:: 0:0:2   **Credits-0**

Course Objectives:
1. To facilitate software based learning to provide the required English Language proficiency to students.
2. To acquaint students with specific dimensions of communication skills i.e. Reading,Writing, Listening , Thinking and Speaking .
3. To train students to use the correct and error - free writing by being well versed in rules of English grammar.
4. To cultivate relevant technical style of communication and presentation at their work place and also for academic uses.
5. To enable students to apply it for practical and oral presentation purposes by being honed up in presentation skills and voice - dynamics.

Language Lab Containts:
1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational Skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars / Conferences / Workshops with emphasis on Paralinguistic / Kinesics .
4. Presentation Skills for Technical Paper / Project Reports / Professional Reports based on proper Stress and Intonation Mechanics
5. Official / Public Speaking based on suitable Rhythmic Patterns .
6. Theme Presentation / Keynote Presentation based on correct methodologies argumentation
7. Individual Speech Delivery / Conferencing with skills to defend Interjections / Quizzes .
8. Argumentative Skills / Role Play Presentation with Stress and Intonation .
9. Misplaced modifiers, Articles, Prepositions
10. Phonetic symbols.
11. Everyday conversation, Identifying Common Errors in Writing: Subject - verb agreement.
12. Writing Practices: Comprehension, Précis Writing.

Reference Books:
1. Word Power Made Easy by Norman Lewis , W.R. Goyal Pub . & Distributors , 2009 , Delhi.
2. Manual of Practical Communication . L.U.B. Pandey ; A.I.T.B.S. Publications India Ltd; Krishan Nagar , 2013 , Delhi.
3. A Course in Phonetics and Spoken English , Sethi & Dhamija :, Prentice Hall.
4. English Pronouncing Dictionary , Joans Daniel , Cambridge University Press, 2007.
5. English Grammar and Usage by R. P. Sinha , Oxford University Press , 2005 , New Delhi.

Syllabus
English Language Lab (AHP-006)

L:T:P:: 0:0:2   **Credits-0**

6. English Grammar, Composition and Usage by N.K. Agrawal & F.T. Wood , Macmillan India Ltd. , New Delhi.
7. Effective Communication Skill , Kulbhusan Kumar , RS Salaria , Khanna Publishing House.
8. English Grammar & Composition by Wren & Martin , S.Chand & Co. Ltd. , New Delhi .
9. Communication Skills for Engineers and Scientists , Sangeeta Sharma et.al. PHI Learning Pvt . Ltd , 2011 , New Delhi.
10. Personality Development , Harold R. Wallace & L. Ann Masters , Cengage Learning , New Delhi.
11. Personality Development & Soft Skills , Barun K. Mitra , Oxford University Press , 2012 New Delhi.
12. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan , McGraw Hill & Co. Ltd. , 2001 , New Delhi.
13. Developing Communication Skills by Krishna Mohan , Meera Bannerji- Macmillan India Ltd. 1990 , Delhi.
14. Spoken English- A Manual of Speech and Phonetics by R. K. Bansal & J.B.Harrison , Orient Blackswan , 2013 , New Delhi.
15. Business English by Ken Taylor , Orient Blackswan , 2011 , New Delhi.

Course outcome: At the end of this course students will demonstrate the ability:

1. Students will be enabled to understand the basic objective of the course by being acquainted with specific dimensions of communication skills i.e. Reading , Writing , Listening , Thinking and Speaking.
2. Students would be able to create substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.
3. Students will apply it at their work place for writing purposes such as Presentation / official drafting / administrative communication and use it for document / project / report / research paper writing.
4. Students will be made to evaluate the correct and error - free writing by being well - versed in rules of English grammar and cultivate relevant technical style of communication & presentation at their work place and also for academic uses.
5. Students will apply it for practical and oral presentation purposes by being honed up in presentation skills and voice - dynamics. They will apply techniques for developing interpersonal communication skills and positive attitude leading to their professional competence.

Syllabus
Biology for Engineers (BTT-001)

L:T:P:: 2:1:0   **Credits-0**

Course Objectives:

The objective of the course is convey to students that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry

Course Outcomes:

1. To understand the fundamentals of living things, their classification, cell structure.

2. To convey that all forms of life has the same budling blocks and yet the manifestations are as diverse as can imagine and learn about molecules of life.

3. To convey that without catalysis life would not have existed on earth, importance of enzyme.

4. The molecular basis of importance coding and decoding genetic information is universal and learn the molecular basis of gene.

5. The fundamental principles of energy transaction are the same in physical and biological world.

Syllabus:

UNIT-I   **(8 hours)**
Introduction to Biotechnology, Different areas of Biotechnology, fundamental difference between science and engineering with some examples, Cell as basic unit of life, Hierarchical classification of organisms based on
(a) cellularity(b) Ultra structure (c) energy and carbon utilization (d) Ammonia excretion (e) Habitat.

UNIT-II   **(8 hours)**
Concept of single celled organisms, Concept of species and strains, Bacterial identification and classifications, Molecular taxonomy, Pure culture techniques, Media compositions and sterilization kinetics of media, Growth kinetics of microbes.

UNIT-III   **(8 hours)**
Biomolecules: Amino acid, peptide bond and proteins, Hierarchy structure and in protein structure, General structure and function of nucleotides and nucleic acid (DNA, RNA), Carbohydrates: monosaccharides, disaccharides and polysaccharide, Liquids, Enzymes.

UNIT-IV   **(8 hours)**
DNA as a genetic material, Central dogma of life, Genetic code and its concept, Universality and degeneracy, Principles of Heredity, Concept of allele and gene, Mendel and his experiments.

UNIT-V   **(8 hours)**
Basic concept of metabolism, Thermodynamic: Basic Concepts, ATP as an energy currency, Energy yielding and energy consuming reactions: Glycolysis, Krebs cycle.

Text Books:
1. Principles of Biochemistry: A.L. Lehninger, Nelson and Cox, McMillan Worth Publishers
2. Concept of Genetics: P.K. Gupta, Rastogi Publications
3. Text book of Microbiology: R. C. Dubey and D. K. Maheshwari, S. Chand and Company
Reference Books:
1. Microbiology: Prescott's

Syllabus
Basic Mathematics(AHT-000)

L:T:P::2:1:0   **Credits-0**

Course Objectives:

From this course, students will be able to:
1. learn distinct intermediate-level mathematical concepts involved in engineering problems
2. get knowledge for geometrical prospective of engineering problems
3. well-versed with partial fraction
4. acquire the knowledge of limit, continuity, derivatives, and integrations and their applications
5. acquaintance with ordinary and partial differential equations

Learning outcomes:

1. Comprehend with intermediate-level of mathematical domain included in engineering problems
2. Learn basic analytical methods to conceptualized the engineering problems
3. Understand how to proceed the engineering problems
4. Learn to determine the solutions for mathematical problems
5. Apprehend with mathematical methodology

Course content:

Unit I: Analytical geometry   (8 hours)
Introduction, Signs of the coordinates, Distance formula, Straight line, Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope - intercept form of a straight line.

Unit II: Partial fraction, limits and continuity   (8 hours)
Introduction, Polynomial, Rational fractions, Proper and improper fractions, Partial fraction, Resolving into partial fraction, Introduction and definition of limit and continuity of a function.

Unit III: Derivative and its properties   (8 hours)
First principle of differentiation, Differentiation of standard functions, Basic rule of differentiation (Product rule, quotient rule and chain rule), Derivatives of exponential and logarithmic functions, Differentiation of infinite series, Basic applications of derivatives.

Unit IV: Integration and its properties   (8 hours)
Antiderivative, Integration of standard functions, Basic properties, Integration by substitution, Integration by using trigonometric identities, Integration by parts, Integration by partial fractions, Basic applications of integration.

Syllabus
Basic Mathematics(AHT-000)

L:T:P::2:1:0   **Credits-0**

Unit V: Differential equations   **(8 hours)**
Types of differential equations, Order and degree, Ordinary differential equations, First order and first degree ordinary differential equations and their solutions, Order and degree of partial differential equations and their classification.

Suggested Text Books / Reference Books:
1. Mathematics-I and II, NCERT text book, NCERT Publisher, 2014.
2. R.D. Sharma, Mathematics (Vol 1 and 2), DhanpatRai Publications, 2021.
3. R.S. Agarwal, Senior Secondary School Mathematics, Bharti Bhawan, 2015.
4. M.L. Bhargava, Elementary Mathematics, Jeevan Son Publications, 2017.

Syllabus

L:T:P:: 0:1:0   **Credits-1.0**

Minor Degree Program in
Advance Web Development

(Web Development-101)

Course Objective:

This course is meant for students who do not have prior programming experience, or have a light background, and are looking to build a robust foundation for computational thinking.

They'll learn to deconstruct what software applications do, and reason about the essence of computation as transformation of data from one shape to another.

Practically, they will be able to set up a development environment, be introduced to HTML & CSS, and learn to program in a functional subset of JavaScript.

By the end of the course, they will build an Online Registration form that runs on the browser, with the ability to store and retrieve submissions using browser native web storage. They will also be able to create and deploy a simple and basic website to the internet.

Course Contents:

Unit- 1: Welcome to the course

This module introduces students to the World Wide Web. Students are also guided through setting up a development environment on their computer. Students are taught to set up Visual Studio Code as their editor and to use Prettier and ESLint extensions for code formatting and code quality respectively.

Unit- 2: Let's create our own websites!

In this module students learn how to develop a simple website using HTML. They experiment with some useful HTML tags, learn how to look inside websites. The students deploy the website they develop and share it over the Internet.

Unit- 3: Basic Introduction to HTML and CSS

This module gives some basic introduction of HTML and CSS. Students learn how to put together a web page that contains HTML, CSS, and JavaScript.

Unit- 4: Style Matters

This module teaches students how to style web pages using CSS. Students also learn how to use Tailwind CSS to add custom styling to their webpages.

Unit- 5: Working with JavaScript data types

In this module students are introduced to different data types - Number, Boolean and String. They carry out various operations on these data types to understand the difference between them and also can decide the suitability of a data type given a task or operation.

Unit- 6 - Working with JavaScript data structures

This module teaches students how to iterate with arrays using *forEach* method and generate an HTML list from an array. Students perform various transformations on an array using the map method and are introduced to filtering of arrays.

Students are also introduced to objects in JavaScript. They learn how to create objects, add and access properties of objects and perform various operations on them.

Unit- 7 - Functions - code we can call multiple times

This module teaches students how to use functions to modularize the codebase. Students learn how to return values from a function and also how to treat functions as values, by passing them as arguments.

Unit-8 - Create a form with validations

In this module, students learn about HTML form element and form data. They learn how to create a user form, add validations, store and retrieve data.
Students develop and deploy their personal website that includes the form they have built with additional validations and display the data submitted by users on the website.

Text/Reference Books (if any):

This course does not require students to use physical textbooks. Instead, original course material (videos, text and images) has been prepared for students to go through and is open-sourced under Creative Commons Attribution-ShareAlike 4.0 International License© Freshworks Inc. & Pupilfirst Pvt. Ltd.

Course Outcomes:

By completing the WD 101 course, students will gain a foundation in programming and computational thinking, and be introduced to the field of web development.

Specifically, they will learn how to:
● Set up a development environment.
● Create and style basic web pages.
● Transform data with JavaScript.
● Use computational abstractions.
● Work with the HTML Forms.
● Work on native HTML Form Validations.
● Understand Web Storage for saving and retrieving data.

Syllabus

L:T:P:: 0:6:0   **Credits-6.0**

Server-side programming with Node.js
(Web Development-201)

Course Objective:

The objective of this course is to teach students how to build web applications using the Express.js framework, with focus on industry-practices like functional programming, object-oriented design, programming style guides, security, and version control.

Course Outcomes:

By the end of the course the students will be able to:

● Build web applications using Express.js.

● Manipulate data using both imperative and functional programming techniques. ● Model real-world systems using object-oriented design

● Write HTML & CSS to create elegant web pages

● Build database applications using Sequelize.

The students would have built fundamental first-principles based knowledge about web development and the practical chops to use them to build real-world software. They would also have learnt what it is to work in a professional software environment, helping build a strong foundation for their transition to the industry as competent professionals.

Prerequisites:

Students should have completed *Web Development 101,* before beginning this course. Students should have access to a computer with a modern OS (Windows 10 or above, Ubuntu 20.04 and above, macOS 10.15 and above).

Overview:

Through the course, the student will work up to build a To-do Management application using Express.js, PostgreSQL, HTML, and CSS. The app will be hosted on the cloud using Heroku.

They will then independently work on a capstone project which will be a microcosm of a production web application and the challenges and trade-offs that come with it.

Being an industry-led course, the students will also be exposed to professional practices like code reviews, code quality, and version control (git). They'll have access to a Web Development Community where they are encouraged to ask well-crafted and specific questions, a valuable skill in a professional setting.

Course Content:

Unit- 1 - Introduction to Node.js
In this module students are introduced to Node.js - they learn how to install it and write programs on it and use Node.js REPL. Students also start using GitHub and learn how to collaborate on code with others using the git tool.

Unit- 2 - Working with NPM
This module is an introduction to Node.js package manager for students where they start writing custom NPM modules. They also explore and use built-in modules of Node.js

Unit- 3 - Node.js deep dive
In this module students start building their first application and learn how to use closure to emulate private methods.

Unit- 4 - Testing
In this module students are introduced to testing. They start writing tests for their application, learn how to use Jest to run the tests and pre-commit hooks to run the tests automatically before each commit.

Unit- 5 - Databases and Sequelize
In this module students get to learn about databases and set up a PostgreSQL database. They learn how to connect to a database from a Node.js application and then work on the database by creating Sequelize models to manipulate data.

Unit- 6 - Backend Web development with Express.js
In this module, students develop their first application and connect it to the PostgreSQL database on their machine, and begin learning the basics of the CRUD pattern by building some additional features to the application that they're working on.

Unit- 7 - Add User Interface for To-do Application
This module teaches students how to create interfaces for their application. They also practice converting a given visual design into working HTML and CSS.

Unit- 8 - EJS Templating
This module teaches touches upon the basics of the MVC pattern, instructing student how to render dynamic data inside their HTML pages using EJS templates. This module also lets the student practice how to deploy their work to a remote server.

Unit- 9 - HTML forms to save and accept user inputs
This module teaches students how to accept user input on their application via form element in HTML. Students also explore more of the CRUD pattern, moving onto creation of resources using forms, deletion of existing resources, and learn about Cross Site Request Forgery (CSRF) and how authenticity tokens can be used to prevent such attacks. Students are also introduced to APIs.

Unit- 10 - User Authentication and final wrap-up

In this module students dig deeper into Sequelize association, migration and validation. They build a functional user sign-up page, learn about password storage and play around with browser cookies, sessions, user authentication, and related best practices. They also learn to display one-off flash messages.

Text/Reference Books (if any):

This course does not require students to use physical textbooks. Instead, original course material (videos, text and images) has been prepared for students to go through and is open-sourced under <u>Creative Commons Attribution-ShareAlike 4.0 International License</u>© Freshworks Inc. & Pupilfirst Pvt. Ltd.

This course material may include some third-party content with a compatible license, and external links for additional reading on the Internet. Students are also taught how to search for information on their own

VEER MADHO SINGH BHANDARI UTTARAKHAND TECHNICAL UNIVERSITY, DEHRADUN

Syllabus

Front-end development with React & Type Script
(Web Development-301)

Course objective

The course aims at training students on the following fronts:

● Understand the basic architecture of front end applications and create web applications using React Type Script front-end stack.
● Interaction between a client-side application and server-side app via an API.
● Industry practices for state management and usage of static types.
● Best practices with regard to the development of a modern client-side application.
● Learn to build Type Script projects from scratch to scale.

Course outcome

By the end of the course the students will:
● Be able to create Single Page Web Applications (SPA) using React, Typescript and TailwindCSS.
● Have a solid understanding of static types, and know how to port untyped JavaScript to TypeScript.
● Learn typed state management that is in line with a backend data model.

Prerequisites

Students should have completed *Web Development 201,* before beginning this course. Students should have access to a computer with a modern OS (Windows 10 or above, Ubuntu 20.04 and above, macOS 10.15 and above).

Course outline

Unit- 1: React fundamentals

This module introduces students to development using TypeScript by setting up a development environment, introducing them to the TypeScript programming language and the React framework, and demonstrates some of the basic concepts that underpin the use of React for building dynamic reactive user interfaces.

Unit- 2: State management

This module introduces students to the *Hooks* feature of React, on the usage of callback functions and how to use them to build dynamic components that maintain an internal state. This module also demonstrates state management by building a form and accepting user input.

Unit- 3: A deeper dive into React Hooks

This module discusses the common pitfalls of state management, introduces in-browser persistent storage, demonstrates additional standard hooks and the creation and use of custom hooks.

Unit- 4: Client-side routing

This module covers the concept of client-side routing as a separate behaviour from server-side route management. It demonstrates the various aspects of client-side routing such as the use of path parameters, query parameters, programmatic navigation and the operation of links and URLs that are handled client-side.

Unit- 5: Types in depth and Variants

This module takes a deeper dive into Type Script's type system, demonstrating concepts such as function types, custom-defined types, generics, and union types. It also instructs the student why the "any" type should be avoided in practice, and finishes up with a demonstration of Type Script's type inference behavior.

Module 6: Modelling and managing complex states

This module teaches students how to manage complex states using the state reducer pattern, and then demonstrates the pattern by implementing it using React's useReducer hook.

Unit- 7: APIs and state modelling

Through this module, students are introduced to using APIs to interface their client-side code with the server-side, how to model types to allow this interaction to take place, how to maintain a session with the backend, and how to work with pageable APIs.

Unit- 8: Best practices and npm packages

This module covers the best practices of front-end development, including the importance of accessibility and WAI-ARIA standards, and use of third-party packages from the NodeJS ecosystem.

Unit- 9: Production React Apps

This final module focuses on production-specific optimizations of a React application, best practices for its build & deployment process, and the configuration of a progressive web app.

Text/Reference Books (if any):

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Syllabus

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Getting ready for production
(Web Development-401)

Course objective

The objective of WD401 is to allow the student to learn more about production-ready deployments.

This can be achieved either via the WD401 course material or through an internship at a company. To complete WD401 by following Pupilfirst's course material, students will need to deploy an application of their choice that integrates learnings from earlier courses, and also work through the material of the course, integrating the new production-readiness concepts that are presented here.

The second option is for the student to gain an internship at a company where they get to work on an application that tests a similar skill-set.

Course outcome

By the end of the course the students will:

● Be able to bundle a codebase with non-trivial JS dependencies and code. ● Know how to differentiate between popular JS flavours and pick one that is suitable for a task.
● Understand why testing is important, what TDD is, and be able to write both unit and integration tests for Rails applications that use JS in the front-end. ● Be able to set up a CI/CD pipeline for a server-side application, ensuring the code reaches production automatically after tests pass.
● Know how to organise & communicate development work using pull requests. ● Be aware of container-based deployments, be able to build a Docker image for their web application and then deploy that image to a web server.
● Know how to set up a web application to support localization.
● Set up error-logging for their web application to capture runtime errors - both in the back-end and in the front-end. They'll also know how to write tests that replicate errors before implementing a fix to prevent regressions.

Prerequisites

Students should have completed *Web Development 301,* before beginning this course. Students should have access to a computer with a modern OS (Windows 10 or above, Ubuntu 20.04 and above, macOS 10.15 and above).

Course outline

Unit- 1: Workflow using pull-requests

This module acts as an advanced guide to the usage of git in development teams, where the norm is to develop on branches, perform peer-reviews, and to re-work based on reviews before merging. Since this cycle is most often performed using online tooling that uses pull requests to achieve this workflow, students are taught how to open a pull request, make changes, submit work for review and then update code based on review.

Unit- 2: JS Bundling - integration of JS into non-JS backends

This module covers the history of why "bundling" as a process exists for the JS ecosystem, the most common bundling tools, and the general methodology. This module also covers the new "import maps" feature that allows for similar capability without the use of a bundling tool.

Unit- 3: Compile to JS languages - options & approaches

This module covers the reason why languages that compile to JS exist, the different purposes that they serve, and demonstrate a few of the most popular options and the differences between each.

Unit- 4: Testing

This module covers the importance of testing, the different approaches to testing such as unit testing, integration testing, and hybrid testing. It should also cover popular libraries that are used to help with testing, and also common pitfalls in the practice of testing and how to avoid them.

Unit- 5: CI/CD - Continuous integration & delivery

This module teaches students about modern development processes that enable teams to release changes quickly and often, by leading them through the process of setting up an automated system that detects changes to code to run tests and then linking that to the deployment of code that passes its test suite to a remote server.

Unit- 6: Application environments

This module teaches students about the different environments in which an application is expected to run. This module explains the differences between the environments that a student has already operated in - development, testing & production, and also introduces the concept of a staging environment which acts as a gateway to the production environment.

Unit- 7: Containerization

This module covers the field of containerization - where complex applications are packaged to run in isolated spaces called containers. The approach for covering this topic involves the use of the popular Docker (OCI) standard, teaching students how to build a Docker image for their web application, and how to deploy this image to different targets.

Unit- 8: Internationalisation and localisation