Department of

First Year B.Tech.

F.Y. B.Tech. Course Book

(2020 Pattern)

(With effect from June 2020)

Chairman (BOS) **Dean Academics** **Director**

Department of

First Year B.Tech.

Under Graduate (UG) Course Book

F.Y. B.Tech. (Common)

Semester - I/II

Chairman (BOS) **Dean Academics** **Director**

INDEX

About First Year Department

- Department provides a common platform to all branches students by imparting fundamental knowledge
- Involvement of Experts from IITs, NITs, Govt. Colleges, Reputed Industries, Alumni and Students in development of curriculum
- Choice Based Credit System (CBCS)
- General Proficiency - Foreign Language (German, French, Japanese and Spanish)
- Remedial Teaching
- Sponsorship for Publications and IPR
- Research Mentorship
- Industry Internship
- Provision of Credit Transfer Scheme (CTS)
- Peer Teaching Scheme
- Teacher Guardian Scheme (TGS)
- Various Clubs and Hobby Modules
- Emphasis on English Communication
- Activity based learning

INSTITUTE VISION AND MISSION

VISION

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards with capabilities of accepting new challenges.

MISSION

Our efforts are dedicated to impart quality and value based education to raise satisfaction level of all stake holders. Our strength is directed to create competent professionals. Our endeavor is to provide all possible support to promote research and development activities.

DEPARTMENT VISION AND MISSION

DEPARTMENT VISION

To achieve excellent standard of quality education through effective teaching and learning process and to create technical manpower with capabilities of global standards.

DEPARTMENT MISSION

To impart quality and value education by providing high standard technical knowledge to create competent professionals.

To inculcate research amongst students and faculties.

Program outcomes

Engineering Graduates will be able to:

PO1	**Engineering knowledge:**Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Identify**, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and a need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Scheme of B.Tech. in
Artificial Intelligence, Computer Engineering, Information & Technology & Data Science

Name of course	Course Category	Teaching Scheme					Evaluation Scheme					
							Theory			Practical		Total Marks
		L	T	P	Total Hours	Credits	TAE	CAE	ESE	INT	EXT	
SEMESTER-I												
Matrices and Differential Calculus	BS1	2	1	0	3	3	10	15	50	--	--	75
Engineering Physics	BS2	1	1	2	4	3	10	15	50	25	--	100
Computer Programming	C1	2	0	4	6	4	10	15	50	50	--	125
Foundations of Data Analytics	C2	1	0	2	3	2	10	15	50	25	--	100
Introduction to Discrete Devices and Circuits	C3	2	0	2	4	3	10	15	50	25	--	100
Problem Identification and Design Thinking	A1	0	0	2	2	1	--	--	--	25	--	25
Introduction to Drones	A2	0	0	2	2	1	--	--	--	25	--	25
Biomedical Engineering	A3	0	0	2	2	1	--	--	--	25	--	25
TOTAL		**8**	**2**	**16**	**26**	**18**	**50**	**75**	**250**	**200**		**575**

Name of course	Course Category	Teaching Scheme				Credits	Evaluation Scheme					
							Theory			Practical		Total Marks
		L	T	P	Total Hours		TAE	CAE	ESE	INT	EXT	
SEMESTER-II												
Integral Calculus and Differential Equations	BS3	2	1	--	3	3	10	15	50	--	--	75
Linear Algebra and Statistics	BS4	2	1	--	3	3	10	15	50	--	--	75
Environmental Chemistry	BS5	1	--	2	3	2	10	15	50	25	--	100
Communication Skills	H1	2	--	2	4	3	10	15	50	25	--	100
Programming for Problem Solving	C5	--	--	4	4	2	--	--	--	50	--	50
Modeling of digital circuit	C6	3	--	2	5	4	10	15	50	25	--	100
Internet of Things	A4	--	--	2	2	1	--	--	--	25	--	25
Foreign Language	A5	--	--	2	2	1	--	--	--	25	--	25
TOTAL		**10**	**2**	**14**	**26**	**19**	**50**	**75**	**250**	**175**		**550**

Scheme of B.Tech. in Electronics & Telecomm. Engineering, Mechanical Engineering & Civil Engineering

Name of course	Course Category	Teaching Scheme					Evaluation Scheme					
							Theory			Practical		Total Marks
		L	T	P	Total Hours	Credits	TAE	CAE	ESE	INT	EXT	
SEMESTER-I												
Matrices and Differential Calculus	BS1	2	1	0	3	3	10	15	50	--	--	75
Basic Electrical Engineering	C1	2	1	2	5	4	10	15	50	25	--	100
Programming for Problem Solving	C2	0	0	4	4	2	--	--	--	50	--	50
Engineering Graphics	C3	1	0	2	3	2	10	15	50	25	--	100
Communication Skills	H1	2	0	2	4	3	10	15	50	25	--	100
Environmental Chemistry	BS2	1	0	2	3	2	10	15	50	25	--	100
Foreign Language	A1	0	0	2	2	1	--	--	--	25	--	25
Introduction to Machine Learning	A2	0	0	4	4	2	--	--	--	50	--	50
TOTAL		**8**	**2**	**18**	**28**	**19**	**50**	**75**	**250**	**225**		**600**

Name of course	Course Category	Teaching Scheme				Credits	Evaluation Scheme					
							Theory			Practical		Total Marks
		L	T	P	Total Hours		TAE	CAE	ESE	INT	EXT	
SEMESTER-II												
Integral Calculus and Differential Equations	BS3	2	1	-	3	3	10	15	50	--	--	75
Engineering Physics	BS4	1	1	2	4	3	10	15	50	25	--	100
Foundations of Data Analytics	C4	1	-	2	3	2	10	15	50	25	--	100
Workshop Practice and Digital Fabrication/Digital Logic Design(ETC)	C5	-	-	4	4	2	--	--	--	50	--	50
Engineering Mechanics/ Digital Logic Design(ETC)	C6	2	-	2	4	3	10	15	50	25	--	100
Biomedical Engineering	A3	-	-	2	2	1	--	--	--	25	--	25
Introduction to Discrete Devices and Circuits	C7	2	-	2	4	3	10	15	50	25	--	100
Introduction to Drones	A4	-	-	2	2	1	--	--	--	25	--	25
TOTAL		**8**	**2**	**16**	**26**	**18**	**50**	**75**	**250**	**200**		**575**

Department of First Year B.Tech.

Detailed Syllabus

F. Y. B. Tech.

Semester-I/II

Courses offered by
Basic Sciences & Humanities

Course Title: **Engineering Physics**										
Semester	I /II	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Odd/ Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	BS	1 Hr.	1 Hr.	2 Hr.	3	10	15	50	25	-
Course Code	UBSL101 UBSP101									
Teaching Mode	Offline	4 Hrs			Total	75			25	
Duration of ESE	2Hrs					100				

Course Objectives	Demonstration of the fundamentals of uniform and non-uniform electric and magnetic fields and working of related devices.
	Familiarization and demonstration of the concepts of interference, laser and their applications.
	Explanation of working of various optoelectronic devices.
	Demonstration of the fundamentals of Quantum Mechanics and its related applications.
Course Outcomes	Upon successful completion of this course, student will be able to:
	CO1: Identify the trajectories of electron in uniform Electric and Magnetic fields and operate related devices.
	CO2: Describe the phenomenon of interference & implement it for finding related parameters.
	CO3: Explain the working of Laser & use it for different applications.
	CO4: Identify various optoelectronic devices and use them for various applications.
	CO5: Apply the knowledge of Quantum Mechanics to solve related problems.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**										**1**
CO2	**3**	**2**										**1**
CO3	**3**	**2**										**1**

CO4	**3**	**2**										**1**
CO5	**3**	**2**										**1**

Course Contents:

Unit	Contents	Hours
I	**Electron Ballistics and Optics**: Trajectories of electron in uniform Electric and Magnetic field (Qualitative), Bethe's law, Electron Lens, Devices- Electron microscope (Theoretical), CRO	**4**
II	**Optics:** Interference-Interference in uniform & non-uniform thin films, AR Coatings, Surface Testing, Branch specific applications.	**4**
III	**LASER:** Characteristics, Spatial and Temporal Coherence, Einstein Coefficient & its significance, Basic requirements of Laser, Components of laser, He-Ne, Semiconductor laser and Branch Specific applications.	**6**
IV	**Semiconductor Physics:** Review of basic Semiconductor physics, Hall Effect, Review of working of PN junction diode with reference to energy level diagrams. Optoelectronic Devices:-Types of optoelectronic devices, LED-Types & working principle, OLED, properties & comparisons, OLED applications, PIN Photodiode, Solar Cell, Branch specific applications as sensors and detectors	**6**
V	**Quantum Physics:** Blackbody Radiation, Compton Effect, Wave particle duality: De Broglie wavelength, Group and Phase velocity, Heisenberg's Uncertainty principle & its applications, Schrödinger's Mechanics: Physical interpretation of Wave Function, Elementary Idea of Operators, Solution of Schrodinger equation for simple boundary value problems, Tunneling, Applications-TEM,SEM, Effect of Quantum constriction on properties of nano materials	**6**

Text Books	1.	Physics for Engineering, Dr. Bhavana P Butey, Oxford University Press, 2017, First Edition
EBooks	1.	https://www.phindia.com/Books/EBooks
Reference Books	1.	Fundamentals of Physics, David Halliday and Robert Resnik, New Age, 1994
	2.	Nanotechnology, Dr. Sulbha K Kulkarni, Capital Publishing Co., 2011
on line TL Material	1.	https://nptel.ac.in/courses/104/104/104104085/

Sr. No.	Name of Experiments
1	Application of CRO: To measure amplitude of AC voltage and determine unknown frequency using CRO
2	Determination of diameter of thin wire using interference by using Air Wedge
3	Determination of Wavelength of Laser source by Newton's ring.
4	Determination of Hall Coefficient of an Extrinsic Semiconductor by arranging it in a Hall Effect. Experiment.
5	Determination of Band gap of an Intrinsic semiconductor by using PN junction diode
6	PN junction diode as a rectifier-Find efficiency & ripple factor by using CRO
7	Application of diode: Voltage regulation by Zener diode.
8	Study of various Photo detectors as sensors
9	Application of interference: Determination of radius of curvature of plano-convex lens using Newton's ring set up.
10	Application of interference: Determination of refractive index using Newton's ring set up.
11	Laser: Determination of Birefringence of double image prism.
12	Determination of Band gap by four probe method.
13	Application of Diode: Determination of Planks Constant by using LEDs.
14	Comparison of V-I characteristics of various diodes.
15	Application of CRO: Determination of phase difference between two AC signals.

Course Title: **Environmental Chemistry**

Semester	I/II	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Odd/Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	BS	1 Hrs.	NA.	2 Hrs.	2	10	15	50	25	NA
Course Code	UBSL102 UBSP102									
Teaching Mode	Offline	3 Hrs			Total	75			25	
Duration of ESE	2 Hrs					100				

Course Objectives	Demonstrate various methods of water treatment for domestic and industrial purpose.
	Explanation of different types of batteries and its commercial applications
	Demonstration and familiarization of impact of waste on environmental degradation.
Course Outcomes	Upon successful completion of this course, student will be able to:
	CO1: Explain various methods of water treatment for domestic and industrial use
	CO2: Differentiate various categories of waste and its disposal techniques
	CO3: Identify various batteries and recognize its commercial applications
	CO4: Classify the different types of Energy and its future scope
	CO5: Apply the knowledge of environmental pollution and degradation to solve related problems

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**						**2**					**1**
CO2	**1**						**3**					**1**
CO3	**1**						**2**					**1**
CO4	**1**						**2**					**1**
CO5	**1**						**3**					**1**

Course Contents:

Unit	Contents	Hours
I	**Water Technology:** Purification of Domestic water, Boiler troubles, softening methods of industrial water.	6
II	**Solid Waste Management and treatment Technology:** Introduction to E-Waste, Biomedical waste and Solid waste. Treatment: Collection, segregation, transportation and its disposal techniques	4

III	**Battery Technology:** Introduction to Battery, reversible and irreversible batteries. Examples: Lead-acid battery, Lithium ion battery and fuel cell	4
IV	**Energy Management:** Fuel- Characteristics, composition and determination of Solid, Liquid and gaseous fuel. Alternative forms of energy-Conventional and Non-Conventional sources – Hydroelectricity, Nuclear, Solar, Biomass and Geothermal energy and Bio-gas.	4
V	**Upcoming Technology for pollution control**: Air pollution- Urban air quality standards as per WHO, its sources and controlling methods. Water pollution- water quality index as per WHO, its sources and controlling methods	4

Text Books	1.	Text Book of Engineering Chemistry,S.S.Dara, S.Chand& company,2013, Eleventh Edition
	2.	Engineering Chemistry,Jain &Jain, Dhanpatrai&Dhanpatrai,2015, sixteenth edition
	3.	A Test Book of Environmental Chemistry &Pollution Control, S.S. Dara ,S. Chand & Co.,2006,eleventh edition
E books	1	Water purification,AlexandruGrumezescu,First edition
	2	Solid waste management by Stephen Burnley ,willey publication,2014
	3	Air Pollution,S. K. Agarwal,APH Publishing, 2005
Reference Books	1.	Environmental Chemistry , B.K. Sharma & H. Kaur, Goel Publishing House,2014,fourteen edition,
	2.	Environmental Studies, R. Rajgopalan, Oxford Publication,2016,Thirdrd edition
On line TL Material	1	Introduction to Household Water Treatment and Safe Storage,https://www.coursera.org/learn/water-treatment/home/welcome
	2.	Electronic waste Management-Issues and challenges by DrBrajesh Kumar Dubey,http://nptel.ac.in/courses/120108005/
	3	Integrated Waste Management for a Smart City ,https://onlinecourses.nptel.ac.in/noc19_ce31/course
	4	Air pollution-Global threat to our Health https://www.coursera.org/learn/air-pollution-health-threat/home/welcome

Sr. No.	Name of Experiments / Case Studies
1	Physical parameters of water- Determination of PH, turbidity and conductivity of given water sample.

2	Chemical parameters of water- Determination of Hardness by Complexometric method and Alkalinity by Warders Method.
3	Demonstration on different types of cells and batteries.
4	Determination of Moisture present in given Solid waste
5	Case study on current scenario of region specific waste generation.
6	Determination of Proximate analysis of Solid fuel as Coal.
7	Determination of Acid value of Liquid fuel.
8	Demonstration on measuring air quality by using Air Quality Tester.
9	Determination of chloride ions from given water sample by Argentometric Method
10	Determination of DO of given water sample by Iodometric titration
11	Preparation of Biodiesel from edible oil
12	Determination of saponification value of liquid fuel

Course Title: **Matrices & Differential Calculus**

Semester	I	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	ODD	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	BS	2 Hrs.	1 Hr.	NA	3	10	15	50	NA	NA
Course Code	UBSL103									
Teaching Mode	Offline	2Hrs			Total	75			–	
Duration of ESE	2 Hrs.					75				

Course Objectives	To introduce concepts of matrices in the field of Engineering.
	To develop skills in student to solve engineering problems based on Matrices.
	To introduce concepts of Differential Calculus & Vector Calculus in the field of Engineering.
	To develop skills in students to solve applications based problems on Differential Calculus.
Course	Upon successful completion of this course, student will be able to:

Outcomes	**CO1:** Understand and use the theory of Matrices to solve the system of linear equations and engineering problems in respective disciplines.
	CO2: Determine the Eigen values and Eigen vectors of a matrix and apply to various engineering problems in respective disciplines.
	CO3: Apply concepts of differentiation in solving engineering problems.
	CO4: Use applications of partial differentiation to solve various problems in engineering.
	CO5: Apply the Knowledge of vector differentiation to solve various problems in engineering.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2		1							3
CO2	3	3	2		1							3
CO3	3	3	2		1							3
CO4	3	3	2		1							3
CO5	3	3	2		1							3

Course Contents:

Unit	Contents	Hours
I	Matrices**:** Adjoint of Matrix, Inverse of matrix by adjoint method, Solution of simultaneous equations by adjoint method. Inverse of matrix by Partitioning method. Rank of matrix, Consistency for system of linear equations, Linear dependence.	8
II	Characteristics equation, Eigen values and its properties. Eigen vectors. Reduction to diagonal form, Cayley Hamilton theorem (statement & verification). Sylvester's theorem, Association of matrices with linear differential equations of second order with constant coefficient.	10
III	Differential Calculus of single variable function: Review of limits, continuity, differentiability and Mean value theorem. Successive differentiation, Leibnitz's Theorem, Taylor's series and Maclaurin series for single variable function.	7

IV	Differential Calculus of function of several variables: Functions of several variables, First and higher order partial derivatives, Euler's theorem, Chain rules. Jacobian, Properties of Jacobian, Maxima and minima of function of two variables, Lagrange's method of undetermined multipliers.	9
V	Vector Calculus: Differentiation of vectors, Gradient of a scalar point function, Directional derivatives. Divergence and Curl of vector point function. Solenoidal & Irrotational vector field.	8

Text Books	1.	Higher Engineering Mathematics: B. S. Grewal, Khanna Publishers, 2013, Forty Third Edition
	2.	Advanced Engineering Mathematics: Erwin Kreyszig John Wiley & Sons, 2013, Tenth Edition
Reference Books	1.	Advanced Engineering Mathematics: Jain, R.K. and Iyengar, S.R.K, Narosa Publishers; Alpha Science International, Ltd, 2007, Third Edition
	2.	Advanced Mathematics for Engineers and Scientists: Spiegel, M. R, McGraw-Hill, 2010, Second Edition

Course Title: **Integral Calculus and Differential Equations**										
Semester	II	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	BS	2 Hrs.	1 Hr.	NA	3	10	15	50	NA	NA
Course Code	UBSL104									
Teaching Mode	Offline	2Hrs			Total	75			_	
Duration of ESE	2 Hrs.					75				

Course Objectives	To introduce the concepts of Integral calculus & Vector integration in the field of Engineering.
	To develop skills in student to apply the concepts of integrals in various engineering problems.

	To develop skills in student to solve problems of Ordinary Differential Equations and its applications in field of engineering.
Course Outcomes	Upon successful completion of this course, student will be able to:
	CO1: Understand and use concept of definite integral & solve engineering problems.
	CO2: Evaluate the multiple integrals using different techniques and apply it to solve engineering problems.
	CO3: Understand vector integration and its applications related to real life problems.
	CO4: Solve first order, first degree & higher order differential equations.
	CO5: Form differential equations for simple engineering systems and find its solution.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2		1							3
CO2	3	3	2		1							3
CO3	3	3	2		1							3
CO4	3	3	2		1							3
CO5	3	3	2		1							3

Course Contents:

Unit	Contents	Hours
I	Integral Calculus: Curve tracing (Cartesian Form), Gamma function, Beta function, Relation between beta and gamma function, Differentiation under integral sign. (Self-study: Area, Volume, Length, Surface area using simple integration.)	8
II	Multiple Integral: Double integral, Change of variables, Change of order of integration, Triple integral, Applications of multiple integral: Area, mass, volume.	10
III	Vector Integration: Line integral, Surface integral, Volume integral, Statement of Gauss theorem, Greens theorem and Stokes theorem and its applications.	8

IV	Differential Equations: Linear, Reducible to linear and exact differential equations of first order. Higher order linear differential equations with constant coefficients (Cases of CF & PI).	8
V	Method of variation of parameters, Cauchy's and Legendre homogeneous differential equations. Applications of Differential equations.	8

Text Books	1.	Higher Engineering Mathematics: B. S. Grewal, Khanna Publishers, 2013, Forty Third
	2.	Advanced Engineering Mathematics: Erwin Kreyszig John Wiley & Sons, 2013, Tenth Edition
Reference Books	1.	Advanced Engineering Mathematics: Jain, R.K. and Iyengar, S.R.K, Narosa Publishers; Alpha Science International, Ltd, 2007, Third Edition
	2.	Advanced Mathematics for Engineers and Scientists: Spiegel, M. R, McGraw-Hill, 2010, Second Edition

Course Title: **Linear Algebra and Statistics**

Semester	II	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	BS	2 Hrs.	1 Hrs.	NA	3	10	15	50	NA	NA
Course Code	UBSL105									
Teaching Mode	Offline	2Hrs			Total	75			–	
Duration of ESE	2 Hrs.					75				

Course Objectives	Analyze problems, recognize appropriate methods to find the solution.
	Apply principles from mathematics to solve applied problems in engineering.
Course Outcomes	Upon successful completion of this course, student will be able to:
	CO1: Apply simple operations like adding, multiplying, inverting, transposing, etc. in matrices and vectors.

	CO2: Apply the concepts of Linear Algebra in programming languages.
	CO3: Apply the concepts of least squares methods and linear regression analysis in engineering.
	CO4: Apply the knowledge of Random variables.
	CO5: Apply the knowledge of Probability distributions to solve engineering problems.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2		1							3
CO2	3	3	2		1							3
CO3	3	3	2		1							3
CO4	3	3	2		1							3
CO5	3	3	2		1							3

Course Contents:

Unit	Contents	Hours
I	Elimination with matrices, Inverse matrices, Factorization, Vector space, Column space and null space, Pivot variables, Row reduced form, Independence, Subspaces, Bases and dimensions, Four fundamental subspaces, Graphs, Networks, Incidence matrix.	10
II	Eigen values and eigenvectors, Diagonalization of a matrix, Symmetric matrices, Linear transformations, Singular Value Decomposition	8
III	Statistics: Introduction to measures of central tendency, Least Square method, Correlation and Regression.	07
IV	Random Variables, Distribution functions of continuous & discrete random variables, Mathematical expectations.	09
V	Special probability distributions: Binomial, Poisson's and Normal distributions.	08

Text Books	1.	Linear Algebra and Matrix Analysis for Statistics, Chapman &Hall,CRC Texts in Statistical Science
	2.	Linear Algebra and Its Applications, Gilbert Strang, Cengage Learning,2006,Fourth
EBooks	1.	https://faculty.atu.edu/mfinan/algebra2.pdf
	2	https://sites.math.northwestern.edu/~len/LinAlg/
	3.	https://faculty.atu.edu/mfinan/LINENG.pdf

Course Title: **Communication Skills**										
Semester	I/II	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Odd/ Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	H	2 Hrs.	-	2 Hrs.	3	10	15	50	25	-
Course Code	UHUL101 UHUP101									
Teaching Mode	Offline	4 Hrs.			Total	75			25	
Duration of ESE	2 Hrs.					100				

Course Objectives	To Introduce the students on the importance of communication in Engineering
	To build up the listening, speaking, reading and writing skills
	To carve the students on their body language through practical approach
	To augment the presentation skills of the students for their technical Proficiency
	To enhance their higher order thinking skills through review activity
Course Outcomes	Upon successful completion of this course, student will be able to:
	CO1: Students shall realize the value and relevance of communication functionalities.
	CO2: Students shall coordinate, collaborate and corroborate through LSRW Skills
	CO3: Students shall attribute their Impactful communication through power body language
	CO4: Students shall confidently exhibit their technical proficiencies through effectual PPTs and Professional Conduct
	CO5: Students shall be strongly opinionated and thoughtful about the contents they are introduced to.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO 1	PO2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1										**3**		
CO2										**3**		
CO3										**3**		
CO4										**3**		
CO5									**3**	**3**		

Course Contents:

Unit	Contents	Hours
I	**Course Foundation :** **Ice-Breaker**- Activity on Group Introduction (Circle Activity) **Self- Realization** – Review on SWOC Analysis and self- Introspection **SMART Goals**- Preparation and presentation of Individual goal charts **Pre-Training Module**: Assessment on prior knowledge of the students	**4**
II	**Communication for Engineering :** Introduction, process, barriers, Types of Communication--Talk on Emerging trends and importance of communication skills in Engineering- Overview of Listening, Speaking, Reading and Writing skills (LSRW)- The techniques and usage of the interrelated LSRW skills- The practical execution of LSRW Skills in Classroom and Lab	**4**
III	**Formal Correspondence and Content Framing**: Introduction to formal Writing techniques- Difference between Formal and Informal Writing- Formats of Letter and Email Writing- Practice of letter and email writing with real time situations- The Art of framing communication with effective content- Implementation of High order thinking skills with Critical thinking to explore Creativity. Review Activity with Moral Case studies/Case Lettes (Stereo Type/ Gender Bias)/ Abstract Writing/Newspaper article/Extempore	**4**
IV	**Presentation skills:** Structure of Presentations-Use of aids like Power point- Do's and Don'ts of presentation-Types of presentation- Body Language during presentation- The practical execution of Presentation skills (Individual and Technical) along with review and feedback	**4**
V	**Non-verbal Communication** Difference between Verbal and Non-verbal Communication-Physical Appearance-"Do Looks really Matter?"- Body Language Practice with Storytelling activity- Tips for improving Nonverbal communication (Gesture/Posture/Facial Expression/Personal Appearance/ Eye contact)	**4**

Text Books	1.	Communication Book – Global Education Ltd (In Progress)
E--Books	1.	Bridging the Soft Skills Gap- Bruce Tulgan
Reference Books	1.	Soft Skills for enhancing Employability(Connecting Campus to Corporate) – M S Rao
	2.	Communication Skills for Technical Students-Mr. Farahatulla
on line TL Material	1.	Online Lectures/Exercises/Assessment/Evaluation/Quizzes shall be made available with extended learning

Sr. No.	Name of Activities
1	Reading Skills: Read Aloud
2	Writing Skills :Abstract Writing
3	Read- Write Activity: Activity on Comprehension
4	Read-Speak Activity: Case Lettes
5	Speak- Speak Activity: Turn Court
6	Write- Write: Triggering Mind
7	Presentation Skills: Practical of Creating PPTs

Courses offered by Artificial Intelligence

Course Title: **Introduction to Machine Learning**										
Semester	I/II	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Odd/Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	A	-	-	4 Hrs.	2	-	-	-	50	-
Course Code	UAIP101									
Teaching Mode	Online	4 Hrs			Total	NIL			50	
Duration of ESE	NIL									

Course Objectives	Understand the basic of Mathematical and Statistical Libraries used for Machine Learning Algorithms.
	Identify Machine Learning Problems
	To introduce the basic concepts and techniques of Machine Learning Algorithms.
Course Outcomes	Upon successful completion of this course, student will be able to:
	CO1:Effectively used Machine Learning Tools
	CO2: Implement mathematical concepts on problems.
	CO3:Characterize Machine Leaning algorithms as supervised , semi-supervised and unsupervised learning
	CO4:Understand and apply machine learning algorithms
	CO5:Design and develop Machine Learning applications on available dataset

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO 1	PO2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	**3**	**3**	**1**	**2**	**2**	**3**		**3**	**3**	**2**	**3**	**1**
CO2	**3**	**3**	**1**	**2**	**2**	**3**		**3**	**3**	**2**	**3**	**1**
CO3	**3**	**3**	**1**	**3**	**2**	**3**		**3**	**3**	**2**	**3**	**1**
CO4	**3**	**3**	**1**	**3**	**2**	**3**		**3**	**3**	**2**	**3**	**1**
CO5	**3**	**3**	**1**	**3**	**2**	**3**		**3**	**3**	**2**	**2**	**1**

Course Contents:

Unit	Contents	Hours
I	Introduction to Machine Learning : History of Machine Learning, Examples of Machine Learning applications, Installation of Python, Various IDEs for Python, Introduction Numpy and Scipy. Mathematical Foundations: L1 and L2 form, Type of Matrixes, Eigenvector and eigen values, Singular-Value Decomposition. Understanding Mean, Median, Mode, Confusion Matrix, Bias and Variance	4
II	Dimensionality Reduction: Introduction to Dimensionality Reduction, Subset Selection. Regression and its types: Logistic Regression, Linear Regression, Applications of Linear Regression, Logistic Regression, Regularization, Regularized Linear Regression, Regularized Logistic Regression	6
III	Support Vector Machine (SVM),Naïve Bayes Algorithm, k-nearest neighbor, Understanding Classification Algorithms: Decision Tree, Random Forest, Applications of Random Forest Algorithm, and Advantages of Random Forest Algorithm.	6
IV	K-means Clustering, Principal Component Analysis, Performance Metrics for Classification Problems, Mean-Shift Algorithm, Mean-Shift Algorithm, Agglomerative hierarchical algorithms, Divisive hierarchical algorithms, Association rule.	6
V	Latest Trends in Machine Learning and Advance Machine Learning Algorithms	4

Text Books	1.	Dr. NileshShelke, Dr. NarendraChaudhari ,Dr. GopalSakarkar " Introduction to Machine Learning ", DAS GANU PRAKASHAN
	2.	Dr. A Krishna Mohan, Dr. T Murali Mohan, Karunakar," Python with Machine Learning", S. Chand Prakashan.
	3.	Introduction to machine learning, EthemAlpaydin. —2nd ed., The MIT Press, Cambridge, Massachusetts, London, England.
E--Books	1.	https://www.kdnuggets.com/tag/machine-learning
	2.	https://www.pdfdrive.com/machine-learning-books.html
Reference Books	1.	Introduction to artificial neural systems, J. Zurada, St. Paul: West.
	2.	Stephen Marsland, Machine Learning: An Algorithmic Perspective.
	3.	EthemAlpaydin, Introduction to Machine Learning, Second Edition
on line TL	1.	https://nptel.ac.in/content/syllabus_pdf/106105152.pdf

Material	2.	https://www.datacamp.com/courses/topic:machine_learning
	3.	https://www.coursera.org/learn/machine-learning

Sr. No.	Name of Experiments
1	Installation of Python and IDEs.
2	Calculate Singular Value Decomposition in Python & Reconstruct Matrix
3	Calculate Mean, Median, and Mode in Python.
4	Implementation of MinMax Scalar Class and Binarization for Pre-processing of Data.
5	Implementation of Logistic and Linear Regression Algorithms
6	Implementation of Support Vector Machine and Naïve Bayes Algorithm
7	Implementation of ,k-nearest neighbor and Decision Tree Algorithms
8	Python program to demonstrate Random Forest Algorithm
9	Python program to demonstrate KNN classification algorithm on IRIS dataset
10	Implement K- Means Algorithm in Python
11	Python program for Performance Metrics for Classification Problems
12	Python program for Divisive hierarchical algorithms
Open Ended Experiments / New Experiments	
1	Based on multiple features/variables perform Linear Regression. For example, based on a number of additional features like number of bedrooms, servant room, number of balconies, number of houses of years a house has been built – predict the price of a house.
2	Implement a classification/ logistic regression problem. For example based on different features of student's data, classify, whether a student is suitable for a particular activity.
3	Create various type of plots/charts like histograms, plot based on sine/cosine function based on data from a matrix. Further label different axes in a plot and data in a plot.
4	Write a Program in Python to tackle with the missing values in the dataset.
Details of on line Laboratory Resource Material Instruction / Operating Manuals	
1.	https://www.w3schools.com/python/python_ml_train_test.asp
2.	https://www.tutorialspoint.com/machine_learning_with_python/index.htm
3.	https://www.coursera.org/learn/machine-learning?

Course Title: **Introduction to Drones**										
Semester	I/II	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Odd/ Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	A	--	--	2 Hrs.	1	--	--	--	25	--
Course Code	UAIP102									
Teaching Mode	Offline	2 Hrs			Total	00			25	
Duration of ESE	NA					25				

Course Objectives	Be able to describe common components of drone
	Be able to define acronyms related to drone
	Be able to design the application oriented drone
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: Recognize and describe the role of drone in present, past and future society
	CO2: Comprehend basic components of drone.
	CO3: Explain the impact of various payloads of drone.
	CO4: Interpret the aspects of legal issues
	CO5: Implement and design application oriented drone.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO 1	PO2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	1	2	2	3		3	3	2	3	1
CO2	3	3	1	2	2	3		3	3	2	3	1
CO3	3	3	1	2	2	3		3	3	2	3	1
CO4	3	3	1	2	2	3		3	3	2	3	1
CO5	3	3	1	2	2	3		3	3	2	3	1

Course Contents:

Unit	Contents	Hours
I	**Introduction to Drone Technology** Types of Drones and Their Technical Characteristics, Main Existing Drone Types, Level of Autonomy, Size and Weight, Differences in Energy Source, Widely Used Drone models,	**4**
II	**Assembly of Drone** Parts of a Drone, Motor, Propellers, Flight Controllers, Electronic Speed Controllers, Safe Assembly of Drone and Drone air Flight for aerial Photos. Battery management systems	**4**
III	**Impact of Payloads** Types of Payloads and their application sensors, other payloads and frequency spectrum issues.	**4**
IV	**Legal Aspects** Legal issues on the use of frequency spectrum and electronic equipment, surveillance and compliance. Flight zones	**4**
V	**Case studies** Future Developments in Drone Technology. Advance topic	**4**

Text Books	1.	The future of Drone Use Opportunities and Threats from Ethical & Legal Perspectives
	2.	DIY Drones for the Evil Genius: Design, Build, and Customize Your Own Drones
E--Books	1.	Quad copters and Drones: A Beginner's Guide to Successfully Flying and Choosing the Right Drone
Reference Books	1.	Build a Drone: A Step-by-Step Guide to Designing, Constructing, and Flying Your Very Own Drone Barry Davies
	2.	Drones: An Illustrated Guide to the Unmanned Aircraft that are Filling our Skies

Sr. No.	Name of Experiments / Mini Project
1	Experimental study of customized drone components interfacing
2	Study of mAH battery capacity with flight time calculation and battery connection
3	Study of type of motors and ESC with connection in adopter
4	Experimental study of propeller blade rotation CC & CCL & it's role in control
5	Installation of Pluto X controller App & it's setting
6	Study of throttle control in quad copter and its controlling
7	Experimental study of role of yaw control in quad copter
8	Experimental study of role of roll control in balancing
9	Experimental study of role of pitch control in quad copter balance and its control
10	Study of sensor board X breakout and sensor interfacing to quad copter
Open Ended Experiments / New Experiments	
1	Chuck to ARM
2	Open Sesame: Drone take-off due to change in ambient pressure
3	Turn the Drone upright from it's flipped position
Details of on line Laboratory Resource Material Instruction / Operating Manuals	
1.	Cygnus software
2.	Pluto X operating manuals
3.	Transmitter & Receiver console

Courses offered by
Computer Engineering

Course Title: **Computer Programming**										
Semester	I/I	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Odd/Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	C	2 Hrs	--	4 Hrs	4	10	15	50	50	
Course Code	UCOL101 UCOP101									
Teaching Mode	Online	6 Hrs			Total	75			50	
Duration of ESE	2 Hrs.					125				

Course Objectives	To introduce the basics of components of programming language and also develop logical thinking
	To implement concepts of mathematics into programming.
	To help students understand how to model real-world problems into the software and develop practical programming skills
Course Outcomes	CO1: Design algorithms and flowcharts for solving Mathematical and Engineering Problems
	CO2: Apply the suitable Control structures to solve the given problem
	CO3: Investigate the problems and Identify the use of Pointers and Functions in it.
	CO4: Assess the programming structure and recommend the type of array to be useful to find a solution for applications.
	CO5: Synthesize various problems to develop logical thinking

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO 1	PO2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1		**3**										
CO2			**3**									

CO3				**3**								
CO4			**3**									
CO5			**3**									

Course Contents:

Unit	Contents	Hours
I	**Introduction to Programming:** Evolution, Programming Paradigms, Features, Algorithm, Flow charts, Data types and storage classes, Strings, Scope of variables, Tokens, Type Casting, Operators	8
II	**Control Statements:** Decision Making Statements: if, if-else, nested if, nested if-else, switch, go-to. Loop Control Statements: Entry control, Exit Control, while, do-while, for, break, continue	7
III	**Arrays:** Definition, Declarations, Initialization, Accessing, Types of Arrays**: 2D,3D**	7
IV	**Pointers:** Definitions, Declarations, Applications **Functions:** Definitions, Declarations, Types**,** Calling, Function arguments: Call by Value, Call by Reference**, Recursion**	6
V	**Structure:** Definition, Accessing Structure Members, Structures as Function Arguments, Pointers to Structures **Union:** Definition, Accessing Union Members **Advance Topic: (As per the instructor)**	7

Text Books	1.	Kernighan and Ritchie, C programming language Prentice Hall of India,
	2.	Balguruswamy, “Programming in ANSI C”, Tata Mcgraw Hill Publishing
	3.	Kakde and Deshpande, “C and Data Structure”, Charles River Media Publisher
	4.	YashwantKanetkar, Let's C, BPB Publishers
Reference Books	1.	Herbert Schildt, C: The Complete Reference, Mcgraw Hill Publishing

	2.	Expert C Programming, Deep C Secrets by Peter van der Linden.
On-line TL Material	1.	https://spoken-tutorial.org/tutorial-search/?search_foss=C+and+Cpp

Sr. No.	**Name of Experiments**
1	Implement syntax of C with algorithm and flowchart
2	Implement Data Types and Type casting
3	Implement the Branch control statements in C
4	Implement the Loop control statements in C
5	Implement the concept of Pointers using C
6	Implement the Functions in C
7	Implement recursive functions in C
8	Implement the Linear Array Operations.
9	Implement the Matrix Array Operations Array for addition and multiplication
10	Implement Structures in C
Open Ended Experiments	
1	Student Record Management System
2	Simple CPP
Details of on line Laboratory Resource Material Instruction / Operating Manuals	
1.	https://spoken-tutorial.org/tutorial-search/?search_foss=C+and+Cpp
2	https://cse02-iiith.vlabs.ac.in/

Course Title: **Foundation of Data Analytics**										
Semester	I/II	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Odd/Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	C	1 Hr.		2 Hrs.	2	10	15	50	25	
Course Code	UCOL102 UCOP102									
Teaching Mode	Online	3 Hrs.			Total	75			25	
Duration of ESE	2 Hrs.					100				

Course Objectives	To perform descriptive statistics on the given dataset
	To perform inferential statistics on the given dataset
	Apply linear regression and logistic regression and perform data visualization on the given dataset with Tableau.
Course Outcomes	**CO1:**Analyze the dataset and perform Descriptive Statistics
	CO2:Analyze the dataset and perform an Inferential Statistics
	CO3: Apply linear regression on the given dataset
	CO4: Apply the logistic regression on the given dataset
	CO5: Create an interactive data visualization

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO 1	PO2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	**3**											
CO2	**3**											
CO3			**3**									
CO4			**3**									
CO5					**3**							

Course Contents:

Unit	Contents	Hours
I	Buzzwords of Data Science, Info-graphic representation of terminologies, Difference between Analysis and Analytics, Applications	3
II	Descriptive Statistics: Population and Sample, Types of Data, Measurement Levels, Representation of categorical variables, Measures of Central Tendency (Mean, Median, Mode), Skewness, Variance, Standard Deviation, Coefficient of Variation, Covariance, Correlation. Histogram Analysis.	3
III	Inferential Statistics: Distribution, Normal Distribution, Standard Normal Distribution, Central Limit Theorem, Standard Error, Estimators and Estimates, Confidence Interval, Students T Distribution, Margin of Error	3
IV	Linear Regression: Introduction to Regression, Simple and Multiple Linear Regression, Correlation vs. Regression, SST (Sum of Squares Total), SSR (Sum of Squares Regression), SSE (Sum of Squares Error) R-Square, Adjusted R-Squared. Multiple Linear Regression, Significance of p-value	3
V	Logistic Regression: Logistic regression, Logitvs logistic, Applications of logistic regression Introduction to data visualization and various graphical ways of data representation	3

Text Books	1.	The Art of Statistics: Learning from Data (Pelican Books), by David Spiegelhalter
	2.	Principles of Statisticsby M. G. Bulmer, Dover Publications Inc.
	3.	Statistics 101: From Data Analysis and Predictive Modeling to Measuring Distribution and Determining Probability, Your Essential Guide to StatisticsBy David Borman, Adams Media
EBooks	1.	An Introduction to the Science of Statistics: From Theory to Implementation, by Joseph C. Watkins https://www.math.arizona.edu/~jwatkins/statbook.pdf
	2.	Introduction to Statistics, by David M. Lane http://onlinestatbook.com/Online_Statistics_Education.pdf
Reference Books	1.	Information Dashboard Design: Displaying Data for At-a-glance Monitoring by Stephen Few, Analytics Press
	2.	Beautiful Visualization, by Noah Iliinsky, Julie Steele Publisher(s): O'Reilly Media, Inc. ISBN: 9781449379865
on line TL Material	1.	The Business Intelligence Analyst Course 2020 https://www.udemy.com/course/the-business-intelligence-analyst-course-2018/
	2.	The Data Science Course 2020: Complete Data Science Bootcamp https://www.udemy.com/course/the-data-science-course-complete-data-science-bootcamp/

Sr. No.	Name of Experiments
1	Apply pivot table of Excel to perform data analysis
2	Perform Descriptive statistics of given dataset using Data Analysis Toolbox of Excel
3	Perform the Histogram Analysis of given dataset using Data Analysis Toolbox of Excel
4	Perform Simple Linear Regression using Data Analysis Toolbox of Excel or with Python and Interpret the regression table
5	Perform Multiple Linear Regression using Data Analysis Toolbox of Excel or with Python and Interpret the regression table
6	Perform the Logistic Regression and given dataset and Interpret the regression table
7	Install Tableau, Understand User Interface, Dimensions, Measures, Pages, Filters, Marks and Show Me, Dataset Connections and Create a visualization
8	Various graphs in Tableau, Integration of Map and geo-locations, Creating Interactive Dashboard and Publishing your Dashboard to Tableau Public Site
9	Scatter Plots, Data Highlighter, Pages and Cards, Annotations Creating Story and publishing on Tableau Public
10	Given a case study: Perform Interactive Data Visualization with Tableau
	Open Ended Experiments
1	Perform Data Visualization with Microsoft Power BI
2	Perform Data Visualization with R
	Details of on line Laboratory Resource Material Instruction / Operating Manuals
1.	Google classroom on 'Business Intelligence Analyst' – Code: udsf4px

Courses offered by
Information & Technology

Course Title: **Problem Identification and Design Thinking**										
Semester	I/II	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Odd/Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	A	--	--	2 Hrs.	2	--	--	--	25	--
Course Code	UITP101									
Teaching Mode	Offline	2 Hrs			Total	--			25	
Duration of ESE	--					25				

Course Objectives	Learn to illustrate the problem definition, significance of stakeholders and information gathering
	Conduct the brainstorming to generate ideas and refining of ideas
	Select the potential ideas and design potential solution
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: Identify the problem definition and stakeholders
	CO2: Analyze the gathered information and identify potential ideas
	CO3: Design a suitable prototype and evolve it.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO 1	PO2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1		**3**										
CO2				**3**								
CO3			**3**									

Sr. No.	Name of Experiments
1	Define: Identify the problem definition and define it and identify the stakeholders. Enlist the constraints associated with Problem Definition and formulate the objectives.
2	Research: Conduct primary and secondary research in identified problem definition. Identify GAP and scope for improvement.
3	Information Gathering: Gather the information in the form of qualitative, quantitative and through surveys
4	Ideate: Perform brainstorming which can leads to generation of potential ideas
5	Refinement: Refine the ideas and increase the effectiveness
6	Prototype: Design a suitable prototypes for ideas generated in Ideate Phase.
7	Selection: Identify the proposed design solution for implementation or development phase
8	Implementation: Implement the solution or Deliver the solution to stakeholders
9	Evolve: Identify what worked well and where in the scope for improvement.
10	Report Writing: Write a detailed report for all the phases of design thinking.
Open Ended Experiments	
1	Define the Industry based problem and conduct the primary and secondary research and information gathering
2	Ideate the potentials ideas and design a prototype for industry based problem.

Text Books	1.	Basics Design 08: Design Thinking, By: Gavin Ambrose, Paul Harris, AVA Publishing
	2.	Jeanne Liedtka and Tim Ogilvie Designing for Growth: A Design Thinking Tool Kit for Managers (Columbia University Press, 2011)
EBooks	1.	The Design Thinking: Guidebook by Mr Lee Chong Hwa (Lead Facilitator)
Reference Books	1.	Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation(HarperBusiness, 2009)

Course Title: **Programming for Problem Solving**										
Semester	I/II	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Odd/Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	C	--	--	4 Hrs.	2	--	--	--	50	--
Course Code	UITP102									
Teaching Mode	Online	4 Hrs			Total	--			50	
Duration of ESE	--					50				

Course Objectives	This Course introduces basic idea of how to solve given problem.
	Focuses of paradigms of programming language.
	Aims at learning python as programming language.
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: Analyze and understand the behavior of fundamental programming constructs.
	CO2: Develop & Analyze Algorithms for solving problems.
	CO3: Demonstrate the knowledge of various concepts of Python Language.
	CO4: Demonstrate knowledge of advanced concepts of Python Programming
	CO5: Develop solutions using functions & recursion

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO 1	PO2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1		3										
CO2			3									
CO3		3										
CO4				3								
CO5			3		3							

Course Contents:

Unit	Contents	Hours
I	ALGORITHMIC PROBLEM SOLVING: Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).	8
II	DATA, EXPRESSIONS, STATEMENTS Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments;	8
III	CONTROL FLOW, FUNCTIONS Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices,	8
IV	DICTIONARIES Dictionaries: operations and methods; advanced list processing – list comprehension; Object Oriented Programming: Classes and objects-inheritance-polymorphism	8
V	FILE HANDLING & EXCEPTION HANDLING Overview of exception classes and Types: try, except, finally: File processing: reading and Writing files, Recent Trends in Python	8

Sr. No.	List of Experiment
1	Implementing if else in Python
2	Implementing loop in Python
3	Implementing Functions in Python
4	Implementing Set, Tuple & Dictionary in Python
5	Project Using Python Module 1: Algorithms, Expression, Variables & I/O
6	Module 2: Control Structures
7	Module 3: List, Strings, Tuples & Dictionary
8	Module 4: Functions
9	Module 5: Object Oriented Programming
10	Module 6: Expression Handling & File Handling

Text Books	1.	Python Programming using problem solving Approach, By Reema Theraja, First Edition, 2017.
	2.	A Byte of Python By C. H. Swaroop, Edition 2.1

Courses offered by
Electronics & Telecommunication Engineering

Course Title: **Basic Electrical Engineering**										
Semester	I/II	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Odd/Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	C	2 Hrs.	1 Hrs.	2 Hrs.	4	10	15	50	25	---
Course Code	UECL101									
Teaching Mode	Offline	5 Hrs			Total	75			25	
Duration of ESE	2 Hrs.					100				

Course Objectives	To prepare students to understand Different types of Circuit Elements
	To make aware about basic principles of operations of electrical machines.
	To train students to know about energy audit & management
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: Understand D.C.Circuits of different configurations.
	CO2: Identify different configurations of A.C.Circuits
	CO3: Classify and formulate different aspects of transformer.
	CO4: Compare A.C machines and DC Machines
	CO5: Estimate Energy Audit for Energy Management

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO 1	PO2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	**3**											
CO2	**3**											
CO3	**3**											
CO4	**3**											
CO5	**3**											

Course Contents:

Unit	Contents	Hours
I	**Unit-I D.C. Circuits** Circuit Elements, transient study of basic circuit configurations (such as R-L, R-C etc.), Voltage and current sources and their inter conversion, Basics of Mesh and Node Analysis Methods, Basics of Network theorem (such as Super position theorem, Thevenin's Norton Theorem and Maximum Power Transfer theorems). Star Delta Transformation Basic of magnetic coupling	12
II	**Unit II A. C. Circuits** Periodic functions, average & rms values, Steady state behaviours with sinusoidal excitation, phasor representation, reactance and impedance, Series and Parallel A.C. circuits, resonance, power in A. C. circuits, power factor, Principle of generation of single phase & Three phase voltages. Power in balanced three phase A.C. systems.	14
III	**Unit III : Single Phase Transformers.** Introduction, flux, MMF, Reluctance, analogous electric circuits, Basic principle, construction of phasor diagram for transformer under no load condition, Transformer on load, EMF equation Phasor diagrams, Equivalent circuit, Losses, Efficiency, Regulation, Open-circuit & short-circuit test, Applications.	12
IV	**Unit IV : Introduction to AC Motors & DC Machines.** Three phase Induction motor Construction, and principle of rotating field, synchronous speed, Rotor current, torque and slip, Principle of Single phase Capacitor Start motor. Applications. Introduction to DC Machines, construction, EMF and Torque equation, classification, self-excitation of D.C. shunt generators, Applications.	16
V	**Unit V : Energy Management & Audit** Need and types of energy audit. Energy management, approach-understanding energy costs, energy audit instruments. Typical Electrical Loads: Light sources, Fans Heating Load Types of Loading Load characteristics Constant Power load (LED etc)	6

Text Books	1.	D.C.Kulkshreshtha, Basic Electrical Engineering, McGraw 2012

	2.	H. Cotton, Basic Electrical Engineering, Seventh Edition, C B S, 2005
	3.	Engineering Circuit analysis by William Hayt Tata McGraw Hill
E--Books	1.	Fundamentals of Electrical Engineering by by Don Johnson Connexions 2010
	2.	Fundamentals of Electrical Engineering and Electronics by Tony R. Kuphaldt.
Reference Books	1.	Naidu, Kamakshaia, Introduction to Electrical Engineering, Third Edition, Tata McGraw Hill, 2000
	2.	Hughes,Electrical and Electronics Technology,11th Edition Pearson
	3.	S G Tarnekar, P K Kharbanda, S B Bodkhe, S D Naik, Laboratory courses in Electrical Engg., Second Edition, S. Chand & Co., 2010
on line TL Material	1.	https://nptel.ac.in/courses/108/108/108108076/
	2.	https://nptel.ac.in/courses/108/108/108108076/
	3.	https://nptel.ac.in/courses/108/108/108108076/

Sr. No.	Name of Experiments / Mini Projects/ Case Studies
1	Overview of Lab Equipment & Safety Precaution.
2	To Verify KVL and KCL of electrical circuit.
3	To Determine Active and Reactive power of Choke coil. Using Three Voltmeter method, Find Internal resistance and inductance of choke coil
4	To find Line & phase quantities in Three Phase star Connected balanced Load.
5	Study of phase relationship in R-L-C parallel network by computer simulation using P-Sim Software.
6	To find the efficiency and regulation of a single phase transformer by OC and SC Test.
7	To Observe the speed reversal of three phase Induction motor.
8	Introduction of Different Motors
Open Ended Experiments / New Experiments	
1	To compare normal capacitor with super-capacitor, Various Types of Capacitor.
2	To study resonance circuit using software
3	Circuit designing, Testing & Validation of Electrical Circuits
4	To study and observe the performance of 33/11 kV distribution substation
Details of on line Laboratory Resource Material Instruction / Operating Manuals	
1.	Virtual Lab

Courses offered by
Mechanical Engineering

Course Title: **Engineering Graphics**										
Semester	I/II	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Odd/Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	C	1 Hr.	-	2 Hrs.	2	10	15	50	25	-
Course Code	UMEL101 UMEP101									
Teaching Mode	Online	3 Hrs.			2	75			25	
Duration of ESE	2 Hrs.					100				

Course Objectives	To familiarize with basic engineering graphics principles and standards of drafting.
	To equip with various techniques to create technical drawings.
	To get acquainted in sketching, manual drafting and computerized drafting appropriately
Course Outcomes	Upon successful completion of this course, student shall be able to:
	CO1: Understand concepts of dimensioning, drawing conventions and theories of projection related to engineering graphics
	CO2: Interpret the projection of planes
	CO3: Predict solid geometry in different angles
	CO4: Imagine section of solids in different angles
	CO5: Create the geometric information of engineering objects into engineering drawing using drafting tools.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO 1	PO2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	**3**	**1**	**2**	**1**	**3**	**1**	**1**	**-**	**1**	**3**	**2**	**3**
CO2	**3**	**2**	**2**	**2**	**3**	**2**	**1**	**-**	**2**	**3**	**2**	**3**
CO3	**3**	**2**	**2**	**2**	**3**	**2**	**1**	**-**	**2**	**2**	**2**	**2**

CO4	3	2	3	2	3	2	1	-	2	3	3	2
CO5	3	1	2	1	3	1	1	-	1	3	2	3

Course Contents:

Unit	Contents	Hours
I	**Theory of Projections** Theory, techniques, first and third angle projections, multi view drawing (from pictorial views), views in orthographic projections, Projection of points, Projection of straight lines inclined to both reference planes.	2
II	**Projection of Planes** Projection of plane figures such as triangle, quadrilateral, regular polygons circle, Plane inclined to both reference planes.	2
III	**Projection of Solids** Projections of solids such as Prisms, Pyramids, Cone, Cylinder with varying position of axes with ground line.	2
IV	**Sections of solids** Section of solid such as Prisms, Pyramids, Cone, Cylinder and introduction to development of surfaces.	3
V	**Orthographic Projection & Isometric Projection** Conversion of pictorial view of solid to orthographic views, conversion of orthographic views in to isometric views.	4

Text Books	1.	A text book of Engineering Drawing by N.D.Bhatt&V.K.Panchal, Revised Latest Edition 2016, Charotar Publishing House, Anand,Gujrat.
	2.	A text book of Engineering Drawing by N.S.Parthasarthy, Vela Murali, Revised edition, 2016, Oxford Publications.
	3.	A text Bok of Engineering Graphics using AUTO CAD by Sarkar, Rastogi and Kulkarni , 2nd edition, 2015,Tata McGraw Hills.
On line TL Material	1.	NPTEL https://nptel.ac.in/courses/105/104/105104148/
	2.	NPTEL https://nptel.ac.in/courses/112/103/112103019/
	3.	http://www.cadtutor.net/tutorials/autocad/drawing-objects.php

Sr. No.	Name of Experiments/Mini Projects/Case studies	Mode of conduction
1	Types of Lines, Dimensioning	Manually(on half imperial drawing sheet)

	&Projection of Line	
2	Projection of Plane	To be drawn with AutoCAD
3	Projection of Solids	To be drawn with AutoCAD
4	Projection of Section of Solids	To be drawn with AutoCAD
5	Orthographic projection	To be drawn with AutoCAD
6	Isometric views	To be drawn with AutoCAD

Course Title: **Workshop Practice and Digital Fabrication**										
Semester	I/II	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Odd/ Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	C	-	-	4 Hrs	2	-	-	-	50	-
Course Code	UMEP102									
Teaching Mode	Offline	4 Hrs			2	-			50	
Duration of ESE	-					50				

Course Objectives	To get acquainted with the use of hand tools for Black smithy, Fitting, Carpentry and Welding used in mechanical engineering workshop
	To equip with various techniques to create product design and developments.
	To train in 3 D part modeling and additive manufacturing appropriately.
Course Outcomes	Upon successful completion of this course, student shall be able to:
	CO1: Understand and demonstrate workshop safety regulations.
	CO2: Use tools and understand its importance in black smithy, fitting, carpentry and welding operations.
	CO3: Communicate creative ideas using virtual and physical prototyping.
	CO4: Explore the boundaries for design and development of real product by using Additive manufacturing (3D Printing).
	CO5: To create new products with the gained knowledge and skills.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO 1	PO2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	**3**	**2**	**3**	**2**	**1**	**-**	**2**	**-**	**3**	**1**	**2**	**2**
CO2	**3**	**2**	**2**	**1**	**2**	**1**	**2**	**-**	**2**	**1**	**3**	**3**
CO3	**3**	**2**	**3**	**2**	**3**	**3**	**2**	**-**	**2**	**3**	**3**	**3**
CO4	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**-**	**2**	**2**	**2**	**2**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**-**	**3**	**3**	**3**	**3**

Course Contents:

Sr No	Contents	Hours
	Workshop Practice (Mechanical Workshop)	
I	**Welding:** Work related to gas welding, arc welding equipment's.	4
II	**Black Smithy:** Work of the smithy tools and the process	4
III	**Fitting:** Use of tools of fitting and the processes involved in fitting.	4
IV	**Carpentry:** Applications of different carpentry tools and the carpentry processes.	4
	Workshop on Advanced Additive Manufacturing – 3 D Printing Digital Fabrication	
V	Introduction to Additive Manufacturing - 3 D Printing and Computer aided design Software's – CATIA v5	1
VI	2 D Sketching on CATIA v5 - To prepare 2D geometrical model by using sketcher toolbar, entities and Views	1
VII	2 D Sketching on CATIA v5 - To prepare 2D geometrical model using drawing constraint and modifying toolbars.	2
VIII	3D Modeling on CATIA v5– To prepare part model using 2 D drawing and with basic extrusion tools. - Conversion of part file to .stl format	2
IX	3D Modeling on CATIA v5 - To prepare part model using Revolve command - Conversion of part file to .stl format	1
X	3 D Printing Slicing / Pre-processing - To pre-processed model for 3 D Printing using of Kissslicer/Cura 4.0	1

	Software's	
XI	3 D Printing Slicing - Development of g.code by using Kissslicer/Cura 4.0 Softwares for 3 D Printing	1
XII	3 D Printing – - Introduction to Fused deposition modeling technique - Introduction to FDM Machine and operating controls.	1
XIII	3 D Printing – - Development of prototype using additive manufacturing – 3 D Printing (FDM Based)	2

Sr. No.	Name of Experiments/Mini Projects/Case studies
1	To prepare a job in Smithy Shop
2	To prepare a job in Fitting Shop
3	To prepare a job in Welding Shop
4	To prepare a job in Carpentry Shop
5	2 D Sketching on CATIA v5
6	Performance on 2D sketching
7	3D Modeling on CATIA v5
8	Performance on 3D modeling
9	3 D Printing

Courses offered by Civil Engineering

Course Title: **Engineering Mechanics**										
Semester	I/II	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Odd/Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	C	2 Hrs.	--	2 Hrs.	3	10	15	50	25	-
Course Code	UCEL101 UCEP101									
Teaching Mode	Offline	4 Hrs			Total	75			25	
Duration of ESE	3 Hrs					100				

Course Objectives	To describe and explain the conditions of rest or motion of the bodies under the action of force and also to be familiar with the concept of simple lifting machine
	To illustrate the basic concepts of forces moments, couples in two dimensional force system & spatial force system.
	To practice and analyze the simple determinate structures like beam & trussand to understand the properties of plane geometric area.
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1. Apply the fundamentals of two dimensional force systems for replacement into equivalent force system
	CO2. Demonstrate the basic concepts of free body diagrams for static equilibrium for two dimensional force systems
	CO3. Implement the concepts of Simple Lifting Machine and friction and to analyze the internal forces in the members of truss.
	CO4. Employ the concepts of forces, moments, and couples in spatial force system
	CO5. Apply the basic concepts of Centroid, Moment of inertia of lamina & Virtual Work

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO 1	PO2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	**3**	**1**										**1**
CO2	**3**	**1**										**1**

CO3	**3**	**1**										**1**
CO4	**3**	**1**										**1**
CO5	**3**	**1**										**1**

Course Contents:

Unit	Contents	Hours
I	**Fundamentals of Statics :** Definition of mechanics, Body, Rigid Body, Scalar quantities, Vector quantities, Representation of vector, Fundamental Units, Derived Units, Particle, Mass, Weight, Fundamental principles of mechanics, Newton's law of universal gravitation. **Equivalent Force System (2-D):** Concept of Force, Unit Newton force, System of force, Principle of transmissibility of force, Resolution and composition of coplanar force system, Resultant, Equilibrant, Law of parallelogram of force, Triangle law, Polygon law, Moment of force, Varignon's theorem, Couple and it's properties, Reduction of system of forces into a force couple system. Numericals on equivalent force involving co-planer force systems acting on body, Numericals on reduction of system of forces into a force couple system.	7
II	**Equilibrium of Two Dimensional Force System :** ***Force System :*** Concept of equilibrium, Principles of equilibrium, Equations of Equilibrium, Lami's theorem, Numericals on equilibrium involving co-planer force systems acting on body. ***Beam:*** Beam, Simply Supported Beam, Overhanging Beam, Beam reaction, Types of load acting over beam i.e. Concentrated load, Uniformly distribute load (UDL), Uniformly varying load (UVL), Types of support i.e. Simple support, Hinge support, Roller Support, Numericals on reaction of beam subjected to combination of loads	8
III	***Analysis of Truss :*** Perfect Frame, Imperfect frame, Deficient frame, Redundent frame, Assumptions made in analysis of truss, Method of joints, Method of sections, Numericals on forces in the members of a truss. **Friction:** Definition of friction, Types of friction, Angle of repose, Coulombs laws of dry friction, Analysis of rigid bodies on rough inclined surfaces.	8
IV	**Spatial Force System (Three Dimensional Force System):**	8

	Component of force in a space, Resultant spatial force system, Force multiplier, Cartesian form of representation of vector, Unit vector, Position vector, Displacement Vector, Scalar product or Dot product, Vector product or Cross product, Length of common perpendicular between two non-intersecting vectors, Shortest distance, Moment of force about point, Moment of force about axis, Moment arm of force about point, Moment arm of force about axis, Resultant moment, Couple.	
V	**Properties of Areas:** Centroid of plane areas, Moment of Inertia of composite lamina, Radius of gyration, Second moment of area, Product of inertia, Parallel axis theorem, Perpendicular axis theorem, Polar moment of inertia, Moment of inertia & product of inertia about new axes, Principal moment of inertia and principal axis direction by analytical method only. **Virtual Work :** Virtual Displacement, Definition of virtual work, Principles of virtual work, Virtual work method applied to beams, frames & mechanisms.	9

Text Books	1.	Engineering Mechanics - Statics & Dynamics by Author : K. Vijaya Reddy & J Suresh Kumar, B S Publication, Third Edition, 2010
	2.	Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", 3rd Edition, Vikas Publishing House Pvt. Ltd., (2005).
	3.	Bhavikatti, S.S, and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, (1998).
E-Books	1.	Textbook of Engineering Mechanics by R.K. Bansal Laxmi Publications, 2005 - Mechanics, Applied
	2.	Engineering Mechanics A Textbook Of Applied Mechanics by S. Ramamrutham, Dhanpat Rai Publishing Company (P) Limited, 2008
Reference Books	1.	I. H. Shames, Engineering Mechanics: Statics and dynamics, 4th Ed, PHI, 2002.
	2.	F. P. Beer and E. R. Johnston, Vector Mechanics for Engineers, Vol I – Statics, Vol II – Dynamics, 9th Ed, Tata McGraw Hill, 2011.
	3.	R. C. Hibbler, Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press, 2006

Sr. No.	Name of Experiments
1	Familiarity (study) of simple lifting machines
2	Determination of velocity ratio, law of machine for “Single Purchase Crab Winch
3	Determination of velocity ratio, law of machine for “Double Purchase Crab Winch”.
4	Determination of velocity ratio, law of machine for “Differential Axle and Wheel”.
5	Determination of velocity ratio, law of machine for “Simple Screw Jack”.
6	Determination of reactions at the supports of simply supported beam
7	Determination of forces in the members of jib crane.
8	Determination of forces in the members of a shear leg apparatus
9	Determination of coefficient of friction of inclined planes
10	Determination of coefficient of coil friction.
11	Determination of mass moment of inertia of fly wheel
Open Ended Experiments	
1	To investigate effect on reaction forces produced at simply supported beam due to variation of position of single load.
2	To investigate effect on reaction forces produced at simply supported beam due to variation of position of multiple loads

Courses offered by
Electronics & Telecommunication Engineering

Course Title: **Electronic Devices & Circuits**										
Semester	I/II	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Odd/Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	C	2 Hrs.	1 Hr.	2 Hrs.	4	10	15	50	25	---
Course Code	UECL102 UECP102									
Teaching Mode	Offline	3 Hrs.			Total	75			25	
Duration of ESE	2 Hrs.					100				

Course Objectives	To give understanding on how current flows through semiconductor devices and relating this phenomena to the characteristics and operation devices.
	To expose students to the function and application of the diodes, bipolar junction, field effect and CMOS transistors in electronic circuits.
	To use appropriate experimentation techniques to evaluate circuit performance.
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: Relate operation of diodes and their role in design of various electronic applications.
	CO2: Develop the capability to analyze and design circuits using bipolar transistors.
	CO3: Design and analyze Build the concepts of feedback and apply the concepts for improvement of performance of amplifier and oscillator
	CO4: Interpret the operation of the Field Effect Transistor (FET), Metal Oxide Semiconductor Field Effect Transistor (MOSFET) and design FET circuits.
	CO5: Design CMOS based circuits.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO 1	PO2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	2	3	2	1	1	2	1	2	3
CO2	3	3	3	2	3	2	1	1	2	1	2	3
CO3	3	3	3	2	3	2	1	1	2	1	2	3
CO4	3	3	3	3	3	2	1	1	3	1	2	3
CO5	3	3	3	3	3	2	1	1	3	1	2	3

Course Contents:

Unit	Contents	Hours
I	**Semiconductor Devices:** PN junction diode review, Half and full wave rectifiers, Zener Diode, Varactor Diode, Tunnel Diodes, BJT transistors- structure, Operations & characteristics, voltages and currents equations, CE, CB, CC configurations, Early Effect	9
II	**BJT Circuits** DC load line, Biasing circuits, Stability factor, thermal runaway, Compensation methods, h-parameters, Feedback Amplifiers,	9
III	**Amplifiers & Oscillators** Classification A, B, AB, C, Efficiency, Push Pull Configuration (A, B, AB) Complementary symmetry, Second Harmonic and Cross over Distortion, Classification of Oscillators, Stability, Bark Hausen Criteria, Design of RC, LC and Crystal Oscillators.	9
IV	**Field Effect Transistors** Field Effect Transistor, MOSFET, NMOS, PMOS Principles of operation and characteristics, channel length modulation, Biasing arrangement.	9
V	**CMOS & IC Technology**: CMOS inverters, Combinations Circuits, introduction IC Technology- Basic fabrication steps, Advance topics based on course	9

Text Books	1.	Electronics Devices and Circuits, S. Salivahanan, N Suresh Kumar, Tata McGraw-Hill 2008, Third Edition
	2.	Integrated Electronics Jacob MillmanTata McGraw-Hill, 2009, Second Edition
	3.	Electronics devices and Circuits and Theory Robert L. Boylestad, Louis Nashelsky, Pearson India, 2009, Tenth Edition
E--Books	1.	Electronics Devices and Circuits, S. Salivahanan
	2.	Solid State Electronic Devices, 6th Edition, Ben G.Streetman & Sanjiv Kumar Banerjee
Reference Books	1.	Electronic Devices & Circuits, Sanjiv Gupta
	2.	Microelectronics Circuits A. S. Sedra & K. C. Smith, Oxford University Press, 2013, Seventh Edition
	3.	Electronics Devices and Circuits, Nagrath I J Phi Learning Pvt Ltd, 2009, Third Edition.
on line TL Material	1.	Virtual Lab,Electronic Devices & Circuits,IIT Bombay http://vlabs.iitb.ac.in/vlab/electrical/index.html

*: Every practical will be performed on Bread Board

Sr. No.	Name of experiments
0	Study of different electronic components
1	Observe and draw V-I Characteristics of PN Diode & LED Diode.
2	Observe and draw the V-I characteristics and Regulation characteristics of a Zener diode.
3	Obtain ripple factor of Half Wave/Full wave Rectifier circuit with & without filter
4	Draw the input and output characteristics of transistor connected in CE/CB/CC any one Configuration
5	Design bipolar junction transistor as a switch
6	Design of Voltage Divider Bias for BJT.
7	Design Audio oscillator using BJT
8	Design Radio Oscillator using BJT
9	Design Oscillator for Laptop./ Mobile
10	Design of Class B push pull power amplifier and observe cross over distortion
11	Draw the Drain and Transfer characteristics of a given FET in CS Configuration.
12	Draw the Drain and Transfer characteristics of a given MOSFET in CS Configuration.
Open Ended Experiments	
1	Design Zener regulator circuits for Processor Motherboard.
2	Design of Simple analog application circuits.
3	Minor Project

Course Title: **Modeling of digital circuits**										
Semester	I/II	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Odd/ Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	C	3 Hrs.	--	2 Hrs.	4	10	15	50	25	--
Course Code	UECL103 UECP103									
Teaching Mode	Offline	3 Hrs.			Total	75			25	
Duration of ESE	2 Hrs.					100				

Course Objectives	To understand number systems, codes and their conversions.
	To demonstrate various Digital ICs and their applications.
	To design digital circuits to solve engineering problems and applications.
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: Solve the problems on Number system codes and their conversions.
	CO2: Identify Digital IC and implement in the circuits.
	CO3: Create, design and simulate canonical logic forms
	CO4: Demonstrate the application of combinational and sequential logic circuits.
	CO5: Demonstrate the application of state machine

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO 1	PO2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	2							1	
CO2	3	3	3	2							1	
CO3	3	3	3	2							1	
CO4	3	3	3	2							1	
CO5	3	3	3	2							1	

Course Contents:

Unit	Contents	Hours
I	**Number Systems** Decimal, binary, octal, hexadecimal number system and conversion, binary weighted & non-weighted codes & code conversion, signed numbers, 1s and 2s complement codes, Binary arithmetic, Binary logic functions ,	9
II	**Boolean Algebra & Logic Gates:** Boolean laws, truth tables, associative and distributive properties, De-Morgan's theorems, realization of switching functions using logic gates. Logic families: TTL, ECL, CMOS and characteristics, Switching equations, canonical logic forms, sum of product & product of sums,	9
III	**Combinational Logic & Combinational Circuits:** simplification of expressions using Karnaugh maps, mixed logic combinational circuits, multiple output functions, Introduction to combinational circuits, code conversions, decoder, encoder, priority encoder, multiplexers & De-multiplexer, Basic Arithmetic Circuits.	9
IV	**Sequential Logic & Circuits:** Latch, flip-flops, clocked and edge triggered flip-flops, timing specifications, asynchronous and synchronous counters counter design, Registers, types of registers. Analysis of simple synchronous sequential circuits, Introduction to Memories.	9
V	**Finite State Machine:** Introduction to Mealy and Moore circuits, State machine design, Advanced Topics based on Course.	9

Text Books	1.	Digital Electronics R P Jain McGraw Hill 2017 Second Edition
	2.	Digital Logic and Computer Design Morris Mano PHI 2017 review Second Edition
	3.	Digital Logic Design (Floyd: Digital Fundamentals With VHDL 10 / E)
Reference Books	1.	Digital Electronic Principles-Malvino PHI 2011-13 Seventh Edition
on line TL Material	1.	IIT's NPTEL lectures

Sr. No.	Name of Experiments
1	To study basic gates and verify their truth tables
2	To realize Basic gates (AND,OR,NOT) From Universal Gates(NAND & NOR)
3	To Design adder, subtractor circuit using a 4-bit adder IC
4	To study about full adder & verify its truth table
5	To design and implement encoder and decoder
6	To design and implement multiplexer and demultiplexer
7	To design and construct basic flip-flops
8	To design and construct of Synchronous Counter
Open Ended Experiments	
1	To verify the truth table of one bit and two bit Comparators using logic Gates
2	To design a 4 bit Binary to Gray code Converter, bit Gray to Binary code Converter, 3 bit Binary to Excess-3 code Converter.
3	Design of real time application using K-Map
Details of on line Laboratory Resource Material Instruction / Operating Manuals	
1.	Virtual Laboratory

Course Title: **Biomedical Engineering**										
Semester	I/II	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Odd/Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	A	---	---	2 Hrs.	1	---	---	—	25	—
Course Code	UECP104									
Teaching Mode	Offline	2 Hrs.			Total				25	
Duration of ESE	2 Hrs.					25				

Course Objectives	It helps students to understand importance of biological concepts in engineering fields.
	To understand application of engineering concepts in medical instrumentation.
Course Outcomes	CO1: Understand Human anatomy
	CO2: Relate various application of sensors for Biomedical applications with safety standards.
	CO3: Analyses and apply various biomedical diagnostic methods.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO 1	PO2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	**3**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**3**	**2**	**2**	**2**
CO2	**2**	**2**	**2**	**2**	**3**	**2**	**1**	**2**	**3**	**2**	**2**	**3**
CO3	**3**	**2**	**2**	**2**	**3**	**2**	**1**	**2**	**3**	**2**	**2**	**3**

Course Contents:

Unit	Contents	Hours
I	**Human Physiology and Anatomy:** Introduction to Human Physiology, Nervous system, Cardiovascular system,	4
II	**Biomedical Instrumentation**: Bio-electric Signals, Types of Electrodes, Electrodes for ECG, EMG, EEG, Transducers and sensors related to biomedical measurements, ECG Machine, B. P, Heart Rate, Heart Sound, Blood Flow Measurements. Electrocardiography, Pacemakers, Defibrillators, Biomedical Standards.	8
II	**Diagnostic Medical instruments**: X-ray, CT Scan, MRI, Ultrasonic Doppler Machine, Diathermy, Lasers in medical application, Robotics in medical application, Case studies, Advance topics in biomedical Engineering. Introduction to BCI. Application of AI in Biomedical.	8

Text Books	1.	Cromwell, “Biomedical Instrumentation and Measurement”, PHI.
	2.	R. S. Khandpur, “Biomedical Instrumentation”.
Reference Books	1.	Carr and Brown, “Biomedical Instrumentation”.
	2.	Webster, “Application and Design of Medical Instruments".

Sr. No.	Name of Experiments / Mini Projects/ Case Studies
1	Study of Human Physiology by Skeleton model
2	Design and perform Heart Rate Detection System using Arduino
3	To study and measure the EEG signals
4	To study and measure the ECG signals
5	To study and measure the EMG signals
6	Mini project
7	Open Ended Experiments

Course Title: **Introduction To Discrete Devices And Circuits**										
Semester	I/II	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Odd/Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	C	2 Hrs.	-	2 Hrs.	3	10	15	50	25	-
Course Code	UECL105 UECP105									
Teaching Mode	Offline	4 Hrs.			Total	75			25	
Duration of ESE	2 Hrs.					100				

Course Objectives	To give understanding on how current flows through the p-n junction and relating this phenomena to the characteristics and operation of the diodes, bipolar and field-effect transistors.
	To expose students to the function and application of the diodes, bipolar junction and field effect transistors in electronic circuits.
	To use appropriate experimentation techniques to evaluate circuit performance.
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: Relate operation of diodes, types of diodes and their role in design of simple electronic applications.
	CO2: Develop the capability to analyze and design simple circuits containing non-linear elements such as transistors using the concepts of load lines, operating points for various biasing methods.
	CO3: Classify Power amplifiers, Oscillators & Display Devices
	CO4: Interpret the operation of the Field Effect Transistor (FET), Metal Oxide Semiconductor Field Effect Transistor (MOSFET) and design FET circuits
	CO5: Demonstrate familiarity with basic electronic components and use them to design simple electronic circuits

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO 1	PO2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	3	3	3	2	1	1	1	1	2	3
CO2	3	3	3	3	3	2	1	1	1	1	2	3
CO3	3	3	3	3	3	2	1	1	1	1	2	3
CO4	3	3	3	3	3	1	1	1	1	1	2	3
CO5	3	3	3	3	3	1	1	1	1	1	2	3

Course Contents:

Unit	Contents	Hours
I	**Semiconductor Devices:** PN junction diode review, Half and full wave rectifiers, Zener Diode, Varactor Diode, Tunnel Diodes, Clippers and Clampers circuits	6
II	**BJT Transistors**- structure, Operations & characteristics, voltages and currents equations, CE, CB, CC configurations, Early Effect	6
III	**BJT Circuits** DC load line, Biasing circuits, Stability factor, thermal runaway, Compensation methods, h-parameters, Feedback Amplifiers,	6
IV	**Field Effect Transistor:** FETs – Drain and Transfer characteristics,-Current equations-Pinch off voltage and its significance, MOSFETs,	6
V	**Active and Passive sensors:** Temperature, humidity, light sensors, Piezo electrical Transducers, Relay	6

Text Books	1.	Electronics Devices and Circuits, S. Salivahanan, N Suresh Kumar, Tata McGraw-Hill 2008, Third Edition
	2.	Integrated Electronics Jacob MillmanTata McGraw-Hill, 2009, Second Edition
	3.	Electronics devices and Circuits and Theory Robert L. Boylestad, Louis Nashelsky, Pearson India, 2009, Tenth Edition
E--Books	1.	Electronics Devices and Circuits, S. Salivahanan
	2.	Solid State Electronic Devices, 6th Edition, Ben G.Streetman & Sanjiv Kumar Banerjee
Reference Books	1.	Electronic Devices & Circuits, Sanjiv Gupta
	2.	Microelectronics Circuits A. S. Sedra & K. C. Smith, Oxford University Press, 2013, Seventh Edition
	3.	Electronics Devices and Circuits, Nagrath I J Phi Learning Pvt Ltd, 2009, Third Edition.

on line TL Material	1.	Virtual Lab, Electronic Devices & Circuits, IIT Bombay http://vlabs.iitb.ac.in/vlab/electrical/index.html

*: Every practical will be performed on Bread Board

Sr. No.	Name of Experiments / Mini Projects/ Case Studies
0	Study of different electronic components
1	Observe and draw V-I Characteristics of PN Diode & LED Diode.
2	Observe and draw the V-I characteristics and Regulation characteristics of a Zener diode.
3	Design Clipper circuit using Diode.
4	Design Clamper circuit using Diode.
5	Obtain ripple factor of Half Wave/Full wave Rectifier circuit with & without filter
6	Draw the input and output characteristics of transistor connected in CE/CB/CC any one Configuration
7	Design bipolar junction transistor as a switch
8	Design Audio oscillator using BJT
9	Design Radio Oscillator using BJT
10	Design Oscillator for Laptop.
11	Draw the Drain and Transfer characteristics of a given FET in CS Configuration.
12	Draw the Drain and Transfer characteristics of a given MOSFET in CS Configuration.
Open Ended Experiments	
1	Design of Class B push pull power amplifier and observe cross over distortion.
2	Design Zener regulator circuits for Processor Motherboard.
3	Design of Simple analog application circuits.

Course Title: **Modeling of Digital Circuits**										
Semester	I/II	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Odd/Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	C	3 Hrs.	0	2 Hrs.	4	10	15	50	25	--
Course Code	UECL106 UECP106									
Teaching Mode	Offline	5 Hrs			Total	75			25	
Duration of ESE	2 Hrs.					100				

Course Objectives	To understand number system and optimization laws
	To apply knowledge on VHDL program in Combinational & Sequential
	To interpret complex problem in the field of digital system design
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: Solve the problems on Number system codes and their conversions.
	CO2: Create and design canonical logic forms
	CO3: To demonstrate basic knowledge VHDL fundamentals
	CO4: Design VHDL Programs
	CO5: Design real time digital applications

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO 1	PO2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	**3**	**3**	**3**	**2**							**1**	**3**
CO2	**3**	**3**	**3**	**2**							**1**	**3**
CO3	**3**	**3**	**3**	**2**							**1**	**3**
CO4	**3**	**3**	**3**	**2**							**1**	**3**
CO5	**3**	**3**	**3**	**2**							**1**	**3**

Course Contents:

Unit	Contents	Hrs
I	**D.C. Circuits:** Circuits Elements (R, L, C), Kirchhoffs Laws, Voltage source, Current Source (definition, characteristics of practical source, equivalent)	05
II	**Number Systems & Boolean Algebra:** Number system, Decimal, binary, octal, hexadecimal number system, 1s and 2s complement codes, Boolean algebra, De-Morgan's theorems, Logic Gates, canonical logic forms, sum of product & product of sums, Karnaugh maps.	08
III	**Combinational & Sequential circuits:** Introduction to combinational circuits, code conversions, decoder, encoder, multiplexers & De-multiplexer, binary adder, Subtractor, BCD adder, Latches, Flip-flops, counters, Shift Registers, Finite state Machine.	11
IV	**Introduction to VHDL:** Introduction to VHDL, Methodologies, design units, data objects, VHDL data types, Attributes, Concurrent and sequential, Structural statements, inertial and transport delays, delta delay, signal drivers.	08
V	**Combination Logic design:** Gates, decoder, encoder, multiplexer, De-mux, adder, Substractor, Latches, SR latch, Flip-Flops, Shift Registers, counters Subprograms – Functions, Procedures, generic, generate, package, IEEE standard logic library.	08

Text Books	1.	Digital Electronics R P Jain McGraw Hill 2017 Second Edition
	2.	Digital Logic and Computer Design Morris Mano PHI 2017 review Second Edition
	3.	VHDL Primer – J Bhasker – Pearson Education
EBooks	1.	Free Range VHDL-Bryan Mealy, Fabrizio Tappero
Reference Books	1.	Digital Electronic Principles-Malvino PHI 2011-13 Seventh Edition
	2.	Digital System Design – John Wakerley
on line TL Material	1.	IIT's NPTEL lectures

Sr. No.	Name of Experiments / Mini Projects/ Case Studies
1	Design 4:1 multiplexer and write a VHDL code for same using data flow style of modeling.
2	Design Arithmetic and Logic Unit for 16 bit operation (Addition,Subtraction,Multiplication,Division,ORing,ANDing,XORing,XNORing)
3	Design BCD to seven segment decoder & display “GHRCEM”.
4	Design half adder and full adder and write a VHDL code for same using dataflow style of modeling.
5	Design & write Test bench for an 8 bit adder having range 0 to 255 decimal.
6	Design 4-to-16 decoder by combining two 3-to-8 decoders and write a VHDL code for Same using structural style of modeling.
7	Write a VHDL code for to design Flip-Flop (D, T, and SR) using behavioral style of modeling.
8	Write a VHDL code for 3-bit up-down counter using sequential style of modeling.
9	Write a VHDL code for high speed two-pole switch for power controlling on FPGA using sensitivity list.
10	Design of Finite state machine to detect a sequence “1011”using Mealy model and write VHDL code for the same.
Open Ended Experiments	
1	Write a VHDL code for to divide clock frequency of 50 Mhz.
2	Write a code for 8 Bit RAM Module
	Details of on line Laboratory Resource Material Instruction / Operating Manuals
1.	Virtual Lab
8	Write a VHDL code for 3-bit up-down counter using sequential style of modeling.
9	Write a VHDL code for high speed two-pole switch for power controlling on FPGA using sensitivity list.
10	Design of Finite state machine to detect a sequence “1011”using Mealy model and write VHDL code for the same.
Open Ended Experiments	
1	Write a VHDL code for to divide clock frequency of 50 Mhz.
2	Write a code for 8 Bit RAM Module
	Details of on line Laboratory Resource Material Instruction / Operating Manuals
1.	Virtual Lab

Course Title: **Internet of Things**										
Semester	I/II	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Odd/ Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	A	-	-	02 Hrs.	01	-	-	-	25	-
Course Code	UECP107									
Teaching Mode	Offline	02 Hrs.			Total	-			25	
Duration of ESE	-					25				

Course Objectives	To enable students to understand scope of Internet of things in Industry
	To introduce the concept of Internet of things
	To develop and apply Advance method for Implementation of Internet of Things
Course Outcomes	CO1: Analyze various IoT devices and its technology.
	CO2: Select and use of appropriate IoT technologies & Gateways protocols for application development.
	CO3: Design and development of IoT application with the use of different cloud technology.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes											
	PO 1	PO2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	1	3	2	3							3
CO2	2	1	3	2	3							3
CO3	2	2	3	2	3						2	3

Course Contents:

Unit	Contents	Hours
I	**Architecture of IoT** Introduction of IoT, Introduction Industry 4.0, Need of IoT for Industry 4.0, Block Diagrams of IoT System, Virtual Private server and IoT Cloud, Application Programming Interface(API)	6
II	**Development of Things using Arduino Platform:** Introduction of IoT Node with Sensor and Actuator, Interface sensors & devices, NodeMCU and ESP 32 wifi Microcontroller, Network: LORA, NRF, Xbee, IoT Gateway. **Communication protocol :** Introduction of Internet Protocol , Internet Layer: IP Transport layer-TCP,UDP , Application Layer- HTTP, MQTT, FTP, CoAP, SPDY.	6
III	**IoT Platform and Application :** Customized IoT Platform using Virtual Private Server, Amazon Alexa, Google API, Blynk, Cayenne, Thingsboard, Thigspeak. Case Study of applications.	8

Text Books	1.	Samuel Greengard ,The Internet of Things" by Samuel Greengard
	2.	Klaus Schwab ,The Fourth Industrial Revolution" by Klaus Schwab Author:
	3.	Cuno Pfister Author: Cuno Pfister ,Getting started with Internet of Things
EBooks	1.	IoT and Smart Building Data – by Senseware.
	2.	SkyHook, Everything You Need to Know About LPWAN Location
Reference Books	1.	Cuno Pfister, Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud (Make: Projects) 2018
	2.	Adrian McEwen , Designing the Internet of Things Kindle Edition

List of Practical

Sr.No.	Name of Experiments
1	To perform programming for Interfacing NodeMCU to Cloud Thingsboard
2	To perform programming for sending DHT Temperature sensor data to cloud.
3	To perform programming for control home appliance using NodeMCU controller and cloud.
4	Design and interface Water level indicator using NodeMCU controller
5	Perform Raspberry PI program to interface of network device [wifi, GSM, GPRS] for device communication
6	Design and Perform digital Notice Board Application Using Raspberry pi3 Mega Board using
7	Design and Perform smart Garbage indication system using NodeMCU controller and GLCD.
8	Design and Perform IOT Based Agriculture monitoring system using Wifi ESP8266 [Thinkspeak Cloud]
9	Project Module 6: Perform Automatic Plant Irrigation controlling System using NodeMCU and Cloud
10	Open Ended Experiment: