Integral University, Lucknow

Effective from Session: 2020-2021							
Course Code	CS-125	**Title of the Course**	Digital Workforce Skills	**L**	**T**	**P**	**C**
Year	I	**Semester**	I	0	0	2	1
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	To study the emerging technologies that forms the software foundation of digital workforce skills. To study the digital aspects of turning data into insight with friendly experience of complex applications. To understand the specialized aspects of data discovery and exploration for data analytics and preparation. To study different types Case studies on the current research and applications of the digital workforce skill in industry.						

Course Outcomes	
CO1	Students must be able to understand the building blocks of Software Digital Workforce Skills.
CO2	Students must be able to articulate the emerging technologies that should embrace a mindset.
CO3	Students must be able to understand the specialized aspects of Ad Hoc analysis and Advance analysis with the help of different real-time case studies.
CO4	Students must be able to represent the analytical aspects of cloud, analytics, artificial intelligence.
CO5	Students must be know the recent research trends related to unlocking hidden values in unstructured data and content inside an image.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Getting started and Technology and workplace	• What are the emerging technologies that we should know deeper: Cloud, Data, Analytics,AI, Machine Learning, Block Chain • A Day in the Life of a Digital Worker • How is the Digital Workplace different from the Workplace of today? • Skills for the Future Workforce (Sensemaking, Social Intelligence, New Media Literacy,Design Mindset, Virtual Collaboration) • Types of collaboration: Human to human, Human to Machine and machine to human, Machine to machineKey drivers for Collaboration: - Real time - Content Management, i.e., sharing of large content, without replication - Best use of network bandwidth - Security • Diving a level deeper – what are the technology building blocks for collaboration • Inform of the latest news updates. • Get material needed for work from communities • Understands colleagues and contributions • Investigates organization reporting line • Chats with colleague Instantly • Locate expertise in the organization with expert finder • Participate in discussions and contributes to communities • Contribute and share file with communities • Co-author and Co-edit documents • Participate in online meeting • Interesting Use Cases in different domains • Host an online meeting Lab: Simulation Preparation Lab: Information collection from News, Communities and documents Lab: Preparation for a meeting, hosting a meeting and sending the notes	2	1

2	Impact of technology and work flow	- Communicating and collaborating digitally - Turn data into insight - Go digital with forms and processes - User friendly experience - Real time case and discussion in depth - Getting insight from the case - Identifying the benefits of growth mindsets - Growth mindsets vs fixed mindsets - Embracing a Growth Mind set - Cloud – the game changing layer Lab1: Assemble Mobile Application Lab 2: Insights from the Real time case study Lab 3: Creating a solution through processes and forms Lab 4: Skills for the future class game	2	2
3	Turning Data into sights	- What is data and its types - Usefulness of data and its impact - Types of Analytics - Analytics Driven organization benefits - What is Business Intelligence and its types - Data Insights, Discovery, exploration - Reporting and Dashboarding - Ad Hoc Analysis and advanced analysis - A story of two halves - Storytelling and case studies Lab: Uploading and Understanding the data sets Lab: Consolidating the data sets, creating data sets and refining the module, Lab: Exploring datasets with asking a question, data visualization, building visualization using datasets and data slots Lab: Defining predictive models and hypothesis Lab: Filtering, drilling and finding the root cause to the problems.	2	3
4	Build Online forms with solutions	- Build application on Cloud - Review application design - Gather design elements - Creating a new application and choosing a layout - Designing the forms, configuring the labels and inputs field - Define workflow and approval steps - Define roles and Control access - Deployment and launching an application - Use and Process Application - Review Application Data Analytics Lab: Getting started with cloud and creating an application theme and nameLab: Choosing a layout and design for the application Lab: Selecting the name and forming the fields for an application Lab: Distributing roles, creating relationship and forming values Lab: Working on securities - Setting administrative, user and staff rights. Lab: Review and testing an application.	2	4
5	Experience Artificial Intelligence with IBM Watson	- Intelligent Chatbot and Virtual agents across variety of channels - Unlocking hidden values in unstructured data - Ability to tag content inside an image - Ability to convert speech to text and text to speech - Translating one language to another	2	5

		• Understanding the content tone, personality and emotional stage		
		• Use cases and functionalities		
		Lab 1: Watson Assistant		
		Lab 2: Synthesizes natural		
		sounding speech from textLab		
		3: Natural Language classifier		
		and translator		
		Lab 4: Natural Language Understanding and knowledge studio Lab 5: Tone analyzer and personality Insights		

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

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	EC-101	**Title of the Course**	Basic Electronics	**L**	**T**	**P**	**C**
Year	I	**Semester**	I	3	1	0	4
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	This course provides the student with the fundamental skills to understand the basic of semiconductor and components like diode, transistor, FET, MOSFET and operational amplifier It will build mathematical and numerical background for design of electronics circuit & component value. Students equipped with the knowledge and training provided in the course will be able to participate in design , development and operation in the different area of electronics system .						

Course Outcomes	
CO1	Understand the current voltage characteristics of semiconductor devices. Identify the unique vocabulary associated with electronics and explain the basic concepts of Semiconductor diodes such as pn junction diode, characteristics and ammeters, DC load line, Zener diode. To apply the basics of diode to describe the working of rectifier circuits such as Full and half wave rectifiers.
CO2	Analyze dc circuits and relate ac models of semiconductor devices with their physical Operation Draw and explain the structure of bipolar junction transistor. Explain the operation of each device in terms of junction bias voltage and charge carrier movement. Identify and explain the various current components in a transistor.
CO3	Design and analyze of electronic circuits Describe the application of transistors for Current and voltage amplification. Also, to describe the characteristics of different configurations of the transistor. Describe DC load line and bias point. List, explain, and design and analyze the different biasing circuits.
CO4	Evaluate frequency response to understand behavior of Electronics circuits. Sketch, explain and design the amplifier circuit for given specification and analyze them discuss oscillator principles, oscillator types, and frequency stability as it relates to its operation. Analyze and design the different types of Oscillators. Discuss ideal and practical operational amplifier (op amp) their electrical parameters, need for op amp. Explain and design different application circuits using op amp
CO5	List and explain the different number system. Solve examples on converting one form of number system to another form. State Boolean laws and theorems. State and explain the different logic gates using truth table. Analyze and design different adder circuits.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Semiconductor Diode	Mechanism of Conduction in Semiconductors: Mobility and Conductivity, Electrons and holes in an intrinsic semiconductors, Donor and acceptor impurities, Fermi level, Carrier densities in semiconductor, Hall effect, Diffusion, Recombination. Junction DiodePN junction characteristic and its equation, Effect of Temperature, Depletion Layer, Piecewise linear diode model, Breakdown Mechanism, Zener and Avalanche Breakdown characteristics. Diode as circuit element Half wave and full wave rectifiers, capacitive filters, Zener diode as a regulator, clamper, clipper and voltage double, special diode- LED, Schott key diodes.	8	1
2	BJT characteristics and circuits	Transistor Operation, CE, CB, CC configuration and their characteristics, transistor biasing circuits, stability factor, h- parameter model (low frequency), computation of Ai, Av, Ri, Ro of single transistor CE amplifier configuration.	8	2
3	Field Effect Transistors	JFET: Construction and principle of working, Drain / Transfer characteristics, basic amplifier circuits, Biasing of JFETMOSFET: Enhancement and depletion type N-channel, P-channel, Drain / Transfer Characteristics.	8	3
4	Switching theory & Logic gates	Number system, Conversion, Compliments, Addition and Subtraction, BCD numbers, Boolean algebra, Canonical form, Logic gates, Minimization of logical function using Karnaugh map.	8	4
5	Operational Amplifier	Concept of ideal operational amplifier (inverting and non-inverting) and its applications, Inverter, integrator, differentiator, voltage follower, summing and differential amplifier Electronic Instruments: Digital Multimeter (block diagram approach), CRO (block diagram and its working), Measurement of voltage, phase, frequency. Double beam CRO (block diagram & it's working).	8	5
Reference Books:				

1.	Bolyested&Nashekey / Electronic Devices and Circuit Theory
2.	Milliman &Halkias: Integrated Electronics
3.	J. S. Katre: Electronics Engineering

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3	3					1			
CO2	3	2	2	1	2	2	2		1	3			1	2	
CO3	3	2	3	1	1	2	3				1				3
CO4	3	2	3	1	2	3	2	2		1			2	2	1
CO5	3	2	1	1		2	1						3	1	

2- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	LN151	**Title of the Course**	Basic Professional Communication Lab	**L**	**T**	**P**	**C**
Year	I	**Semester**	I	0	0	2	1
Pre-Requisite	10+2	**Co-requisite**	**U.G. Program**				
Course Objectives	- The course aims to educate the students in both the artistry and utility of the English language for professional purposes through the study of language and literature. - The key component of the various types of professional communication is basically communication in the English language which is now a global language. - The Department of Languages caters to the needs of the students aspiring for training, expertise and excellence in professional communication with a marked emphasis on English for Specific/Special Purposes (ESP). - Students will be given new insights into the concepts of soft skills & professional communication to boost their confidence which will help them choose and build a better career which depends not only on the hard skills, but on one's soft skills & professional ethics also. - The course will help them overcome their fear & anxiety of public speaking & guide them to be a good & effective communicator whom people love to hear.						

Course Outcomes	
CO1	Students will be introduced to the basic understanding of communication and Professional Communication. Knowledge of Professional, cultural and cross-cultural communication will be imparted. Meaning and process of communication, verbal and nonverbal communication will be focused. Basic Understanding of communication and Professional/Business Communication will be provided. They will also learn & practice how to introduce oneself in professional setting & how to manage speaking anxiety. .
CO2	Corrections in basic English sounds and correct pronunciations will be practiced by various Listening exercises & word games to help them become better conversationalist.
CO3	Basic tools of communication and improvement in communicative competence. Improvement in communicative competence will be done by using various software applications, showing them cultural movies & involving them in exercises like small & situational talk.
CO4	Phonetic Alphabet and Phonetic Transcriptions will be taught & practiced to improve vocal clarity & pronunciation. Understanding the structural and functional grammar and basic structure of language.
CO5	Intonation & Stress will be practiced to make them learn how paralinguistic features dramatically affect meaning & how it can help one in becoming a persuasive & engaging speaker.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Introduction**	Difference between Introduction and Description, SWOT Analysis	**6**	**CO 1**
2	**Software -I**	Listening exercises, Pronunciation improvement through self- testing, Vocabulary improvement through word games	**6**	**CO 2**
3	**Software – II**	Conversational skills, Exercises based on Language Skills/ Small talk, Cultural movies	**6**	**CO 3**
4	**Phonetics**	Phonetic Alphabet and Phonetic Transcriptions	**6**	**CO 4**
5	**Non-verbal communication**	Intonation and Stress	**6**	**CO 5**

Reference Books:

1. Gerson, Sharon J. *Technical Writing: Process and Product* (5th edition). Prentice Hall, 2005.

2. K. Floyd, *Interpersonal Communication: The Whole Story*. McGraw Hill, 2009.

3. Greenbaum, Sidney and Nelson Gerald, *An Introduction to English Grammar*. Routledge, 2009.

4. Swan, Michael, *Practical English Usage*. OUP, 2005.

5. Murphy, Raymond. *English Grammar in Use*. Cambridge University Press, 2019.

6. Kumar, Sanjay and Pushp Lata., Communication Skills. Oxford University Press, Oxford 2011.

7. Raman, Meenakshi, and Sangeeta Sharma. Technical Communication: Principals and Practice. Second Edition, Oxford University Press, 2012.

8. Gerson, Sharon J. *Technical Communication: Process and Product* (9th edition). Longman Pub., 2016.

e-Learning Source:
1. **https://ndl.iitkgp.ac.in./**
2. **https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=9RA537jM1m7VD3VCoav4lQ==**
3. **https://library.iul.ac.in/**

PO-PSO CO	**Course Articulation Matrix: (Mapping of COs with POs and PSOs)**
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3	3	N.A.	N.A.	N.A.	N.A.	N.A.	3	3	3	3	3	N.A.
CO2	3	3	3	3	3	3	3	N.A.	N.A.	N.A.	N.A.	N.A.	3	3	3	3	3	N.A.
CO3	3	3	2	3	3	3	3	N.A.	N.A.	N.A.	N.A.	N.A.	3	3	3	3	3	N.A.
CO4	3	3	2	3	3	3	3	N.A.	N.A.	N.A.	N.A.	N.A.	3	3	3	3	3	N.A.
CO5	3	3	3	3	3	3	3	N.A.	N.A.	N.A.	N.A.	N.A.	3	3	3	3	3	N.A.

3- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Teaching and Learning methods	Flipped Classrooms, Concept Mapping, Information-Based Approach, Personal-Response Approach, Language-Based Approach, Paraphrastic Approach, Moral-Philosophical Approach and Stylistics Approach
List/Topics/Activities Planned that are beyond Syllabus	Information-Based Activities, Personal-Response Activities, Language-Based Activities, Periphrastic Activities, Moral-Philosophical Activities, and Stylistics Activities, Presentations, Small talk, Situational talk, role playing, Group Discussions, Assignments are used as a medium to work on cognitive development/growth.

Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	EE103/EEE103	**Title of the Course**	Basic Electrical Engineering	**L**	**T**	**P**	**C**
Year	I	**Semester**	I	3	1	0	4
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	- Knowledge and concept of D.C Circuit Analysis and Network Theorems Circuit. - Use of Steady State Analysis of Single-Phase AC Circuits AC fundamentals. - Knowledge and concept of Three Phase AC Circuits Three phase system and measuring devices. - Basic concepts of Power System and Transformer - Study of Electromechanical energy conversion devices: AC/ DC Machines.						

Course Outcomes	
CO1	Know about the concept of D.C Circuit Analysis and Network Theorems Circuit.
CO2	Steady State Analysis of Single-Phase AC Circuits AC fundamentals.
CO3	Know about concept of Three Phase AC Circuits Three phase system and measuring devices.
CO4	Layout of Power System and transformer
CO5	Know about Electromechanical energy conversion devices: AC/ DC Machines

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	D.C CIRCUIT ANALYSIS AND NETWORK THEOREMS	**Circuit concepts:** Concept of network, Active and passive elements, linear network, unilateral and bilateral elements, source transformation, Kirchhoff's Law: loop and nodal methods of analysis, star delta transformation. **Network theorems:** Superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem.	8	1
2	STEADY STATE ANALYSIS OF SINGLE-PHASE AC CIRCUITS	**AC fundamentals:** Average and effective value of Sinusoidal waveform, form factor and peak factor, concept of phasor, phasor representation of sinusoidally varying voltage and current, analysis of series RLC circuits. Apparent, active and reactive powers, power factor, causes and problems of low power factor, power factor improvement, resonance, bandwidth and quality factor in series circuit.	8	2
3	THREE PHASE AC CIRCUITS&MEASURING INSTRUMENTS	**Three phase system:** Its necessity and advantages, meaning of phase sequence, star and delta connections, balanced supply, line and phase voltage/current relationship. **Measuring Instruments:** Types of instruments: construction and working principle of PMMC, MI type instruments, induction type energy meter.	8	3
4	INTRODUCTION OF POWER SYSTEM, MAGNETIC CIRCUIT AND SINGLE-PHASE TRANSFORMER	**Introduction of Power System:** General layout of electrical power system, standard generation, transmission and distribution voltage levels, concept of grid. **Magnetic circuit:** Concepts, analogy between electric and magnetic circuit. **Single Phase Transformer:** Principle of operation, construction, emf equation, equivalent circuit, losses, efficiency, Introduction to auto transformer.	8	4
5	PRINCIPLE OF ELECTROMECHANICAL ENERGY CONVERSION	**DC Machines:** Types, emf equation of generator and torque equation of motor, applications. **Three Phase Induction Motor:** Types, principle of operation, applications. **Single Phase Induction Motor:** Principle of operation and introduction to methods of starting, applications. **Three Phase Synchronous Machines:** Principle of operation of alternator, synchronous motor, applications.	8	5
Reference Books:				
1.	V.Deltoro, "Principle of Electrical Engg." PHI, 2009.			
2.	M.A Mallick, Dr. I. Ashraf, "Fundamental of Electrical Engg," CBS Publishers, 2010.			
3.	A. Hussain, "Basic Electrical Engg" Dhanpat Rai & sons, 2007.			

4. J Nagrath, "Basic Electrical Engg", TMH, 2010.

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	3						3	3	3	2
CO2	3	3	3	2	1	1						2	3	2	1
CO3	3	2	1	1	2	2	3					3	3	3	2
CO4	3	2	2	2	3	3						2	3	2	2
CO5	3	1	1	1	1	2	1					2	3	3	2

4- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	EE104/EEE104	**Title of the Course**	Electrical Engineering Lab	**L**	**T**	**P**	**C**
Year	I	**Semester**	I	0	0	2	1
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	Knowledge and concept of D.C Circuit Analysis and Network Theorems Circuit. Use of Steady State Analysis of Single-Phase AC Circuits AC fundamentals. Knowledge and concept of Three Phase AC Circuits Three phase system and measuring devices. Basic concepts of Power System and Transformer Study of Electromechanical energy conversion devices: AC/ DC Machines.						

Course Outcomes	
CO1	Know about the concept of D.C Circuit Analysis and Network Theorems Circuit.
CO2	Steady State Analysis of Single-Phase AC Circuits AC fundamentals.
CO3	Know about concept of Three Phase AC Circuits Three phase system and measuring devices.
CO4	Layout of Power System and transformer
CO5	Know about Electromechanical energy conversion devices: AC/ DC Machines

S. No.	**List of Experiments**	**Contact Hrs.**	**Mapped CO**
1	Verification of Thevenin's Theorem.	2	1
2	Verification of Superposition Theorem.	2	1
3	Verification of Maximum Power Transfer Theorem.	2	2
4	To study V-I characteristics of diode.	2	2
5	To study the input & output characteristics of BJT in CE configuration.	2	3
6	To study the full wave rectifier circuit with &without filter and determine the ripple factor.	2	3
7	To study the phenomenon of resonance in series RLC circuit.	2	4
8	Determination of losses in single phase transformer by OCT and SCT.	2	4
9	To calibrate a single-phase induction type energy meter.	2	5
10	To study the running and reversing of a three phase SCIM.	2	5
11	Study of OP Amp based inverting and non-inverting amplifier.	2	5

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3		1				3	3	3	2
CO2	3	2	3	2	1	1						2	1	2	1
CO3	3	2	1	1	2	2	3		2			3	3	3	2
CO4	3	2	3	2		3						2	2	2	2
CO5	3	1	2	1	1	2	1					2	3	3	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2015-16

Course Code	LN-101	Title of the Course	Professional Communication-I	L	T	P	C
Year	I	Semester	I	3	1	0	4
Pre-Requisite	None	Co-requisite	None				
Course Objectives		• Developing the art of communication and learning language though literature • Knowledge of Professional, cultural and cross-cultural communication • Basic concept of structural and functional grammar; meaning and process of communication, verbal and nonverbal communication • Knowledge of reading and comprehension of general and technical articles, precise writing, summarizing, abstracting • Basic concepts of group discussion, organizing seminars and conferences • Development of Reading and Writing skills					

Course Outcomes	
CO1	Basic Understanding of communication and Professional Communication
CO2	Basic knowledge of structural and functional grammar. Learning Language through literature
CO3	Basic tools of communication and improvement in communicative competence
CO4	Understanding the basic grammar and basic structure of language
CO5	Enhancement of writing skills in English i.e., writing application, report and various types of letters

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction to Communication	Definition, Types of Communication, Channels of Communication, Language.	4	1
2	Interpersonal Communication	Culture- Definition and Types, Communication and Culture including Cross Cultural Communication.	6	2
3	Written Communication	Letter Writing- Informal and Formal - Letters of Enquiry, Letters of complaint, Response to complaints and enquiries, Self-Exploration through description.	8	3
4	Grammar through Worksheets	Situational activities and modules- Parts of Speech, Tenses, Articles, Modals, Active and Passive, Subject-Verb Agreement, Direct and Indirect Speech, Degrees of comparison	12	4
5	Grammar through Worksheets Continued	Sentences: Simple, Compound, Complex, Declarative, Assertive, Negative, Interrogative, Exclamatory, Imperative.	10	5

Reference Books:

1. Wren PC and Martin H, "High School Grammar and Composition", S. Chand and Co.

2. K. Floyd, "Interpersonal Communication: The Whole Story" (2009), McGraw Hill.

3. Greenbaum Sidney and Nelson Gerald, "An Introduction to English Grammar", Pearson.

4. Swan Michael, "Practical English Usage" OUP, 2005.

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3		1				3	3	2	2
CO2	3	2	3	2	1	1						2	1	2	1
CO3	3	2	1	1	1	2	3					2	1	3	2
CO4	3	2	3	2		3						1	2	2	2
CO5	3	2	2	1	1	2	1					2	3	3	2

5- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	ME103	**Title of the Course**	ENGINEERING GRAPHICS	**L**	**T**	**P**	**C**
Year	I	**Semester**	I/II	0	0	2	1
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	• Main objective is to teach the fundamentals of Engineering Graphics. • This course enhances visualization skill and imagination power. • To understand techniques of drawings for various fields of engineering • To improve their technical communication skill in the form of communicative drawings.						

Course Outcomes	
CO1	Describe the fundamentals of engineering drawing, use of geometrical instruments and drawing steps
CO2	To understand the concept of projection and acquire visualization skills, draw the projection of points, lines and planes.
CO3	Classify solids and projection of solids at different positions
CO4	To get the exact sectioned view of solids and development of their surfaces.
CO5	To draw isometric projection and perspective views of an object.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Lettering and geometrical constructions	Describe the fundamentals of engineering drawing, use of geometrical instruments and layout for initial drawing.	2	CO1
2	Orthographic projections of points	Describe the fundamentals orthographic projections and use of geometrical instruments and layout for initial drawing.	2	CO2
3	Projections of lines	Describe the fundamentals of projections of lines and use of geometrical instruments and procedure for the drawing.	2	CO2
4	Projections of solids	Describe the fundamentals of projections of solids and use of geometrical instruments and procedure for the drawing.	2	CO3
5	Sectioning of solids	Describe the fundamentals of sectioning of solids and use of geometrical instruments and procedure for the drawing.	2	CO4, CO3
6	Isometric Projections	Describe the fundamentals of Isometric projections and use of geometrical instruments and procedure for the drawing.	2	CO5
7	Production drawing	Describe the fundamentals of production drawing.	2	CO1, CO2

Reference Books:
Engineering graphics by Pradeep Jain
Engineering graphics by Krunal Patel

e-Learning Source:
https://www.youtube.com/watch?v=p62LPzFqGQw&list=PLp6ek2hDcoNCjoRLQ4rjpCozisCACBxKA
https://www.youtube.com/watch?v=VrU73IwRyc4&list=PLLv_2iUCG87Bw9XPfEF3r3EW5UlAOv8iz

PO-PSO CO	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3								1	2		3	3		3
CO2	3	2	2						1	2		3	3		3
CO3	3	2	2						1	2		3	3		3
CO4	3	2	2						1	2		3	3		3
CO5	3	2	2						1	2		3	3		3

6- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	MT-101	**Title of the Course**	Engineering Mathematics-I	**L**	**T**	**P**	**C**
Year	I	**Semester**	I	3	1	0	4
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives		The course is aimed to develop the skills in mathematics which is necessary for grooming them into successful engineering graduate. The topics introduced will serve as basic tools for specialized studies in science field.					

Course Outcomes	
CO1	Able to calculate rank of matrix, characteristic equation & characteristic roots & use the applicability of Cay lay Hamilton Theorem to find inverse of matrix which is very important in many engineering applications.
CO2	To develop ability to solve higher derivative, expansion of functions in ascending power of variable & partial derivatives.
CO3	Develops ability to solve Jacobian, error and approximation and Extrema of the function.
CO4	Learn the evaluation policy of some special function like gamma & Beta function. & Their relation which is helpful to evaluate some definite integral arising in various branch of Engineering.
CO5	Able to determine vector differentiation and integration.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Differential Equations	Linear differential equations of first order, Linear differential equations of higher order with constant coefficients, Complementary functions and particular integrals, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent and independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).	8	1
2	Laplace Transform	Laplace transform, Existence theorem, Laplace transform of derivatives and integrals, Unit step function, Dirac-delta function, Laplace transform of periodic functions, Inverse Laplace transform, Convolution theorem, Applications to solve simple linear and simultaneous differential equations.	8	2
3	Fourier Series and Partial Differential Equations	Periodic functions, trigonometric series, Fourier series of period 2π, Euler's formulae, functions having arbitrary period, change of interval, Even and odd functions, Half range sine and cosine series. Introduction of partial differential equations, linear partial differential equations with constant coefficients of second order and their classifications to parabolic, elliptic and hyperbolic forms with illustrative examples.	9	3
4	Applications of Partial Differential Equations	Method of separation of variables for solving partial differential equations, Wave equation up to two-dimensions, Laplace equation in two-dimensions, Heat conduction equations up to two dimensions, Equations of transmission Lines.	8	4
5	Basic Statistics and curve fitting	Mean, Median, Mode, Standard deviation and Variance, Method of least squares, Curve fitting of straight line and parabola.	7	5

Reference Books:
E. Kreyszig Advanced Engineering Mathematics, Wiley Eastern Ltd.
2. Jaggi and Mathur Advanced Engineering Mathematics, Khanna Publication.
3. B. S. Grewal Higher Engineering Mathematics, Khanna Publication.
4. Dennis G. Zill Advanced Engineering Mathematics, CBS Publication.

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3	3					1			
CO2	3	2	2	1	2	2	2		1	3			1	2	
CO3	3	2	3	1	3	2	3				1				3
CO4	3	2	3	1	3	3	2	2		1			2		
CO5	3	2	1	1	3	2	1						3		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	PY-101	**Title of the Course**	Physics	**L**	**T**	**P**	**C**
Year	I	**Semester**	I	3	1	0	4
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives		The purpose of this undergraduate course is to impart basic knowledge of fundamental concept of physics which is necessary for a strong engineering knowledge base.					

Course Outcomes	
CO1	To analyze the connection between daily life observations and science. To realize that apparently different ideas of Optics such as Interference and Diffraction have interrelationship between them. To realize the simplicity of ideas involved in explaining complex phenomenon.
CO2	To grow in ideas of different aspect of light and develop connection between daily life applications and science To analyze the process of development of a new theory while dealing with Polarization. To correlate that the conceptualization of an idea is far ahead than its practical realization while dealing with LASER. To grow in realization of totally different manifestation of light. To find the most recent applications of light in terms of communication and storage of data. To realize that how the design of complex systems is based on the simple ideas.
CO3	To grow in developing connection between philosophy and science. To find that seemingly different ideas such as Optics and Mechanics have interrelationship between them. To understand the process of development of a new theory and its application in life. To realize the requirement of power of imagination.
CO4	To grow in developing the connection between philosophy and science To find that seemingly different ideas such as Compton Effect and Quantum Theory have interrelationship between them. To understand and analyze the process of development of a new theory and how the development of one idea leads to the development of a apparently different idea.
CO5	To grow in developing connection between daily life utility and material science. To realize that apparently different materials with respect to Electric and Magnetic properties have inter relationship between them. To evaluate that how totally different manifestation of Modern Science leads to new technology.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Electrostatics	Boundary conditions and Boundary value problems in electrostatics, The Uniqueness theorem, Laplace and Poisson's equations in electrostatics and their applications, method of electrical images and their simple applications, energy stored in discrete and continuous system of charges.	8	1
2	Wave Optics	Methods of formation of coherent sources, Theory of Interference, Fresnel's Biprism, Displacement of Fringes, thin film interference, Newton's ring. Fraunhoffer diffraction at single slit and grating, Rayleigh's criterion of resolution, resolving power of grating.	8	2
3	Optical activity and Modern Optics	Production of plane polarized light by reflection and Double refraction, Nicol prism. Optical activity, Fresnel's theory, polarimeter (Laurent and Biquartz). Principle of fiber optics, numerical aperture, attenuation, dispersion in optical fibers, material dispersion, waveguide dispersion, intermodal and intramodal dispersion, Pulse dispersion in step index fiber, Main components of laser, Einstein's coefficients, He-Ne laser, Nd-YAG laser and their applications.	8	3
4	Properties of Matter and Relativistic Mechanics	Viscosity, Poiseuille's equation, Frame of reference, Michelson-Morley experiment and its implications, Galilean transformation equations, Einstein's postulates, Lorentz transformation equations and their consequences, energy mass relation, relativistic kinetic energy.	8	4
5	Quantum Physics-	Compton effect, Basic postulates of quantum mechanics, Wave function and its physical admissibility, orthogonality and normalization of wave functions, Heisenberg's uncertainty principle (no derivation) and its applications to (non-existence of electron in nucleus, Bohr's radius), Schrodinger's equation and its application to particle in 1-D box and finite well.	8	5
Reference Books:				

1.	Fundamentals of Optics by Jenkins and White.
2.	Optical Fiber Communication by Gerd Keiser.
3.	Concepts of Modern Physics by Arthur Beiser.
4.	Introduction to Special Theory of Relativity by Robert Resnick.
5.	Quantum Physics by Eisberg.
6.	Introduction to Nanotechnology by Poole Owens, Wiley India.
7.	Solid State Physics by S.O. Pillai, New Age Publications

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	3	1	3	3	3	2	1	3			
CO2	2	2	2	2	2	3	2	2	2	2	2	2	1		3
CO3	3	3	1	3	3	1	3	3	3	1	3	3		2	
CO4	2	2	2	3	1	2	2	2	2	2	3	1	3		
CO5	2	1	1	1	2	2	2	2	1	1	1	2			1

7- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	PY104	**Title of the Course**	PHYSICS LAB	**L**	**T**	**P**	**C**
Year	I	**Semester**	I	0	0	2	1
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	The purpose of this undergraduate course is to impart practical knowledge of the concepts through different experiments related to its theoretical course						

Course Outcomes	
CO1	To demonstrate how interference takes place by division of amplitude and by division of wavefront.
CO2	To demonstrate the practical applications of polarization phenomenon in finding the specific rotation, refractive index and Brewster's angle.
CO3	To demonstrate the practical application of Fraunhoffer diffraction in wavelength and focal length calculation.
CO4	To demonstrate the magnetic and heating effect of current in finding the magnetic field and Stefan's constant.
CO5	To demonstrate how to calculate the energy band gap of a semiconductor material and viscosity of a liquid

S. No.	List of Experiments	Contact Hrs.	Mapped CO
1	To determine the wave length of monochromatic light by Newton's ring.	2	1
2	To determine the wave length of monochromatic light with the help of Fresnel's Biprism.	2	1
3	To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.	2	2
4	To determine the specific rotation of cane sugar solution using Biquartz polarimeter.	2	2
5	To determine the wavelength of spectral lines using plane transmission grating.	2	3
6	To determine the Brewster's angle and refractive index of material with the help of a laser source.	2	3
7	To determine the variation of magnetic field along the axis of a current carrying coil and then to estimate the radius of the coil.	2	4
8	To verify Stefan's law by electrical method.	2	4
9	To determine the energy band gap of a given semiconductor material.	2	5
10	To determine the viscosity of a liquid.	2	5

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3		1				3	3	3	2
CO2	3	2	3	2	1	1						2	1	2	1
CO3	3	2	1	1	2	2	3		2			3	3	3	2
CO4	3	2	3	2		3						2	2	2	2
CO5	3	1	2	1	1	2	1					2	3	3	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	CH101	**Title of the Course**	Chemistry	**L**	**T**	**P**	**C**
Year	I	**Semester**	II	3	1	0	4
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	The course is aimed to develop the skills in Chemistry which is necessary for grooming them into successful engineering graduate. The topics introduced will serve as basic tools for specialized studies in science field.						

Course Outcomes	
CO1	Analyze and compare magnetic behavior and stability of heteronuclear diatomic molecules, Significance of hydrogen bonding, band theory, radius ratio, density of unit cell, fullerenes and graphite
CO2	Comprehension of types of polymers to make an appropriate choice of use of polymers (Natural, synthetic and biodegradable).
CO3	Compare reaction intermediates and mechanism of chemical reactions and isomerism.
CO4	Interpret phase rule, phase diagram, corrosion and its prevention, calculation of activation energy, rate constant, half-life period, emf of electrochemical cells, construction and operation of galvanic cell and concentration cells,
CO5	Determination of calorific value, analyzing water softening methods, principles, instrumentations of UV, IR and NMR spectroscopy and their applications.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Chemical bonding and state of matter	Molecular theory of hetero diatomic molecules, Band theory of bonding in metals, Hydrogen bonding. Solid state chemistry: Radius ratio rule, Space lattice (only cubes), Types of Unit cells, Bragg's law, calculation of density of unit cell. One- and Two-Dimensional solids, Graphite as two dimensional solid and its conducting and lubricating properties. Fullerene and its applications	8	1
2	Polymers	Polymerization and its classification, Thermoplastic and thermosetting resins. Elastomers (Buna-S, Buna-N, thiokols, polyurethanes, silicons), Polyamides (Nylon-6, Nylon-6,6, Nylon-6,10, Nylon-11, Kevlar), Polyesters (Terelene), Polyacrylates (PMMA, PAN, PVC). Organic conducting and biodegradable polymers	8	2
3	Structural and mechanistic concepts in organics	Stability of reaction intermediates, e.g., Carbanions, Carbocations and free radicals. Types of organic reactions, mechanism of nucleophilic substitution reactions. Mechanism of the following name reactions. i. Aldol condensation ii. Cannizzaro reaction iii. Beckmann rearrangement iv. Hofmann rearrangement and v. Diels-Alder reaction E-Z Nomenclature. R.S configuration, Optical isomerism of organic compounds containing one chiral center. Examples of optically active compounds without chirality. Conformations of n-butane.	8	3
4	Reaction kinetics, Phase rule, Electrochemistry and Corrosion	Order and molecularity of reactions. First and second order reactions. Energy of activation. Phase Rule, its application to one component system(water). Equilibrium potential, electrochemical cells (galvanic and concentration cells) Electrochemical theory of corrosion and protection of corrosion.	8	4
5	Analytical methods, Fuel and Water treatment	Basic principles of spectroscopic methods. The use of UV, Visible, IR, 1HNMR, for the determination of structure of simple organic compounds. Classification of fuels, determination of gross and net calorific values using Bomb Calorimeter. Hardness of water, softening of water by Lime-Soda process, Zeolites and ion exchange resins process and Reverse Osmosis. Treatment of boiler feed water by Calgon process	8	5
Reference Books:				
1.	Jain P. C. and Jain M. 1994. Engineering Chemistry. Danpat Rai publishing company Pvt. Ltd., Delhi.			
2.	Bahl B.S, Arun Bahl and Tuli B.D. 2007. Essentials of Physical Chemistry. S. Chand and Co. Ltd., Delhi.			
3.	Industrial Chemistry B.K.Sharma, Goel publishing house.			

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1						1		2	3	2	2
CO2	3		2	1		2	1	2		1		3	3		2
CO3	3	2	2	2		2				1		2	3	2	
CO4	3	3	2	2	1	2	2			1		3	3	3	2
CO5	3	3	2	2	2	2	2	2		1		2	3	3	2

8- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	CH-102	**Title of the Course**	CHEMISTRY LAB	**L**	**T**	**P**	**C**
Year	I	**Semester**	I	0	0	2	1
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	The objective of the Engineering Chemistry is to acquaint the students with the basic phenomenon/concepts of chemistry, the student face during course of their study in the industry and Engineering field. The student with the knowledge of the basic chemistry, will understand and explain scientifically the various chemistry related problems in the industry/engineering field.						

Course Outcomes	
CO1	Analyze the need, design and perform given set of experiments with precision and accuracy
CO2	Utilize the fundamental laboratory techniques for analyses such as titrations.
CO3	Organize the records of all performed experiments in the manner which is required in laboratory.
CO4	Comprehension of principle, instrumentation and use of UV-VIS spectrophotometer and pH meter.
CO5	Able to analyze importance of personal safety, care of chemicals, equipments and gain experimental skill.

S. No.	List of Experiments	Contact Hrs.	Mapped CO
1	To determine the Iron content in the given iron ore by using external indicator.	2	1
2	To determine the Alkalinity in the given water sample	2	1
3	To determine the Chloride content in the given water sample by Mohr's method. (Argentometric method)	2	2
4	To determine the Percentage of Available Chlorine in the given sample of Bleaching powder iodometrically.	2	2
5	To determine the temporary and permanent hardness in water sample by Complexometric titration using EDTA as standard solution.	2	3
6	To determine the Equivalent weight of Iron by Chemical Displacement method. (The Equivalent weight of copper is 63.5)	2	3
7	To determine the strength of given HCl solution by titrating it against NaOH solution using pH meter.	2	4
8	To determine the iron concentration in the given water sample by Spectrophotometer using potassium thiocyanate as color developing agent.	2	4
9	To detect the presence of functional groups in the given organic compound.	2	5
10	To detect the presence of Elements in the given organic compound.	2	5

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

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	CS-101	**Title of the Course**	Computer Programming	**L**	**T**	**P**	**C**
Year	I	**Semester**	II	3	1	0	4
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	- To give knowledge of computers, networks, algorithms & flowcharts. - To provide fundamental concepts of programming language 'C'. - To show the use of functions and pointers to different problems. - To study the implementation of arrays, matrices and strings. - To give concepts of user defined data types structure & union.						

Course Outcomes	
CO1	Understand basic concepts of computer, networks and formulation of algorithmic solutions to problems.
CO2	Understanding of programming concepts of C language and their implementation.
CO3	Analyze and develop programs on pointers and functions.
CO4	Develop programs on different operations on arrays, matrices & strings.
CO5	Implement programs on structure, union & Dynamic memory allocation.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction to Computers	Generation of computers, Characteristic and classifications of computers. Components of Computer: CPU, Various I/O Devices, Memory & its types, (Memory Hierarchy, Storage Media), Computer Software and their types, Operating System. Computer Networks & Communication: LAN, MAN, WAN, Network Topologies, Modes of Data Communication. Introduction to Internet and its Safeguard: Internet Addresses, Domain Name System, URL, Web Browsers Search Engines, Firewalls, Anti-Virus, Translators. Algorithm and flowchart: Algorithm and flow chart characteristics, Sketching Flowcharts of various problems	8	1
2	Starting C	Standard I/O in 'C', 'C' Fundamental, C Character set, Constants, Variables, Keywords and Identifiers, Data types, Declaration. Operators and Expressions, Conditional statements (If, If-else), Nesting of if- else statement, switch statement, The? operator, goto statement. Decision making and Looping (While, Do-While, for), Break and Continue statements, Case Control Structures (Switch), C programs based on above concepts.	8	2
3	Introduction to pointers	Declaration and initialization of pointers, accessing the address of the variable, accessing the variable through the pointer, chain of pointers, pointers operators, pointer arithmetic Introduction to Functions: Need of "C" function, User Defined and Library Functions, Prototype of Function, Call by Value; Call by Reference; Nesting of Functions, Recursion. Pointers with function, C program based on above concept.	8	3
4	Array	Concept of One Dimensional and Multi-Dimensional arrays, Declaration, Operations: insert, delete, search, traverse, and merge, matrix operations, Sorting: Bubble sort, merge sort, insertion sort. Character array and strings: declaring and initializing strings variable, reading and writing a character, reading and writing strings from terminal, Arithmetic operations on characters, string handling functions. Application of pointers, and function on array, C program based on above concept.	8	4
5	Structures	Defining Structure, Declaration of Structure Variable, Accessing Structure members, copying and comparing structure variable, operation on individual member, nesting of structures, Array of structures. Application of pointers and function on Structures. Union Defining Union Declaration of Union, difference between structure and Union, Introduction of Static and Dynamic memory allocation- The process of Dynamic memory allocation, C program based on above concept.	8	5
Reference Books:				
1.Foundation of Information Technology by 'D.S. Yadav'				
2. Programming in 'C' by 'E Balagurusamy'.				

3. Let us 'C' by 'YashwantKanitkar'
4. The C Programming Essentials by Dey

e-Learning Source:

https://onlinecourses.nptel.ac.in/noc22_cs40/preview

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2				3		3	2			2	3	2	
CO2	3	3	1			1		2				2	1	3	
CO3	3	2				2	3	2				3			3
CO4	3	2		2		3	2	2				1			3
CO5			1			1							1		3

9- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	CS102	**Title of the Course**	COMPUTER PROGRAMMING LAB	**L**	**T**	**P**	**C**
Year	I	**Semester**	II	0	0	2	1
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	1.To learn the basic concepts and syntax of C programming. 2.To be able to develop logics which help them to create programs and applications using C language. 3.To learn the use of C libraries functions in C language. 4.To learn the file handling and basic memory allocation concepts in C language. 5.After learning the C programming they can easily switch over to any other language.						

Course Outcomes	
CO1	Able to understand the basic concepts of C programming language and their implementation.
CO2	Able to design and develop various programming problems using C programming concepts.
CO3	Able to analyze and develop programs on pointers and functions.
CO4	Able to develop programs on different operations on arrays, matrices & strings.
CO5	Able to implement programs on structure, union & Dynamic memory allocation.

S. No.	List of Experiments	Contact Hrs.	Mapped CO
1	Write a Program to print any message	1	1
2	Write a Program to print sum and multiply of two numbers.	1	1
3	Write a Program to enter the temperature in Celsius(c) then count it into Fahrenheit	1	1
4	Write a Program to swap the number taking the help of third variable.	1	1
5	Write a Program to calculate the volume of box.	1	1
6	Write a Program to swap the number without taking the help of third variable.	2	2
7	Write a Program to check a year is leap year not.	2	2
8	Write a Program to print number is even or odd.	2	2
9	Write a Program to Print month of name using switch case	2	2
10	Write a Program to print the no is positive or negative.	2	2
11	Write a Program to find the greater number enter by user.	2	3
12	Write a Program to find the greater number Input 3 No.	2	3
13	Write a Program to enter any no and check whether the given no is palindrome or not.	2	3
14	Write a Program to enter any no. and check whether the given no. is Armstrong or not.	2	3
15	Write a Program to Print Pattern * * * * * * * * * *	1	3
16	Write a Program to Print Pattern 1 2 3 4 1 2 3 1 2 1	1	4
17	Write a Program to Print Pattern 1 1 2 1 2 3 1 2 3 4	1	4
18	Write a program to find in C to design the report card of 5 subject	1	4

	according to the following condition if the total percentage are. >=35 and <45 IIIrdDiv >=45 and <60 IIndDiv >=60 IstDiv If any students score <35 in any of the subject display fail			
19	Write a Program to create 2-D array or order M*N and insert the element and display it.	2	4
20	Write a Program to find the addition of two matrix of order M*N.	2	4
21	Write a Program to find the Transpose of the matrix.	2	5
22	Write a Program to swap two numbers Call by Value.	2	5
23	Write a Program to swap two number using function pointers.	2	5
24	WAP for structure of player Name, batting average and then name.	2	5

Reference Books:

1.Foundation of Information Technology by 'D.S. Yadav'

2. Programming in 'C' by 'E Balagurusamy'.

3. Let us 'C' by 'YashwantKanitkar'

4. The C Programming Essentials by Dey

e-Learning Source:

https://onlinecourses.nptel.ac.in/noc22_cs40/preview

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2		3		3						2	1	1
CO2	1	1	1	2	1		3						2	1	1
CO3	1	2	2	2			3						2	1	1
CO4	1	2	2	2			3						2	1	1
CO5	1	2	1				3						2	1	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-2021							
Course Code	CS-126	**Title of the Course**	Changing Business with Data Insights	**L**	**T**	**P**	**C**
Year	I	**Semester**	II	3	1	0	4
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	1. To study the basics of business insights using IBM Cognos. 2. To study the concept of visualization with a view to rapid analyze the trend of complex applications. 3. To understand the specialized aspects of Watson Analytics including filtering, sorting, and reporting analytics. 4. To study the aspect of data preparation in industry using IBM Cognos for exploring business insights.						

Course Outcomes	
CO1	Student must be able to understand the building blocks of IBM Cognos.
CO2	Student must be able to articulate the advance dashboarding using IBM Cognos for business trends.
CO3	Student must be able to understand the specialized aspects of Watson Analytics with the help of customize reports, chart and focusing on filters and sorting of data.
CO4	Student must be able to represent the analytical aspects of Watson Analytics using IBM Cognos for better business decisions.
CO5	Student must be know the recent research trends related to building queries, data aggregation and data preparation for decision making.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Dashboard Overview	Dashboards, Cognos Analytics dashboards: a tutorial, Scenario for the tutorial, uploading data, creating a dashboard, what's next in Cognos Analytics? Creating a dashboard, Templates, Changing the template on a tabbed dashboard	8	1
2	Visualization	Creating a visualization in a dashboard , Exporting a dashboard to PDF 9 ,Resetting a dashboard ,Creating multilingual dashboards, Exploring your data ,Viewing the underlying data, Changing the columns or members in a visualization ,Selecting columns from a different data asset, Drilling up and down in your data, Working with a data point ,Relinking data source connections, Resolving ambiguous data source connections ,Zooming in and out ,Visualizations Using a different visualization type, Highlighting conditionally formatted data with color, Showing data as points in a visualization , Showing data as sizable points in a visualization ,Repeating a visualization by row or column ,Setting a timer to automatically refresh a visualization , Adding a title to a visualization ,Limiting data to top or bottom values in a dashboard visualization ,Sharing visualizations ,Setting up drill-through 9 ,Adding a drill-through definition ,Editing a drill-through definition ,Widgets ,Adding text ,Adding images and shapes , Adding web pages ,Adding video or audio ,Changing web pages, media, and images	12	2
3	Filtering data	Filtering data in one visualization, highlighting data points across visualizations, adding a filter widget Keeping or excluding data points in a visualization, disconnecting visualizations and filter widgets, Filtering data in the current tab, Filtering data in all tabs, clearing filters, Removing filters.	7	3
4	Sorting data	Sorting, Sorting in numerical order, Sorting in alphabetical order, Calculations, creating column calculations for all visualizations, Using the calculation editor, Formatting, working with the legend Changing Colors, Stories: IBM COGNOS ANALYTICS: DASHBOARDS AND STORIES (V)	7	4
5	Data preparation	Changing the axis, Improving the visibility of labels, adding labels in the visualization, Changing the label orientation, connecting data points with smooth lines, Changing the size or color of bubbles, working with objects, Data properties, changing how data is aggregated, Editing column headings, Enabling data caching	6	5
Reference Books:				
1. IBM Cognos 10 Report Studio Cookbook by Ahmed Lashin.				
2. IBM Cognos Business Intelligence v10: The Complete Guide (IBM Press) 1st Edition, Kindle Edition				
3. IBM Cognos TM1 The Official Guide.				

4.	IBM Cognos Business Intelligence v10: The Complete Guide (IBM Press) 1st Edition, Kindle Edition
5.	IBM Cognos TM1 The Official Guide.
6.	IBM Cognos Business Intelligence

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2				3	2	3	2	1		2			
CO2	3	2							3		2				
CO3	3		3	2			3		3	3	3	2			
CO4	2	2	3	2	3			2	2		3	3			
CO5	2	2	3		2		2		2		3	3			

10- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	ME-101	**Title of the Course**	Basic Mechanical Engineering	**L**	**T**	**P**	**C**
Year	I	**Semester**	II	3	1	0	4
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	• To understand the working and basic components of 4 stroke petrol engine and 4 stroke Diesel engine through study their models. • To understand the working and basic components of 2 stroke petrol and vapor compression refrigeration system through model study. • To understand basic components and working of water tube boiler through model study. • To learn the technique for determine of hardness and impact strength of a material. • To learn the technique for determine of compressive strength of a brick through UTM						

Course Outcomes	
CO1	Explain basic concepts of thermal sciences and temperature measurement on the basis of zeroth law of thermodynamics.
CO2	Understand and apply first and second law of thermodynamics to various processes and real systems.
CO3	Model the problem using free-body diagrams and reach to solution by using equilibrium equations.
CO4	Draw Shear Force Diagram (SFD) and Bending Moment Diagrams (BMD) for statistically determinate beams.
CO5	Design simple components on the basis of knowledge of stress, strain and strength of material.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	FUNDAMENTALS OF THERMODYNAMICS	Fundamental Concepts and Definitions: Definition of Thermodynamics, System, surrounding and universe, Phase, Concept of continuum, Macroscopic & microscopic point of view. Density, Specific volume, Pressure, temperature. Thermodynamic equilibrium, Property, State, Path, process, Cyclic process, Energy and its form, Work and heat, Enthalpy. Laws of thermodynamics: Zeroth law: Concepts of Temperature, Zeroth law.	8	1
2	FIRST LAW &SECOND LAW	Laplace transform, Existence theorem, Laplace transform of derivatives and integrals, Unit step function, Dirac-delta function, Laplace transform of periodic functions, Inverse Laplace transform, Convolution theorem, Applications to solve simple linear and simultaneous differential equations.	8	2
3	MECHANICS AND STRENGTH OFMATERIALS	Force system and Analysis: Basic Concept: Laws of motion. Transfer of force to parallel position, Resultant of planer force system. Free Body diagrams, equilibrium and its equation. Friction: Introduction, Laws of Coulomb friction, Equilibrium of bodies involving dry friction, belt friction.	8	3
4	STRUCTURE ANALYSIS	Beams: Introduction, Shear force and bending moment, Shear and bending moment diagram for statically determinate beams.	8	4
5	STRESS AND STRAIN ANALYSIS	Simple Stress and strain: Introduction, Normal, shear stresses, Stress-strain diagrams for ductile and brittle materials. Pure Bending of Beams: Introduction, Simple bending theory.	8	5

Reference Books:

1. Van Wylen G.J. &Sonnlog R.E. Fundamentals of Classical Thermodynamics, John Wiley &Sons, Inc. NY.

2. WarkWenneth: Thermodynamics (2nd edition) Mc Graw Hill Book Co. NY.

3. Holman, J.P.: Thermodynamics, Mc Graw Hill Book Co.NY.

4. Shames I.H., Engineering Mechanics, P.H.I.

5. D.S. Kumar, Mechanical Engineering, S.K. Katarial& Sons.

6. BhaviKatti S.S., Engineering Mechanics, New Age Pub.

7. P.K. Bharti: Engineering Mechanics, Kataria and Sons.

8. R.K. Rajput, Mechanical Engineering, Laxmi Pub.

e-Learning Source:

https://nptel.ac.in/courses/112103108

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1		2						3	3	2	2
CO2	3	3	3	2		3						3	3	3	2
CO3	3	3	3	2		3						3	3	2	1
CO4	3	2	2	2		3						3	3	2	1
CO5	3	3	2	1		3						3	3	2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session:	2015-16						
Course Code	ME102	**Title of the Course**	MECHANICAL ENGINEERING LAB	**L**	**T**	**P**	**C**
Year	I	**Semester**	II	0	0	2	1
Pre-Requisite	NONE	**Co-requisite**	NONE				
Course Objectives	• To understand the working and basic components of 4 stroke petrol engine and 4 stroke Diesel engine through study their models. • To understand the working and basic components of 2 stroke petrol and vapor compression refrigeration system through model study. • To understand basic components and working of water tube boiler through model study. • To learn the technique for determine of hardness and impact strength of a material. • To learn the technique for determine of compressive strength of a brick through UTM.						

Course Outcomes	
CO1	To understand the working and basic components of 4 stroke petrol engine and 4 stroke Diesel engine through study their models.
CO2	To understand the working and basic components of 2 stroke petrol and vapor compression refrigeration system through model study
CO3	To understand basic components and working of water tube boiler through model study.
CO4	To learn the technique for determine of hardness and impact strength of a material.
CO5	To learn the technique for determine of compressive strength of a brick through UTM.

Experiment No.	Title of the Experiment	Content of Unit	Contact Hrs.	Mapped CO
1	Four Stroke Petrol Engine	To Study & Sketch the model of S.I. Engine (4 Stroke)	2	CO1
2	Four Stroke Diesel Engine	To Study & Sketch the model of C.I. Engine (4 Stroke).	2	CO1
3	Two Stroke Petrol Engine	To Study & Sketch the model of S.I. Engine (2 Stroke)	2	CO2
4	Vapor Compression	To Study & Sketch the model of Vapor Compression Refrigerators	2	CO2
5	Water Tube Boiler	To Study & Sketch the model of water tube boiler (Babcock & Wilcox)	2	CO3
6	Impact Testing	To determine the Impact Strength of Mild Steel using Izod Method	2	CO4
7	Hardness Testing	To determine the harness of a mild steel specimen by using hardness tester (Rockwell Hardness test)	2	CO4
8	UTM Testing	To learn the technique for determine of compressive strength of a brick through UTM.	2	CO5
e-Learning Source:				
https://www.vlab.co.in/				

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Course Articulation Matrix: (Mapping of COs with POs and PSOs)															
CO1	3	2	2	1		3			3	2		3	3	2	2
CO2	3	2	2	2		3			3	2		3	3	2	2
CO3	3	2	3	2		3			3	2		3	3	2	2
CO4	3	3	3	2		3			3	2		3	3	2	2
CO5	3	3	2	1		3			2	2		3	3	2	2

11- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	MT-112	**Title of the Course**	Engineering Mathematics-II	**L**	**T**	**P**	**C**
Year	I	**Semester**	II	3	1	0	4
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	The course is aimed to develop the skills in mathematics which is necessary for grooming them into successful engineering graduate. The topics introduced will serve as basic tools for specialized studies in science field						

Course Outcomes	
CO1	Solve first order linear equations and higher order differential equation of certain types and interpret the solutions.
CO2	To use shift theorems to compute the Laplace transform, inverse Laplace transform and the solutions of second order, linear equations with constant coefficients.
CO3	Able to determine given function in terms of sine and cosine terms in Fourier series.
CO4	Apply problem-solving using concepts and techniques from PDE's and Fourier analysis applied to diverse situations in physics, engineering, financial mathematics and in other mathematical contexts.
CO5	Apply method of least squares to find the curve of best fit for the given data

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Differential Equations	Linear differential equations of first order, Linear differential equations of higher order with constant coefficients, Complementary functions and particular integrals, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent and independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).	8	1
2	Laplace Transform	Laplace transform, Existence theorem, Laplace transform of derivatives and integrals, Unit step function, Dirac-delta function, Laplace transform of periodic functions, Inverse Laplace transform, Convolution theorem, Applications to solve simple linear and simultaneous differential equations.	8	2
3	Fourier Series and Partial Differential Equations	Periodic functions, trigonometric series, Fourier series of period 2π, Euler's formulae, functions having arbitrary period, change of interval, Even and odd functions, Half range sine and cosine series. Introduction of partial differential equations, linear partial differential equations with constant coefficients of second order and their classifications to parabolic, elliptic and hyperbolic forms with illustrative examples.	8	3
4	Applications of Partial Differential Equations	Method of separation of variables for solving partial differential equations, Wave equation up to two-dimensions, Laplace equation in two-dimensions, Heat conduction equations up to two dimensions, Equations of transmission Lines.	8	4
5	Curve fitting and Solution of Equations	Method of least squares, curve fitting of straight line and parabola, Solution of cubic and biquadratic equations.	8	5

Reference Books:
1. E. Kreyszig Advanced Engineering Mathematics, Wiley Eastern Ltd.
2. Jaggi and Mathur Advanced Engineering Mathematics, Khanna Pub.
3. B. S. Grewal Higher Engineering Mathematics, Khanna Pub.
4. Dennis G. Zill Advanced Engineering Mathematics, CBS Pub.
e-Learning Source:
https://nptel.ac.in/courses/111105134

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3	3					1			
CO2	3	2	2	1	2	2	2			3			1	2	
CO3	3	2	3	1	3	2	3								3
CO4	3	2	3	1	3	3	2			1			2		
CO5	3	2	1	1	3	2	1								

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session:							
Course Code	ES 101	**Title of the Course**	Environmental Studies	**L**	**T**	**P**	**C**
Year	I	**Semester**	I	2	1	0	3
Pre-Requisite	10+2 with Physics, Chemistry & Biology/ Maths	**Co-requisite**					
Course Objectives	The purpose of this undergraduate course is to impart basic and key knowledge of environment and ecosystem. This will help students in enhancing their knowledge of biodiversity and its conservation. After successful completion of course, the student will able to explore concept of the subject into their respective dimensions.						

Course Outcomes	
CO1	Gain knowledge about environment and ecosystem
CO2	Students will learn about natural resource, its importance and environmental impacts of human activities on natural resource.
CO3	Gain knowledge about the conservation of biodiversity and its importance.
CO4	Aware students about problems of environmental pollution, its impact on human and ecosystem and control measures.
CO5	Students will learn about increase in population growth and its impact on environment.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction to Environment and Ecosystems	Environment, its components and segments, Multidisciplinary nature of Environmental studies, Concept of Sustainability and sustainable development, Environmental movements, Ecosystem, Structure & Function, Energy flow in the Ecosystem, Ecological Pyramids and Ecological Succession.	8	CO1
2	Natural Resources	Renewable and non- renewable, Soil erosion and desertification, Deforestation, Water: Use and over exploitation, Impacts of large Dams, Case studies	8	CO2
3	Biodiversity and Conservation	Levels of biological diversity, Hot spots of biodiversity, India as a Mega Diversity Nation, Endangered and endemic species of India, Threats to Biodiversity, Conservation of Biodiversity, Ecosystem and biodiversity services.	8	CO3
4	Environmental Pollution, Policies and Practices	Environmental pollution, Solid waste management, Ill effects of fireworks, Climate change, Ozone layer depletion, acid rain and impacts on human communities and Environment, Environmental Laws: Environment Protection Act, Wildlife protection Act, Forest conservation Act, Convention on Biological Diversity (CBD), Tribal rights, Human wildlife conflicts.	8	CO4
5	Human Population and the Environment	Human population growth: Impacts on environment, human health and welfare, Resettlement and rehabilitation of project affected persons, Environmental ethics, Environmental communication and public awareness, case studies.	8	CO5

Reference Books:

1) Agarwal, K.C. 2001 Environmental; Biology, Nidi Pub. Ltd. Bikaner.

2) Bharucha Erach, The Biodiversity of India, Mapin Pub. Pvt. Ltd., Ahemdabad-380, India.

3) Brunner R.C. 1989. Hazardous waste incineration, Mc Graw Hill

4) Clark R.S. Marine Pollution, Clanderon Press Oxford (TB)

5) Cunningham W.P.2001.Cooper, T.H. Gorhani, E & Hepworth, Environmental encyclopedia, Jaicob Publication House, Mumbai.

6) De. A.K. Environmental chemistry Willey Eastern Limited.

7) Glick, H.P.1993 water in crisis, Pacific Institute for studies in dev, Environment & security, Stockholm Env, Institute, Oxford Univ, Press 473 p.

8) Hawkins R .E. Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay.

9) Heywood, V.H. & Watson, R. T.1995.Global biodiversity Assessment. Cambridge Univ. Press 1140 p.

10) Jadhave, H. and Bhosale, V. M. 1995 Environmental protection and laws, Himalaya pub, house, Delhi.284 p.

11) Mckinnery, M.L. and School, R. M.1996 Environmental science systems and solutions, web enhanced edition 639 p.   12) Mhaskar A.K. Matter Hazardous, Techno Science Pub (TM)

13) Miller T.G. Jr, Environmental Ecology, W. B. Saunders Co.USA,574 p. 16

14) Odum, E.P.1997.Fundamental chemistry, Goel Pub House Meerut.

15) Survey of the Environment, The Hindu (M).

	16) Sharma B.K.2001.Environmental Chemistry, Goel Pub.House Meerut

e-Learning Source:
https://byjus.com/biology/difference-between-environment-and-eCOsystem.
https://www.youtube.com/watch?v=dRPl4TB8w7k
https://www.youtube.com/watch?v=3fbEVytyJCk
https://www.vedantu.com/biology/conservation-of-biodiversity
https://youmatter.world/en/definition/soil-erosion-degradation-definition/
https://byjus.com/biology/difference-between-environment-and-eCOsystem.

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	1	1	1	1	3	2	1	1	1	1	1	1	1	1	-	-
CO2	1	1	1	1	1	1	3	1	1	1	1	1	1	1	1	1	-	-
CO3	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	-	-
CO4	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	-	-
CO5	1	1	1	1	1	2	3	2	1	1	1	1	1	1	1	1	-	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation