Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11EC111	**Semester:** Even **(specify Odd/Even)**	**Semester:** 2nd **Session** 2021 -2022 **Month:** February – June
Course Name	**Electrical Science -1**		
Credits	4	**Contact Hours**	3+1

Faculty (Names)	**Coordinator(s)**	Kaushal Nigam (JIIT-128) & Atul Kumar Srivastava (JIIT-62)
	Teacher(s) (Alphabetically)	Ashish Gupta, Varun Goel, Sajaivir Singh, Satyendra Kumar, Abhishek Kashyap, Neetu Joshi, Mandeep Narula, Archana Pandey, Rachna Singh, Shraddha Saxena.

COURSE OUTCOMES		**COGNITIVE LEVELS**
C113.1	Recall the concepts of voltage, current, power and energy for different circuit elements. Apply the Kirchhoff laws and different analyzing techniques to identify the different circuit parameters.	ApplyingLevel(C3)
C113.2	Define and apply the networks theorems in the complex AC and DC circuits, networks. Demonstrate the physical model for given Sinusoidal AC signal and construct the phasor diagrams.	Applying Level (C3)
C113.3	Demonstrate the concept of resonance and operate different instrumental and measurement equipments.	Understanding Level (C2)
C113.4	Demonstrate the construction and working of a single phase transformer.	Understanding Level (C2)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Basic Concepts	Voltage, Current, Power and Energy analysis for Circuit elements (R, L, C), Independent and Dependent Sources, Kirchhoff's Laws, Voltage Divider rule, Current Divider rule.	6
2.	DC Circuit Analysis	Star-Delta Transformation, Source transformation, Mesh and Supermesh Analysis, Nodal and super nodal Analysis	6
3.	Network Theorems	Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem.	6
4.	Sinusoidal Steady State Analysis	Physical Model for a Sinusoid, Average Value, Effective Value, Phasor presentation, Addition of Phasor using Complex Numbers, Concepts of impedance and admittance.	4
5.	AC Network Analysis and Theorems	Mesh and Nodal analysis, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem.	6
6.	Resonant Circuits	Series and Parallel resonance, frequency response of Series and Parallel resonance, Q-Factor, Bandwidth.	4

7.	Electrical Instruments	Essentials of an Instrument, Permanent Magnet Moving Coil (PMMC) Instruments, voltmeter, ammeter, Ohmmeter, Meter Sensitivity (Ohms-Per-Volt Rating); Loading Effect; Multimeter; Cathode Ray Oscilloscope: Construction,	6

		Working and Applications. Function Generators.	
8.	Single Phase Transformer	Principle of operation, construction, e.m.f. equation, equivalent circuit, power losses, efficiency (simple numerical problems), introduction to auto transformer.	4
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment, quiz, attendance)
Total	**100**

Project based learning component: Students will learn fundamental concepts, working and applications of Permanent Magnet Moving Coil (PMMC) Instruments, voltmeter, ammeter, Ohmmeter, Cathode Ray Oscilloscope and Function Generators that develop aptitude among students to design minor and major projects. They will also develop knowledge about step-up and step-down transformers which can be further used to design advanced circuits in communication and robotics. It will also help develop concepts about instrumentation in electrical/electronics/biotech/communication based industries.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	R.C. Dorf and James A. Svoboda, "Introduction to Electric Circuits"**,** 9th ed, John Wiley & Sons, 2013.
2.	Charles K. Alexander (Author), MatthewN.O Sadiku, " Fundamentals of Electric Circuits", 6th ed, Tata Mc Graw Hill, 2019.
3.	Robert L. Boylestad, Louis Nashelsky, " Electronic Devices and Circuit Theory ", 11th ed, Prentice Hall of India, 2014.
4.	D.C. Kulshreshtha, Basic Electrical Engineering,Revised 1st ed, Tata Mc Graw Hill, 2017 .

Course Description

Course Code	15B17EC171	**Semester -:** Even (specify Odd/Even)	**Semester:** 2nd **Session** 2021 -2022 **Month:from** February – June
Course Name	Electrical Science Lab-1		
Credits	1	**Contact Hours**	2

Faculty (Names)	**Coordinator(s)**	Abhishek Kashyap & Shradha Saxena
	Teacher(s)	Atul K. Srivastava, Bhawna Gupta, Akansha Bansal, Gaurav Verma, Madhu Jain, Nisha Venkatesh, Rachna Singh, Ritesh Sharma, Samriti Kalia, Shradha Saxena, Vijay Khare, Vishal N. Saxena, Abhishek Kashyap, Bajrang Bansal, Kaushal Nigam, Sajai Vir Singh, Varun Goel, Ashish Gupta

COURSE OUTCOMES		**COGNITIVE LEVELS**
C176.1	Understand various active and passive components and instruments (Multimeter, Bread board, Regulated D.C. power supply).	Understanding Level (C2)
C176.2	Acquire the knowledge of electrical network and circuit such as branch, node, loop and mesh in networks and circuits.	AnalyzingLevel (C4)
C176.3	Study and verification of reduction technique using different network theorem.	Remembering Level (C1)
C176.4	Study and verification of series and parallel AC circuits as well as Open & Short Circuit Test in single phase transformer.	ApplyingLevel (C3)

Module No.	**Title of the Module**	**List of Experiments**	**COs**
1.	Exp.1	Introduction to various components (Resistor, Capacitor, inductor, and IC) and instruments Multimeter, Bread board, Regulated D.C. power supply, and CRO.	C176.1
2.	Exp.2	Verification of KVL and KCL using a given circuit.	C176.2
3.	Exp.3	Verification of Superposition Theorem.	C176.3
4.	Exp.4	Verification of Thevenin's Theorems.	C176.3
5.	Exp.5	Verification of Norton's Theorems.	C176.3

6.	Exp.6	Verification of Maximum Power Transfer Theorem	C176.3
7.	Exp.7	Verification of Reciprocity Theorem	C176.3
8.	Exp.8	Verification of Star-Delta Theorem	C176.2
9.	Exp.9	To study the time domain behavior of voltage - current in Series-Parallel RLC Circuit AC circuit.	C176.4
10.	Exp.10	To study the behavior of Series-Parallel RLC Circuit at Resonance.	C176.4
11.	Exp.11	Open Circuit Test in Single Phase Transformer using Vlab.	C176.4
12.	Exp.12	Short Circuit Test in Single Phase Transformer using Vlab.	C176.4

Evaluation Criteria

Components	**Maximum Marks**
Viva1	20
Viva2	20
Report file, Attendance, and D2D	60 (15+15+30)
Total	**100**

Project Based Learning: Electrical Science Lab-I experiments are performed on breadboard and softwares like Multisim. The experiments have designed in order to meet out basic demand of today's electrical and electronics industry. In this lab students get the idea of all the electrical components like resistor, capacitor, inductor, transformer and apparatus like bread board,multimeter, power supply, cathode ray oscilloscope, function generator. The high demands of various electrical instruments in various industries helps students towards employability/ entrepreneurship/ skill development.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Richard C. Dorf, James A. Svoboda, "Introduction to Electric Circuits," Wiley; 7th Edition, 2006
2.	D. Roy Choudhary and Shail B. Jain, "Linear Integrated Circuit," 2nd Edition, NAILP, 20 03
3.	Analog Signals, Network and Measurement Virtual Laboratory (IIT Kharagpur) Analog Signals, Network and Measurement Laboratory (ernet.in)
4.	Electric Circuits Virtual Lab (Pilot): Physical Sciences: Amrita Vishwa Vidyapeetham Virtual Lab
5.	https://phet.colorado.edu/sims/html/circuit-construction-kit-dc-virtual-lab/latest/circuit-construction-kit-dc-virtual-lab_en.html
6.	https://phet.colorado.edu/sims/html/circuit-construction-kit-ac/latest/circuit-construction-kit-ac_en.html

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11CI211	**Semester:** Even	**Semester:** 2nd **Session** 2021 -2022 **Month:** February – June
Course Name	Software Development Fundamentals – II		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names)	**Coordinator(s)**	Ashish Mishra (J62),Ambalika Sarkar (J128), Ankita Wadhwa (J62),Nishtha Ahuja(J62)
	Teacher(s) (Alphabetically)	J128 - Ambalika Sarkar, Chetna Gupta, Himanshu Mittal, Mukesh Saraswat, Naveen, Rashmi Kushwah, Shailesh Kumar, Surender, Shariq Murtuza J62 – Aditi Sharma, Alka Singhal, Ankita Verma, Ankita Wadhwa, Ashish Mishra, Kapil Madan, Mradula Sharma, Neetu Sardana

COURSE OUTCOMES		**COGNITIVE LEVELS**
C110.1	Explain various object-oriented concepts like class and objects, friend function, function and operator overloading, etc.	Understanding Level (C2)
C110.2	Apply and implement the relationships of association, aggregation, composition, and inheritance	Applying Level (C3)
C110.3	Analyze the output of the source code and able to debug the errors	Analyzing Level (C4)
C110.4	Design the class diagram for real life problems and implement it using virtual functions, abstract classes, templates, and exception handling	Creating Level (C6)
C110.5	Apply SQL commands to create tables and perform various operations like insert, delete, select, *etc.*	Applying Level (C3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction to Object Oriented Programming	Comparison of Procedural and Object-Oriented Approach, Characteristics of Object-Oriented Languages, Separation of behavior and implementation	2
2.	OO Concepts using C++	Objects, Classes, Internal representations of Objects, Constructors, Destructors Functionand Operator Overloading, Static and Friend Functions	8
3.	Inheritance using C++	Base Class, Derived class, Method Overriding, Private and Public Inheritance, Multiple Inheritance.	3
4.	Polymorphism using C++	Virtual Functions, Pure Virtual Functions, Abstract Classes, Dynamic Dispatch, Internal representations of method tables, RTTI	3
5.	UML/Relationship Implementation in C++	Models, Views and Model Elements, Class Diagram, Relationships of Association, Aggregation, Composition, and Inheritance, *etc.* and their implementing	8
6.	Exceptions, Templates, and	Exceptions, Try, Catch and Throw, Re-throwing exceptions, Exception and Inheritance, Function Templates, Overloading	8

	STL in C++	Functions Template, Class Templates, Collection classes and iteration protocols (STL)	
7.	Introduction to Database	Fundamentals of Database and Database Management System, Introduction to Relational Database, Table, Attributes, Records, Introduction to SQL, Data types in SQL, Various operations on single table like create, insert, delete, update, alter, etc. using SQL, SQL queries on single table using select statement with or without where/ group by clause, etc.	10
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Mini Project (10), Attendance (10), Tutorial Assignments (5))
Total	**100**

Project based learning: Each student in a group of 3-4 will have to develop a mini project based on object-programming concepts. The students have to design the class diagram for any real-world application. The students implement the mini project using C++/Java language. Project development and its presentation will enha knowledge and employability of the students in IT sector.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1	Herbert Schildt, C++: The Complete Reference, McGraw-Hill Osborne Media, 4th Edition, 2017
2	Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Pearson, 7th Edition, 2016
3	Stroustrup B., The C++ Programming Language, Addison Wesley, 4th Edition, 2013
4	Avi Silberschatz, Henry F. Korth, and S. Sudarshan, “Database System Concepts”, 6th edition, McGraw-Hill, 2010.
5	Robert Lafore, Object Oriented Programming in C++, SAMS, 4th Edition, 2002
6	John Hubbard, Schaum's Outline of Programming with C++, McGraw-Hill, 2nd Edition, 2000

Detailed Syllabus
Lab-wise Breakup

Course Code	15B17CI271	**Semester:** Even	**Semester:** 2nd **Session** 2021 -2022 **Month:** February – June
Course Name	Software Development Lab - II		
Credits	1	**Contact Hours**	0-0-2

Faculty (Names)	**Coordinator(s)**	(J62) Alka Singhal, Mradula Sharma, Aditi Sharma (J128) Mukesh Saraswat
	Teacher(s) (Alphabetically)	(J62) Adwitiya Sinha, Aditi Sharma, Alka Singhal, Anita Sahoo, Ankita Verma, Arpita Yadav, Ashish Mishra, Chetna Dabas, Deepti,Jaspal, Kapil madan, K Vimal Kumar, Mradula Sharma, Neetu Sardana, Parul Sharma, Raghu Vamsi, Sangeeta Mittal, Sarishty Gupta. (J128) Arti Jain, Mukta Goyal, Rashmi Kushwah, Shailesh Kumar, Shariq Murtuza, Surender, Swati

COURSE OUTCOMES		**COGNITIVE LEVELS**
C173.1	Write programs in C++ to implement OOPs concepts related to objects, classes, constructor, destructor, and friend function.	Applying Level (C3)
C173.2	Write programs in C++ using OOPs concept like encapsulation, inheritance, polymorphism and abstraction.	Applying Level (C3)
C173.3	Write programs in C++ using Standard Template Library.	Applying Level (C3)
C173.4	Perform exception handling in C++ programs.	Applying Level (C3)
C173.5	Write MySQL queries to perform operations like ADD, DELETE, UPDATE, SELECT on relational databases.	Applying Level (C3)

Module No.	**Title of the Module**	**List of Experiments**	**No. of Labs for the module**
1.	OO Concepts using C++	Write output based C++ programs to implement the concepts of Objects, Classes, Internal representations of Objects, encapsulation, Constructors, Destructors, Function and Operator Overloading, Static and Friend Functions.	3
2.	Inheritance using C++	Write programs in C++ to implement concepts of Base Class, Derived class, Method Overriding, Private and Public Inheritance, Multiple Inheritance.	2
3.	Polymorphism using C++	Write programs in C++ using Virtual Functions, Pure Virtual Functions, Abstract Classes, Dynamic Dispatch, Internal representations of method tables, RTTI, operator overriding.	2
4.	UML/Relationship Implementation in C++	Write programs in C++ using based on Class diagram, Relationships of Association, Aggregation, Composition, and Inheritance	1

5.	Exceptions, Templates, and STL in C++	Write programs in C++ using Exceptions, Try, Catch and Throw, Re-throwing exceptions, Exception and Inheritance, Function Templates, Overloading Functions Template, Class Templates, Collection classes and iteration protocols (STL)	2
6.	Introduction to Database	Design simple SQL queries using MYSQL to apply various operations on single table like create, insert, delete, update, alter, etc., Queries on single table using select statement with or without where/ group by clause, etc.	2
		Total number of Labs	**12**

Evaluation Criteria

Components	**Maximum Marks**
Evaluation 1	15
Lab Test1	20
Evaluation 2	15
Lab Test 2	20
Mini Project	10
Attendance	10
TA	10
Total	**100**

Project based leaning: Groups of 3-4 students will choose a project topic. They will use the concepts of OOP and/or database to execute their project. In a team, they will learn how to apply the concepts for problem solving in a meaningful way.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1	Herbert Schildt, C++: The Complete Reference, McGraw-Hill Osborne Media, 4th Edition, 2017
2	Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Pearson, 7th Edition, 2016
3	Stroustrup B., The C++ Programming Language, Addison Wesley, 4th Edition, 2013
4	Avi Silberschatz, Henry F. Korth, and S. Sudarshan, “Database System Concepts”, 6th edition, McGraw-Hill, 2010.
5	Robert Lafore, Object Oriented Programming in C++, SAMS, 4th Edition, 2002
6	John Hubbard, Schaum's Outline of Programming with C++, McGraw-Hill, 2nd Edition, 2000
7	Brian W. Kernighan / Dennis Ritchie,” The C Programming Language”, Pearson 2nd Edition

Course Description

Course Code	15B11MA211	**Semester** Even	**Semester** II **Session** 2021-22 **Month from** Feb - Jun 2022
Course Name	Mathematics 2		
Credits	4	**Contact Hours**	3-1-0
Faculty (Names)	**Coordinator(s)**	Dr. Richa Sharma, Dr. Neha Ahlawat, Dr. Shruti Goel	
	Teacher(s) (Alphabetically)	Prof. Alka Tripathi, Prof. R.C. Mittal, Prof. A.K. Aggarwal, Prof. Lokender Kumar, Dr. Anuj Bharadwaj, Dr. Himanshu Agarwal, Dr. Richa Sharma, Dr. Neha Ahlawat, Dr. Shruti Goel, Dr. Shikha Pandey, Dr. Manish Bansal, Dr. Neha Singhal, Dr. Pankaj Srivastav, Dr. Dinesh Bisht, Dr. Md. Sarfaraj, Dr. Rajanish Rai, Dr. Pinkey Chauhan.	

COURSE OUTCOMES		**COGNITIVE LEVELS**
After pursuing the above-mentioned course, the students will be able to:		
C106.1	apply different methods for solving ordinary differential equations of second order.	Applying Level (C3)
C106.2	explain different tests/methods of convergence for infinite series.	Understanding Level (C2)
C106.3	find the series solution of differential equations and use it to construct Legendre's polynomials and Bessel's functions.	Applying Level (C3)
C106.4	classify the partial differential equations and apply Fourier series to find their solution.	Applying Level (C3)
C106.5	explain Taylor's & Laurent's series expansion, singularities, residues and transformations.	Understanding Level (C2)
C106.6	apply the concept of complex variables to solve the problems of complex differentiation and integrations.	Applying Level (C3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Second Order Linear Differential Equations	Linear Differential Equations of Second Order with constant coefficients and with variable coefficients, Change of Variable, Variation of Parameters.	5
2.	Convergence of Series	Convergence of series, Tests of convergence, Alternating Series, Absolute & Conditional Convergence, Uniform Convergence.	7
3.	Series Solution and Special Functions	Series Solutions, Bessel Function, Recurrence Relations and Orthogonality. Legendre functions, Recurrence relations and Orthogonality.	7
4.	Fourier Series and Partial	Fourier Series. Classification and Solution of PDE, Equation of vibrating string, Solution of one dimensional wave & heat equations.	5

	Differential Equations		
5.	Complex Variables	Limit, Continuity and Differentiability of Functions of Complex Variables, Analytic Functions, Cauchy's Riemann Equations.	3
6.	Complex Integration	Cauchy Integral Theorem, Cauchy Integral Formula and Applications.	4
7.	Series Expansion	Taylor and Laurent Series Expansion, Poles and Singularities.	4
8.	Contour Integration	Residues, Cauchy's residue theorem and its applications.	5
9.	Conformal Mapping	Bilinear transformation	2
Total number of Lectures			**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz, Assignments, Tutorials)
Total	**100**

Project based learning: Each student in a group of 3-4 will apply the concepts of Fourier Series, partial differential equations and contour integration to solve practical problems.

Recommended Reading material:

1.	**Jain, R. K. &Iyenger, S. R. K.,** Advanced Engineering Mathematics, 5th Ed., Narosa Publishing House, New Delhi, 2016.
2.	**Brown, J.W. & Churchill, R.V.,** Complex Variables and Applications, 6th Ed., McGrawHill, 1996.
3.	**Prasad, C.,** (a) Mathematics for Engineers (b) Advanced Mathematics for Engineers, Prasad Mudranalaya, 1982.
4.	**Kreysizg, E.,** Advanced Engineering Mathematics, 10th Edition, John Willey & Sons, Inc., 2015.
5.	**Simmons, G. F.,** Differential Equations with Applications and Historical Notes, 2nd Ed. McGraw Hill, 1991.
6.	**Spiegel, M.R.,** Complex Variables, Schaum's outline series, Mac Graw-Hill, 2009.
7.	**Grewal, B. S.,** Higher Engineering Mathematics, 44th Edition, Khanna Publisher, 2018.

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11PH211	**Semester: Even**	**Semester:** 2nd **Session** 2021 -2022 **Month:** February – June
Course Name	PHYSICS-2		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names)	**Coordinator(s)**	**Dr. Anshu D Varshney and Dr. Anuraj Panwar**
	Teacher(s)	Prof. D.K. Rai Prof. S. C. Katyal Prof. S. P. Purohit Prof. R. K. Dwivedi Prof. Navendu Goswami Dr. Manoj Kumar Dr. Vikas Malik Dr. Suneet Kumar Awasthi Dr. Amit Verma Dr. A. P. S. Chauhan Dr. Prashant Kumar Chauhan Dr. Anshu D Varshney Dr. Anuraj Panwar Dr. Dinesh Tripathi Dr. Anuj Kumar Dr. Manoj Tripathi Dr. Ashish Bhatnagar Dr. Ravi Gupta

COURSE OUTCOMES		**COGNITIVE LEVELS**
C102.1	Recall the basic concepts relating to electromagnetic theory, lasers, fiber optics and solid state physics.	Remembering Level (C1)
C102.2	Illustrate the various physical phenomena with interpretation based on the mathematical expressions involved.	Understanding Level(C2)
C102.3	Apply the basic principles in solving a variety of problems related to lasers, electromagnet theory, fiber and solid state physics.	Applying Level(C3)
C102.4	Analyze and examine the solution of the problems using physical and mathematical concepts involved in the course.	Analyzing Level(C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**

1.	**Electromagnetism**	Introduction of electromagnetism, Basic idea of Cartesian, Spherical polar and cylindrical coordinate systems, Basics of fields, Gradient, Divergence and Curl, Coulomb's law, Electric Flux & Gauss's law , Applications of Gauss law for Spherical and Cylindrical symmetries (all important cases), Electric field due to charged conductor, Force per unit area on the surface of the charged conductor, Laplace and Poisson's equations and their applications to solve electrostatic problems in Cartesian and cylindrical systems, Treatment of electrostatic problems using Laplace and Poisson's equations in spherical coordinate system, Maxwell's correction to Ampere's law, Displacement current, Maxwell's equations in free space and dielectric media (both differential and integral forms) Poynting's theorem (derivation) and Poynting vector, Electromagnetic waves in free space (equations and solutions) and Transverse nature of EM waves, Energy and momentum in EM waves, Radiation pressure, Propagation of EM waves through boundary, Boundary Conditions across the medium ,Reflection and Transmission of EM waves at normal incidence, Reflection and Transmission at oblique incidence- Laws of Reflection and Refraction , Oblique incidence-p polarization, Fresnel's equations, Total internal Reflection and Brewster's Law for EM waves	17
2.	**Lasers, Optical Fiber and their applications**	Introduction to Laser, spontaneous and stimulated emission, population inversion, Einstein A and B coefficients, Principles and working of lasers, Three level Laser Scheme, Ruby laser, Applications of lasers , Concept of optical fiber and Principle of Total Internal Reflection in optical fiber, Numerical aperture and Single, multistep & graded index fiber, Attenuation coefficient, Transmission losses in optical fiber, Applications of an optical fiber: Endoscopy and sensing applications (discussion of one specific example) of an optical fiber.	08
3.	**Solid State Physics**	Basic ideas of Bonding, Ionic bonding, covalent bonding and Metallic Bonding, Inter-atomic coulomb forces in ionic crystals and Determination of equilibrium separation, Minimum Potential energy and determination of Madelung constant 'α 'for NaCl crystal in 1D , Lattice points and space lattice, Basis and crystal structure, Unit cell and Primitive cell, Seven crystal systems and Fourteen, Bravais space lattice, Coordination number, nearest neighbor distance, atomic radius and packing factor in crystal structure, Calculation of lattice constant, Lattice planes and Miller indices,Separation between lattice planes, Derivation and examples, X-ray diffraction, Bragg's law of X- ray diffraction, Electrical properties of metals: Classical free electron theory of conduction in metals , Quantum mechanical treatment: Quantum theory of electronic conduction in metals , Kronig Penney Model: Periodic Potential and Allowed Energies, Emergence of Bands through Kronig Penney Model and Band Theory of Solids, Distinction between metals, Semiconductors and insulators, intrinsic and extrinsic semiconductors,Effective Mass: Concept and Significance, Brillouin zone: Relation with Lattice Structures, Types of Brillouin zones, Energy and Momentum ,Brillouin zone: Origin of Forbidden Bands	15
		Total number of Lectures	**40**

Evaluation Criteria

Components	**Maximum Marks**
T1	**20**
T2	**20**
End Semester Examination	**35**
TA	**25**
	(a) Quizzes /class tests (05 M),
	(b) Attendance (05 M)
	(c) Internal Assessment (05)
(d) Assignments in PBL mode (10 M)	
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	D. J. Griffiths, Introduction to electrodynamics, Pearson India.
2.	G. Keiser, Optical Fiber Communications, Tata Mc Graw Hill Education.
3.	A. Beiser, Concepts of Modern Physics, Mc Graw Hill International.
4.	S. O. Pillai, Solid State physics, New Age International (P) Limited.
5.	B. G. Streetman & S. Banerjee, Solid State Electronic Devices, Prentice-Hall India.

Project Based Learning (PBL): Small projects (in groups) will be assigned to the students on diverse topics such as electromagnetism, lasers, optical fibres, and solid-state theory in order to study their applications in engineering and technology and to better comprehend the role of physics. This will assist students in connecting the concepts learned in class to their engineering and technology applications, as well as improve their analytical skills.

Detailed Syllabus
Lab-wise Breakup

Course Code	15B17PH271	**Semester: Even**	**Semester:** 2nd **Session:** 2021 -2022 **Month:** February – June
Course Name	Physics Lab-2		
Credits	1	**Contact Hours**	2

Faculty (Names)	**Coordinator(s)**	Dr. Alok Chauhan and Dr. Vikas Malik.
	Teacher(s) (Alphabetically)	Mit Verma, Anuj Kumar, Ashish Bhatnagar, Anshu Varshney , B.C. Joshi, Dinesh Tripathi, Manoj Kumar, Manoj Tripathi, Navendu Goswami, , Prashant Chauhan, Sandeep Chhoker, Suneet Kumar Awasthi, Vikas Malik.

COURSE OUTCOMES		**COGNITIVE LEVELS**
C171.1	Recall laser, fibre optics, semiconductor and solid state physics principles behind the experiments.	Remembering Level (C1)
C171.2	Explainthe experimental setup and the principles involved behind the experiments performed.	Understanding Level (C2)
C171.3	Plan the experiment and set the apparatus and take measurements.	Applying Level (C3)
C171.4	Analyze the data obtained and calculate the error.	Analyzing Level (C4)
C171.5	Interpret and justify the results.	Evaluating Level (C5)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Semiconductor Physics	**1(a).** To determine the band gap in a semiconductor using its p-n junction diode. **1(b).** To draw the I-V characteristic of Solar cell and find maximum power and fill factor. **2(a).** To measure resistivity of semiconductor at different temperatures by Four Probe Method. **2(b).**To determine Band Gap of the semiconductor. **3.**To study the Hall effect in semiconductor and to determine its allied coefficients.	1-5
2.	Solid State Physics	**4.** To study the Magnetostriction in metallic rod with the help of Michelson interferometer arrangement. **5.** To find the susceptibility of a paramagnetic substance ($FeCl_3$) in the form of liquid or a solution. **6.**Study of dielectric (constant) behavior and determination of Curie's temperature of ferroelectric ceramics.	1-5
3.	Modern Physics	**7.**To study the magneto resistance of given semiconductor material. **8(a).** To determine the value of specific charge (e/m) of an electron by Magnetron method. **8(b).** To determine the velocity of ultrasonic wave in the medium of liquid using ultrasonic interferometer and to determine the compressibility of the given liquid. **9(a).** To determine Planck"s Constant using LEDs of known	1-5

		wavelength. **9(b).** To study the photovoltaic cell and hence verify the inverse square law.	
4.	Optical Fiber	**10(a).** To determine the numerical aperture of a given multimode optical fiber. **10(b).** To measure the power loss at a splice between two multimode fibers and tostudy the variation of splice loss with Longitudinal and Transverse misalignments of thegiven fibers.	1-5

Evaluation Criteria

Components	**Maximum Marks**
Mid Term Viva (V1)	20
End Term Viva (V2)	20
D2D	60
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Dey and Dutta, Practical Physics
2.	Lab Manuals

Detailed Syllabus
Lab-wise Breakup

Course Code	18B15GE112	**Semester:** Even	**Semester:** 4th **Session:** 2021 -2022 **Month:** February – June
Course Name	Workshop		
Credits	1.5	**Contact Hours**	03

Faculty (Names)	**Coordinator(s)**	Prabhakar Jha, Nitesh Kumar
	Teacher(s) (Alphabetically)	Chandan Kumar, Deepak Kumar, Madhu Jhariya,Nitesh Kumar. Prabhakar Jha, Rahul Kumar and Vimal Saini

COURSE OUTCOMES		**COGNITIVE LEVELS**
C179.1	Tell the basic of manufacturing environment and various safety measures associated with it.	Remembering Level (C1)
C179.2	Apply the appropriate tools to fabricate joints utilizing work-bench tools.	ApplyingLevel (C3)
C179.3	Create various prototypes in the carpentry trade, fitting trade, and welding trade	CreatingLevel (C6)
C179.4	Demonstrate the working principle of lathe, shaper and milling machines and able to fabricate the prototypes of desired shape and accuracies.	UnderstandingLevel(C2)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Carpentry	Preparation of T joint as per the given specification. Preparation of dovetail joint/ cross lap joint as per given specification.	**C179.2, C179.3**
2.	Welding Shop	To study Gas welding and Arc welding equipment and various safety measures associated with it. To make butt joint and lap joint.	**C179.1**, **C179.2, C179.3**
3.	Sheet Metal Shop	To prepare a square tray using GI sheet. To prepare a funnel using GI sheet.	**C179.2, C179.3**
4.	Fitting Shop	To prepare V- groove fit as per given specifications. To prepare square fit as per given specifications.	**C179.2, C179.3**
5.	Machine Shop	To perform turning, facing and grooving operation on Lathe. To perform slotting operation on Shaper Machine. To perform face milling operation on Milling Machine.	**C179.4**

Evaluation Criteria

Components	**Maximum Marks**
Viva 1	20
Viva 2	20
Report file, Attendance, and D2D	60 [File Work (20) + Attendance (10) +(Experimental Work (30)]
Total	**100**

Project based learning: Here students are divided in groups and learn about the applying of appropriate tools to fabricate joints utilizing work-bench tools which helps them in creating various prototypes in the field of engineering and technology. In the present workshop laboratory with the application of the course outcomes, students prepare their projects like robotic car, cutting of electronic board made of wood, etc. where application of carpentry shop, sheet metal shop and fitting shop is required.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai
2.	Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology",4th edition, Pearson Education India Edition, 2002.
3.	Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata Mc GrawHill House, 2017.
4.	John K.C., Mechanical Workshop Practice, 2nd Edition, PHI, 2010
5.	Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998
6.	Gowri P.Hariharan and A. Suresh Babu, "Manufacturing Technology – I" Pearson Education, 2008
7.	Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.

Detailed Syllabus
Lecture-wise Breakup

Subject Code	**22B12HS111**	**Semester: Even** Semester	**Semester: 2nd Session** 2021 -2022 **Month:from** February – June
Subject Name	**LIFE SKILLS AND EFFECTIVE COMMUNICATION**		
Credits	**2**	**Contact Hours**	**1-2-0**
Faculty (Names)	**Coordinator(s)**	Dr. Kanupriya Misra Bakhru	
	Teacher(s) (Alphabetically)	Dr. Amandeep Kaur, Dr. Anshu Banwari, Dr. Ankita Das, Dr. Chandrima Chaudhuri, Dr. Debjani Sarkar, Dr. Ekta Srivastava, Dr. Nilu Choudhary, Dr. Monali Bhattacharya, Dr. Swati Sharma, Ms Shikha Kumari	

COURSE OUTCOMES: The students will be able to:		**COGNITIVE LEVELS**
CO1	Understand different life skills required for Self, Family, Society and lifelong success.	Understanding Level (C2)
CO2	Apply listening, speaking, reading and writing skills in professional environment.	Applying Level (C3)
CO3	Develop Work-place skills for personal and professional excellence.	Analyzing Level (C4)
CO4	Evaluate and make decisions for empowerment of self and others.	Evaluating Level (C5)

Module No.	**Subtitle of the Module**	**Topics in the module**	**No of Lectures**	**No of Practical**
1.	Introduction	Overview of Life Skills: Meaning and significance of life skills, Life skills identified by various organizations, Life Skills for Self, Family, Society and lifelong success. **Practical 1: Ice-breaking and Introducing Oneself** **Practical 2: Understanding Self**	2	4
2.	AdvancedLSRW Skills	Advanced Reading and Comprehension Skills, inferring lexical and contextual meaning, employing discourse analysis, Advanced Speaking Skills: Conversations, Dialogues and Debates, Persuasion, Negotiation Skills, Expressing Opinions, Agreement and Disagreement, Advanced Listening Skills, Advanced Writing skills: The art of Condensation, Note making, Essay Writing. **Practical 3: Academic Listening** **Practical 4: Comprehensive Reading** **Practical 5: Career-oriented Writing**	2	6
3.	Work-Place Skills	Interpersonal Skills: Team- work skills, Empathy, Emotional Intelligence, VUCA Leadership, Resilience, Tolerance, Self-Belief and Time Management **Practical 6: Team Communication-1** **Practical 7: Team Communication-2**	3	4
		Presentation and Interaction Skills: Speech Delivery, Group Discussion, Presentation Skills (Focused and targeted information seeking and presentation), Public Speaking, Audience Analysis, Interviews, Assessment of Personality - Projective& Self Report Techniques - Building Self-Confidence – Enhancing Personality Skills. **Practical 8: Technical Presentation-1** **Practical 9: Technical Presentation-2**	2	4

		Creativity and Critical Thinking: Creativity: Definition; Characteristics of Creative Person: Fluency; Originality; Curiosity; Critical Thinking, Problem Solving Techniques: Six Thinking Hats, Mind Mapping etc. **Practical 10: Thinking Skills** **Practical 11: Interview Skills-1**	2	4
4.	Ethics and Holistic Life	Harmony in personal and social life: Professional Integrity, Respect & Equality, Building Trusting Relationships. Concept of personal and group Ethics; Balance between - rights and duties-welfare of self and welfare of all. Understanding Nine universal values in relationships. Understanding harmony in the Family. Harmony in the Family; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the harmony in the society (society being an extension of family): Undivided Society (AkhandSamaj),Universal Order (SarvabhaumVyawastha)- from family to world family. Gender Harmony & equity. **Practical 12: Interview Skills-2**	2	2
		Character, Righteousness and Virtues for A Meaningful Life: Self-Realization Through Spiritual texts: Egoless, Humility, Righteousness, Purity, Truthfulness, Integrity, Self-restraint, Self-control, Sense of responsibility, Empathy, Love, Compassion, Maitri / Comradeship, Cooperation, Tolerance and Gratitude.	1	
		Practical 13: PROJECT **Practical 14: PROJECT**		4
Total number of Hours			14	28

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Technical presentation, class participation, Project)
Total	**100**

Project Based Learning:

Students, in groups of 4-5, are required to visit Old Age Home/ Underprivileged Children/ NGO/ Cancer Hospital / etc. Spend time with them for 3-4 hours. Apply Life Skills learned in understanding their feeling and help them by providing solution to ease their stress. They have to document their visit and present in the class.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Wadkar Alka, Life Skills for Success, Sage Publication Pvt Ltd, 2019
2.	Carnegie Dale, Become an Effective Leader, New Delhi: Amaryllis, 2012
3.	Harold R. Wallace et. al, Personality Development, Cengage Learning India Pvt. Ltd; New Delhi, 2006
4.	Barun K. Mitra, Personality Development & Soft Skills, Oxford University Press, New Delhi, 2012.
5.	Mark G. Frank, David Matsumoto, Hyi Sung Hwang, Nonverbal Communication: Science and Applications, 2012, 1st Edition, Sage Publications, New York.
6.	William S. Pfeiffer, Public Speaking, Pearson, Delhi, 2012.
7.	Human Values, A.N. Tripathi, New Age International Pvt Ltd. Publishers New Delhi ,2005
8.	Shiv Khera, You Can Win, Macmillan Books, New York, 2003.
9.	S. Kumar and PushpLata, Communication Skills, Oxford University Press,1st, Ed. 2011
10.	Raman M. and S. Sharma, Technical Communication: Principles & Practices, 29th Impression, Oxford University Press,

	New Delhi, 2009