Faculty of Science

Second Semester, 2021 – 22
Course Handouts

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The ICFAI University, Raipur

Faculty of Science

Second Semester, 2021 – 2022

Course Handout

Course No	Course Title	L	P	U
SC 111	**Physics I (Classical Mechanics & Quantum Mechanics)**	**4**	**2**	**5**

Instructor-in-charge: Mr. DHARMENDRA

Learning Outcomes:

(1) The objective of this course is to make the students understand the basic Classical Mechanics and Quantum Mechanics.

(2) It also introduces the concepts of Classical & Quantum Mechanics with their applications using mathematical treatment.

(3) This course forms the basis for understanding the subsequent courses in science stream.

Text Books T1	Unified physics 3rd year (1st paper) by R.P. Goyal
Reference Books R1	Classical Mechanics by J.C. Upadhyay, Himalaya Publishing House, 2014 Edition

Lecture-wise Plan

Lecture No.	Learning Objective	Topics to be covered	Reference
1-3	Understanding Basic coordination system	Basics of Coordinate systems, Cartesian, polar, cylindrical and spherical coordinate system.	Digital Notes will be provided
4-6	Learning Basic aspects of classical mechanics	Derivation of expression for velocity and acceleration in terms of polar, cylindrical and spherical coordinate system	Digital Notes will be provided
7-9		Generalized co-ordinates and Velocities, Generalized Force, constraints, Principle of virtual work Derivation of Lagrange's equation of motion from Alembert's Principles	R1 (2.1 – 2.8)
10-12	Understanding about the Lagrangian mechanics	Lagrangian and its Application to Simple,	R1 2.9
13-14	Continued….	Hamilton's Principle, Calculus of Variation and derivation of Euler-Lagrange's equation	R1 2.11

15-18	Learning Lagrange's equation and relating them with Hamiltonian	Lagrange's Equations derived from Variational principle for Non-conservative systems, Hamiltonian	R1 5.6
19-21	Transformation from one to other system	Hamilton's equations of motion, Canonical Transformations,	R1 6.1
22-24	Application of Lagrangian and Hamiltonian	Poisson's Brackets and its applications	R1 7.2
25-26	Understanding basics of quantum theory	Origin of the quantum theory: failure of classical physics to explain the phenomena such as black-body spectrum, photoelectric effect.	2.1, 2.2, 2.3,
27-29	Learning fundamental of quantum physics and related experiments	Wave-particle duality and uncertainty principle: de Broglie's hypothesis for matter waves: the concept off wave and group velocities, evidence for diffraction &interference of particles, experimental demonstration of mater waves. Davisson and Germer's experiment	3.1,3.2,3.5 ,3.8
30-33	Equations in quantum physics and its applications	Schrodinger 's equation, postulatory basis of quantum mechanics, operators, expectation values	4.1,4.12,
34-35		Schrodinger's time dependent and time independent equation	4.1(1), 4.1(2)
36-39		Schrodinger's equation for free particle, potential step	5.1,5.3
40-42		Application to one dimension and three dimension box.	5.4,5.5,5.6

Physics II- Lab (Including Virtual Lab (VL)

S.No	Name of the Experiment
1	To find the refractive index of material of a prism using spectrometer
2	To find the dispersive power of material of the prism using spectrometer
3	To draw the characteristics of a solar cell
4	To study the emission spectra of Hydrogen, Neon and mercury vapors. (VL)
5	Determination of Planck's constant. (VL)
6	To plot the characteristics of thermistor and hence find the temperature coefficient of resistance. (VL)

Evaluation Scheme:

Student evaluation is based on the series of Tests and Quizzes conducted during the course of semester followed by a comprehensive examination.

Evaluation Component	Duration	Weightage	Date	Syllabus (Lec.No.)	Remarks
Test 1	60 Minutes	08	21.03.2022	01-10	CB
Test 2	60 Minutes	08	25.04.2022	11-20	CB
Test 3	60 Minutes	08	17.05.2022	31- 42	CB
Lab	Throughout the Semester	20		**	CB
Comprehensive Exam	3 Hours	56	07.06.2022	01-42	CB

** To be announced in the class

Make-up Policy: Make –up will be given only under genuine circumstances for Tests Only. However prior and proper intimation to the concerned instructor is must.

General: It shall be the responsibility of individual students to attend all sessions, to take prescribed Assessment Tests, Tests and Comprehensive Examinations, etc.

Date: 03/01/22

Mr. DHARMENDRA
Instructor-In-charge

The ICFAI University, Raipur

Faculty of Science

Second Semester, 2021 – 2022

Course Handout

Course No	Course Title	L	P	U
SC 122	**Chemistry II (Inorganic Chemistry)**	**4**	**2**	**5**

Instructor-in-charge: Dr. PIYUSH KUMAR THAKUR

Learning Outcomes:

1) To identify the properties of the noble gases.
2) To Explain and predict the chemical behavior and reactivity of organometallic compounds.
3) The students will be able to describe the salient features of alkali and alkaline earth metals.
4) To understand general trends in the chemistry behind p-block elements.

Text books T1	Concise Inorganic Chemistry, J.D. Lee, OUP, 5th Edition, Black Well Science 2002.
T2	Advance in Inorganic Chemistry, S.K. Agrawal, KeemtiLal, Pragati Prakashan 2021.
T3	Organometallic Chemsitry A Unified Approach, R.C. Mehrotra, A. Singh, 2nd edition, New Age International Publishers 2003.
T4	Chemistry for degree students, R.C. Madan, S chand and company limited 2011.
Reference books R1	Inorganic Chemistry, 4th Edition, P. Atkins, T. Overton, J. Rouke, M. Weller, F. Armstrong, Oxford University Press 2005.
R2	Inorganic Chemistry, Huheey, Keiter & Keiter, Pearson Education 2002.

Lecture-wise Plan

Lecture No.	Learning Objective	Topics to be covered	Reference
1-4	To identify the properties of the noble gases.	Chemical properties of the noble gasses, chemistry of xenon, structure & bonding in Xenon compounds.	T1 635-649
5-8	To identify oxidizing/reducing agents in chemical reaction.	Use of redox potential, redox stability in water-frost, Latimer and Pourbaix diagram.	R1 141-160

9-10	To Explain and predict the chemical behavior and reactivity of organometallic compounds	Definition, nomenclature and classification of organo metallic compounds	T3 16-21
11-12		Preparation, properties, bonding and applications of alkyls and aryls of Li, Al, Hg, Sn and Ti.	T3 146-194
13-14		A brief account of metal ethylenic complexes and homogenous hydrogenation	R1 684-685
15-16		mononuclear carbonyls and nature of bonding in metal carbonyls.	T3 331-346
17-18	To define importance of inorganic elements in vital systems	Essential and trace elements in biological processes	T4 203-211
19-21	Explain Metal ion binding to biomolecules and their functions	Metalloporphyrins with special reference to haemoglobin and myoglobin	R2 663-667
22-24		Biological role of alkali and alkaline earth metals with special reference to Ca^{21}, nitrogen fixation.	R1 721-722 R2 691-692
25-28	The students will be able to describe the salient features of alkali and alkaline earth metals.	**s- Block Elements** Salient features of hydrides, Salvation and complexation tendencies including their function in Biosystems and Introduction to Alkyl and Aryls.	R1 262,277 R1 253-267 T1 349-350 T1 305-308
29-32	To understand general trends in the chemistry behind p-block elements.	**p-Block Elements** group 13-17 elements, Compounds like hydrides, Oxides, Oxyacids and Halides of groups 13-16.	R1 287-417
33-37	The students will be able to know the important compounds and important applications of compounds of boron and silicons.	**p-Block Elements** Hydrides of Boron-diborane and higher boranes, Borazine, Borohydrides.	R1 299-306
38-40		Silicates (Structural principle), Tetra sulfur tetra nitride	R1 13.12
41-42	To study the properties of Inter halogens and their complexes.	Basic properties of halogens, Interhalogens and Polyhalides.	R1 408-411

Chemistry II -Lab (Including Virtual Lab (VL)

S.No	Name of the Experiment
1	Determination of acetic acid in commercial vinegar using
2	Determination of alkali content - antacid tablet using HCl
3	Estimation of calcium content in chalk as calcium oxalate by permanganometry.

4	To analyse the given mixture for anions (acid radicals) and cations (basic radicals)
5	Preparation of pure sample of potash alum (Fitkari) [K_2SO_4. $Al_2(SO_4)_3$. $24H_2O$] (VL)
6	Preparation of pure sample of the complex potassium trioxalatoferrate (III), $K_3[Fe(C_2O_4)_3]$. $3H_2O$ (VL)
7	Preparation of Tetraamminecopper(I1) Sulphate Monohydrate.
8	To determine the amount of substance in a solution of unknown concentration using various titrimetric methods. (VL)
9	To discuss the elements or compounds determined with the help of polarography in different types of samples like food stuff, sea water, fuels, etc. (VL)
10	To determine the amount of phosphate in soft drinks (VL)

Evaluation Scheme:

Student evaluation is based on the series of Tests and Quizzes conducted during the course of semester followed by a comprehensive examination.

Evaluation Component	Duration	Weightage	Date	Syllabus (Lec.No.)	Remarks
Test 1	60 Minutes	16	22.03.2022	01-10	CB
Test 2	60 Minutes	17	26.04.2022	11-20	CB
Test 3	60 Minutes	17	19.05.2022	31- 42	CB
Lab	Throughout the Semester	10		**	CB
Comprehensive Exam	3 Hours	40	08.06.2022	01-42	CB

** To be announced in the class

Make-up Policy: Make –up will be given only under genuine circumstances for Tests Only. However prior and proper intimation to the concerned instructor is must.

General: It shall be the responsibility of individual students to attend all sessions, to take prescribed Assessment Tests, Tests and Comprehensive Examinations, etc.

Date: 05/01/22

Dr. PIYUSH THAKUR
Instructor-In-charge

The ICFAI University, Raipur

Faculty of Science

Second Semester, 2021 – 2022

Course Handout

Course No	Course Title	L	P	U
SC123	**Mathematics-II (Multivariable Calculus)**	**3**	**0**	**3**

Instructor-in-charge: Dr. SHANTI SWARUP DUBEY

Learning Outcomes:

After successful completion of the course student will be able to

1. Find Partial Derivatives
2. Total differential and differentiability, Jacobians, Change of variables, Euler's theorem for homogeneous functions.
3. Double and Triple Integrals Double integration over rectangular and nonrectangular regions
4. Green's, Stokes' and Gauss Divergence Theorem Line integrals

Text Book R1	A Course in Multivariable Calculus and Analysis by Sudhir R Ghorpade
Text Book R2	Multivariable Calculus (Seventh Edition) by James stewart

Lecture wise plan

Lecture Nos.	Learning Objective	Topics to be covered	Reference (chapter/sec./Page Nos of Text/Ref. Books)
1-2	Partial Differentiation Functions of several variables	Definition of Partial Differentiation Functions of several variables	R1 Ch-3 pp-84
3-4	Chain rule	Definition of Chain rule and their problems	R1 Ch-3 pp-116-120
5-6	Euler's theorem	Euler's theorem for homogeneous functions	R2 Ch pp-901-991
7-9	Taylor's theorem	Taylor's theorem for functions of two variables and more variables.	R2 Ch 14 pp-901-991
10-13	Minima and Maxima of a function	Minima and Maxima of a function and problems	R2 Ch-14 pp-970-981
14-19	Minima and Maxima of functions of two and more variables.	Definition of Minima and Maxima of functions of two variables and its properties	R1 Ch-4 pp-157-167
20-24	Method of Lagrange multipliers	Method of Lagrange multipliers for finding	R1 Ch-4

		minima and maxima.	pp-157-167
25-27	Double and Triple Integrals	Definition of Double and Triple Integrals and its problem.	R2 Ch-15 pp-997-1064
28-32	Double integration over rectangular and non rectangular regions.	Double integration over rectangular and nonrectangular regions, Double integrals in polar coordinates	R2 Ch-15 pp-997-1064
33-34	Change of variables in double and triple integrals	Change of variables in double and triple integrals and its examples	R2 Ch-15 pp-997-1064
35-37	Line integrals	Line integrals, Line Integrals in Space,Line Integrals of Vector Fields	R 2 Ch-16 1087-1097
38-40	Applications of line integrals	Applications of line integrals and problems	R 2 Ch-16.2 pp-1087-1097
41-45	Green's, Stokes' and Gauss Divergence Theorem	Examples on Green's, Stokes' and Gauss Divergence Theorem	R 2 Ch-16 pp-1087-1097

Evaluation Scheme:

Student evaluation is based on the series of Tests and Quizzes conducted during the course of semester followed by a comprehensive examination.

Evaluation Component	Duration	Weightage	Date	Syllabus (Lec.No.)	Remarks
Test 1	60 Minutes	17	23.03.2022	1-12	CB
Test 2	60 Minutes	17	27.04.2022	13- 28	CB
Test 3	60 Minutes	16	21.05.2022	29- 45	CB
Quizzes (2)	20 Minutes each	10			CB
Comprehensive Exam	3 Hours	40	10.06.2022	1- 45	CB

** To be announced in the class

Make-up Policy: Make –up will be given only under genuine circumstances for Tests Only. However prior and proper intimation to the concerned instructor is must.

General: It shall be the responsibility of individual students to attend all sessions, to take prescribed Assessment Tests, Tests and Comprehensive Examinations, etc.

Dr. SHANTI SWARUP DUBEY
Instructor-In-charge

Course No	Course Title	L	P	U
SC 124	Computer Science II (C Programming)	4	2	5

Scope & Objective of the course:

This course is offered as a technical art subject to engineering students. It focuses on training the students rigorously in the skills of a structured programming language, particularly in C and application of such language in problem solving.

Textbook(s)	
T1	"Programming with ANSI C", E. Balaguruswamy, TMH 4th edition, 2004.
Reference book(s)	
R1	"Programming with C", Gottfried, Schaum -TMH, 2nd Edition, 2002.
R2	"A Book on C", Al Kelly & Ira Pohl , Pearsons, 4th Edition, 2001.
R3	"The C Programming Language", Kernighan & Ritchie, 2nd Edition PHI, 2002.

Lecture-wise plan:

Lecture Nos.	**Learning Objective**	**Topics to be covered**	**Reference (Ch./Sec./ Page Nos.of Text Book)**
1	Overview of C	History, Sample program, basic structure of C, executing a C program	T1 Ch.1
2-3	Constants, Variables and Data types	Constants, variables, data types, storage classes, declarations, assigning values, etc	T1 Ch.2
4-5	Operators and Expressions	Arithmetic, relational, logical, assignment, increment and decrement bitwise, conditional operators, expressions, operator precedence, type conversions, etc.	T1 Ch.3
6	Input, output operations	Reading, writing characters, formatted i/o, etc	T1. Ch.4
7	Decision making & branching	If statement, if - else, nested if, switch statement, etc	T1 Ch.5
8	Decision making & looping	While loop, do loop, for loop etc	T1 Ch.6
9-10	Arrays	One-dimensional, two-dimensional, multi-dimensional arrays, initialization, etc	T1 Ch.7
11-12	Character arrays & strings	Declaring, initializing, reading, writing strings. Arithmetic operations on characters and string operations, etc	T1 Ch.8
13-15	Low level Programming	Bitwise Operations, Bit fields	R1 Ch.13
16-17	Understanding Functions	Definition of function, function calls, return values	T1 Ch.9
18-20	User Defined Functions	Types of functions, passing arguments, nesting, recursion, passing arrays	T1 Ch.9

21-23	Understanding Structures	Defining structure, accessing structure members, structure initialization, operations on individual members, arrays of structures	T1 Ch.10
24	Structures & Unions	Unions, Structures Vs Unions	T1 Ch.10
25	Dynamic Memory Allocation	Introduction, Dynamic Memory Allocation, Malloc, Calloc, Realloc	T1. Ch.13 (13.1-13.6)
26-27	Understanding Pointers	Introduction, accessing address of a variable, declaring pointers, initialization	T1. Ch.11 (11.1-11.5)
28-29	Programming with Pointers	Accessing a variable through pointer, pointer expressions, pointer increments and scale factor	T1. Ch.11 (11.6-11.9)
30-31	Pointers & Arrays	Pointers & Arrays, Pointers & Strings, Array of Pointers	T1. Ch.11 (11.10-11.12)
32-33	Pointers & Functions	Pointers as function arguments, functions returning pointers, pointers & structures	T1. Ch.11 (11.13-11.16)
34-36	File Management	Opening a files, closing a file, I/O operations, Random Access to File, Command line arguments	T1. Ch.12
37-42	Data Structures using C	Implementation of linear linked lists, stacks, queues and binary trees	R2 Ch.10 T1. Ch.13

Evaluation Scheme:
Student evaluation is based on the series of Tests and Quizzes conducted during the course of semester followed by a comprehensive examination.

Evaluation Component	Duration	Weightage	Date	Syllabus (Lec.No.)	Remarks
Test 1	60 Minutes	08	22.03.2022	01-10	CB
Test 2	60 Minutes	08	26.04.2022	11-20	CB
Test 3	60 Minutes	08	19.05.2022	31- 42	CB
Lab	Throughout the Semester	20		**	CB
Comprehensive Exam	3 Hours	56	08.06.2022	01-42	CB

** To be announced in the class

Make-up Policy: Make –up will be given only under genuine circumstances for Tests Only. However prior and proper intimation to the concerned instructor is must.

General: It shall be the responsibility of individual students to attend all sessions, to take prescribed Assessment Tests, Tests and Comprehensive Examinations, etc.

The ICFAI University, Raipur

Faculty of Science

Second Semester, 2021 – 2022

Course Handout

Course No	Course Title	L	P	U
ES102	**Environmental Science**	**3**	**0**	**3**

Instructor In-charge: Dr. PIYUSH THAKUR

Learning Outcomes:

- Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- To describe the challenges of maintaining Soil quality and solid waste Management
- Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
- Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
- Understanding of earth processes, evaluating alternative energy systems, pollution control and mitigation, natural resource management, and the effects of global warming and climate change.

Textbook (s) **T1**	Principles of Environmental Science and Engineering, P. VenugopalaRao PHI Learning private limited, Publication)
T2	A Textbook of Environmental Chemistry and Pollution Control by S.S. Dara (S. Chand and Company)
Reference book (s) **R1**	Masters, G.M. Introduction to Environment Engineering and Science (Prentice Hall of India)
R2	Environmental Chemistry by A.K. Dey (Eastern Ltd.).
R3	Environmental Chemistry by B.K. Sharma (Krishna Prakashan).

Lecture Nos.	Learning objectives	Topics to be covered	Reference (Ch./Sec./ Page Nos.of Text Book)
1-3	Observe and describe habitats within ecosystems	Definition, Characteristics of Ecosystem: Structure of Ecosystem	T1:40-44
4-6		Function of ecosystem, Food chain, Food web, Trophic level, Energy flow, ecological pyramids.	T1: 46-54
7-9		Types of ecosystems: Aquatic ecosystems Terrestrial ecosystems	T1:59-71
10-11	To describe the challenges of maintaining Soil quality	Land Pollution, Lithosphere, pollutants	T2 110-120
12-14		Pollutants & their origin and effect, collection of solid waste	T2: 132-147
15-18		Solid waste management, recycling and reuse of solid waste and their disposal techniques (open dumping, sanitary land filling, thermal, composting).	
19 -21	To describe the challenges of maintaining surface and ground water quality.	Aquatic Environment, water pollutants, Eutrophication	R2: 201-220
22-25		Chemical Speciation, monitoring techniques and methodology	R2: 12.11.1 -12.11.1
26-27		Determination of temporary and permanent hardness of water	T1: 251-252
28-30		Waste water treatment	T1: 153-162
31- 33	To understand the sources of air pollutionand describe the types of air pollutants.	Introduction- definition-classification of air pollutants- air quality standards.	T1: 125-131
34-37		Sources, Analysis, Effects and control measures for Sox, NOx, PM and CO	R2:146-172
38-40		Secondary [photochemical smog, acid rain, ozone, PAN (Peroxy Acetyl Nitrate)], Green-house effect, ozone depletion, atmospheric stability and temperature inversion,	T2 27-45

Evaluation Scheme:

Evaluation Scheme:
Student evaluation is based on the series of Tests and Lab Tests conducted during the course of semester followed by a comprehensive examination.

Evaluation Component	Duration	Weightage	Date	Syllabus (Lec.No.)	Remarks
Test 1	60 Minutes	08	23.02.2022	01-10	CB
Test 2	60 Minutes	08	21.03.2022	11-20	CB
Test 3	60 Minutes	08	25.04.2022	31- 40	CB
Lab	Throughout the Semester	20		**	CB
Comprehensive Exam	3 Hours	56	16.05.2022	01-40	CB

Make-up Policy: Make –up will be given only under genuine circumstances for Tests Only. However prior and proper intimation to the concerned instructor is must.

General: It shall be the responsibility of individual students to attend all sessions, to take prescribed Assessment Tests, Tests and Comprehensive Examinations, etc.

Dr. PIYUSH THAKUR
Instructor-In-Charge

Date: 05/01/2022

The ICFAI University, Raipur

Faculty of Science

Second Semester, 2021 – 2022

Course Handout

Course Code	Course Title	L	P	U
SC 221	**Physics IV**	**3**	**0**	**3**

Instructor-in-charge: Dr. RAVI SHRIVASTAVA

Learning Outcomes:

(1) The objective of this course is to make the students understand the basic Magnetism and way to analyze them.

(2) It also introduces the concepts of Electromagnetic theory and, their applications using mathematical treatment.

(3) This course forms the basis for understanding the subsequent courses in science stream.

Text Books T1	Electromagnetic Field Theory and Transmission Lines by GSN Raju (Pearson Publication)
Reference Books R1	Physics for Degree Students (B.Sc. First) by C.L. Arora& P.S. Hemne (S. Chand)
R2	Elements of Electromagnetic Fields by S. P. Seth

Lecture-wise Plan

Lecture No.	Learning Objective	Topics to be covered	Reference
1-2	To learn basics of magnetic field	Concept of electromagnetic field, Lenz's Law	Digital Notes
3-4	To cover magnetic field due to current carrying conductor	Biot - Savart law and its application to current carrying circular loop	3.6
5-6	Contd…	Ampere's circuital law and its applications to infinitely long straight wire, Straight and toroidal solenoids	3.9-3.10
7-8	Understanding the concept behind force due to magnetic field or moving charge	Force on a moving charge in uniform magnetic and electric fields	R1 21.2
9-10	Learning about various aspects of currying carrying conductors	Current loop as a magnetic dipole and its magnetic dipole moment	R1 21.6-21.7

11-15	Understanding Magnetic dipole	Magnetic dipole moment of a revolving electron, Magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis.	R1 21.10-21.11
16-18	Learning about the force couple responsible for rotatory motion	Torque on a magnetic dipole (bar magnet) in a uniform magnetic field; bar magnet as an equivalent solenoid	R1 21.10-21.11
19-21	Covering the properties of magnetic materials	Magnetic field lines; Para-, dia- and ferro - magnetic substances, with examples.	3.20
22-24	Understanding Basics of electrostatics	Basic Concepts of Electrostatics, Gauss's Law and its applications	17.27
25-27	Learning basics of coordinate system	Fundamentals of Coordinate systems (elementary idea only),	Digital notes
28-29	Understanding Basics of vector algebra	Elementary idea of Gradient, divergence & Curl, Electromagnetic waves,	1.1-1.6
30-32	Understanding Basics of EMF	Equation of Continuity for Time Varying Fields.	4.2
33	Combining various rules related to EMF	Maxwell's Equations for Time Varying Fields	4.3
34-35	Learning various of Maxwell's equation	Differential form of Maxwell's equation, Integral form of Maxwell's equation,	4.3-4.4
36-37	Converting Maxwell's equation from one form to other	Conversion from Differential form of Maxwell's Equation to Integral form,	4.5
38-39	Covering various situation for Maxwell's equation	Maxwell Equation for Static Field Characteristics of Static Field & Maxwell Equation for Static Field	4.6
40	Contd…	Maxwell's equation for free space, Characteristics of Free Space &Maxwell Equation for Free Space	4.7
41-42	Contd…	Maxwell Equation for Free Space and Static Field.	4.9

Physics II- Lab (Including Virtual Lab (VL)

S.No	Name of the Experiment
1	To study the variation of magnetic field with distance along the axis of a circular coil carrying current.
2	To determine the Hall voltage developed across the sample material. (VL)
3	To draw the static current-voltage (I-V) characteristics of a junction diode. (VL)
4	To verify Newton's Law of Cooling of different materials and different liquids. (VL)

5	To study Magnetic field along the axis of current carrying coil - Stewart and Gee's method
6	To find the value of Planck's constant using Photocell.
7	To find the value e/m using Thomson's method.
8	To study the AC waveform using CRO

Evaluation Scheme:

Student evaluation is based on the series of Tests and Quizzes conducted during the course of semester followed by a comprehensive examination.

Evaluation Component	Duration	Weightage	Date	Syllabus (Lec.No.)	Remarks
Test 1	60 Minutes	08	23.02.2022	01-10	CB
Test 2	60 Minutes	08	21.03.2022	11-20	CB
Test 3	60 Minutes	08	25.04.2022	31- 42	CB
Lab	Throughout the Semester	20		**	CB
Comprehensive Exam	3 Hours	56	18.05.2022	01-42	CB

** To be announced in the class

Make-up Policy: Make –up will be given only under genuine circumstances for Tests Only. However prior and proper intimation to the concerned instructor is must.

General: It shall be the responsibility of individual students to attend all sessions, to take prescribed Assessment Tests, Tests and Comprehensive Examinations, etc.

Date: 03/01/22

Dr. RAVI SHRIVASTAVA
Instructor-In-charge

The ICFAI University, Raipur

Faculty of Science

Second Semester, 2021 – 2022

Course Handout

Course No	Course Title	L	P	U
SC 222	Chemistry IV (Organic Chemistry)	4	2	5

Instructor-in-charge: Dr. PIYUSH KUMAR THAKUR

Learning Outcomes:

1) The students can predict and account for the most commonly encountered reaction mechanisms in organic chemistry.
2) Learn to recognize the alcohol, phenol, and ether functional groups.
3) Recognize the physical and chemical properties of for aldehydes and ketones.
4) Recognize the general structures of carboxylic acids, acyl halides, acid anhydrides, esters and amides.
5) To interpret the concept of aromaticity and the main properties of aromatic compounds.

Text books T1	Organic chemsirty, R. T. Morrison, R. N. Boyd, sixth edition, pearson education.
T2	Organic Chemistry Reactions and Reagents, O.P. Agrawal, Goel publishing House.
Reference books R1	Organic Chemistry, Francis A. Carey, seventh Edition, The McGraw-Hill , 2008.
R2	Organic Chemistry, P.Y. Bruice, Third edition, Pearson Education.
R3	March's Advanced organic chemistry, M. B. Smith, eighth edition, weily.

Lecture-wise Plan

Lecture No.	Learning Objective	Topics to be covered	Reference
1-2	To understand different types reaction mechanisms in organic chemistry.	Homolytic&heterolytic bond breaking, types of reagents-electrophones & nucleophiles. Types of organic reactions.	R3 279-283

3-4		Reactive Intermediates- carbocations, carbanions, free radicals, carbenes, arynes and nitrenes	R3 223-276
5-6		Alkyl halides: Methods of preparation, Nucleophilic aliphatic substitution reactions, SN2 Reaction, Stereochemistry, SN1 Reaction	R3 404-418
7-8		Relative stability of carbocations, SN2 Vs SN1, Elimination reactions, E2 mechanism, E1 mechanism, Electrophilic addition reaction.	T1 330-346
9-10	To Explain and predict the important physical and Chemical properties of the alcohols, phenols, and ethers.	Alcohols: preparation, properties and relative reactivity of 1° , 2°, 3° alcohols, Bouvaelt-Blanc Reduction; Preparation and properties of glycols Pinacol-Pinacolone rearrangement	R1 621-640
11-13		Phenols: Preparation and properties; Acidity and factors effecting it, Ring substitution reactions, Reimer–Tiemann and Kolbe's–Schmidt Reactions, Fries and Claisen rearrangements with mechanism.	T1 925-948
14-16		Ethers and Epoxides: Preparation and reactions with acids. Reactions of epoxides with alcohols, ammonia derivatives and LiAlH4	R1 602-668
17	To understand the physical and chemical properties of for aldehydes and ketones.	Structure, reactivity and preparation; Nucleophilic additions	R1 701-714
18		Nucleophilic addition-elimination reactions with ammonia derivatives with mechanism	T1 693-697
19-24	To understand the specific naming reaction and their mechanism	Aldol and Benzoin condensation, Knoevenagel condensation, Claisan-Schmidt, Perkin, Cannizzaro and Wittig reaction, Beckmann and Benzil-Benzilic acid rearrangements, haloform reaction and Baeyer Villiger oxidation.	T2 514-564
25-28	To understand the general structures of carboxylic acids, acyl halides, acid anhydrides, esters and amides.	Preparation, physical properties and reactions of monocarboxylic acids: Typical reactions of dicarboxylic acids, hydroxy acids and unsaturated acids: succinic/phthalic, lactic, malic, tartaric, citric, maleic and fumaric	R1 791-815

		acids	
29-32		Preparation and reactions of acid chlorides, anhydrides, esters and amides; Comparative study of nucleophilicsustitution at acyl group - Mechanism of acidic and alkaline hydrolysis of esters, Claisen condensation, Dieckmann and Reformatsky reactions, Hofmannbromamide degradation and Curtius rearrangement.	R1 830-857
33-37	Know the properties of aromatic and antiaromatic compounds, and the chemical consequences of aromaticity.	Nomenclature of benzene derivatives. structure of benzene: molecular formula and Kekule&Dewar structure. Stability and carbon-carbon bond lengths of benzene, resonance structure, MO picture.	T1 529-544
38-39		**Aromaticity:** The Huckel rule.	R2 602-609
40-42		**Aromatic electrophilic substitution**-General reaction mechanism, Mechanism of nitration, halogenation, sulphonation, mercuration and Fiedel-Crafts reaction. Energy profile diagrams. Activating and deactivating substituents, orientation and ortho/para ratio. Side chain reactions of benzene derivatives. Birch reduction.	T1 553-581

Chemistry II -Lab (Including Virtual Lab (VL)

S.No	Name of the Experiment
1	Systematically identify the functional groups in the given organic compound and perform the confirmatory tests after identifying the functional groups.
2	Preparation of phenol formaldehyde resin. (Bakelite)
3	Preparing Phenol - Formaldehyde (PF) resin.
4	Preparing Urea-Formaldehyde (UF) resin.
5	Isolation and Quantification of Lycopene from Tomato.

6	To detect the halogens, nitrogen and sulphur in an organic compound. (VL)
7	To obtain pure components from a mixture of organic compounds using Fractional distillation.(VL)
8	To determine the amount of aspirin in the whole of the given solution (VL)
9	To estimate the amount of glucose in the whole of the given solution. (VL)
10	To calculate the maximum wave length of organic compounds (VL)

Evaluation Scheme:

Student evaluation is based on the series of Tests and Quizzes conducted during the course of semester followed by a comprehensive examination.

Evaluation Component	Duration	Weightage	Date	Syllabus (Lec.No.)	Remarks
Test 1	60 Minutes	16	24.02.2022	01-10	CB
Test 2	60 Minutes	17	22.03.2022	11-20	CB
Test 3	60 Minutes	17	26.04.2022	31- 42	CB
Lab	Throughout the Semester	10		**	CB
Comprehensive Exam	3 Hours	40	20.05.2022	01-42	CB

** To be announced in the class

Make-up Policy: Make –up will be given only under genuine circumstances for Tests Only. However prior and proper intimation to the concerned instructor is must.

General: It shall be the responsibility of individual students to attend all sessions, to take prescribed Assessment Tests, Tests and Comprehensive Examinations, etc.

Date: 05/01/22

Dr. PIYUSH THAKUR
Instructor-In-charge

The ICFAI University, Raipur

Faculty of Science

Second Semester, 2021 – 2022

Course Handout

Course No	Course Title	L	P	U
SC223	**Mathematics-IV(Group Theory)**	**4**	**0**	**4**

Scope and Objective of the course:

Mathematics and Abstract algebra **group theory** studies the Algebraic structures known as Group. The concept of a group is central to abstract algebra: other well-known algebraic structures, such as Rings ,Fields and Vector spaces can all be seen as groups endowed with additional Operations and Axioms .Groups recur throughout mathematics, and the methods of group theory have influenced many parts of algebra. Linear algebraic group and Lie group are two branches of group theory that have experienced advances and have become subject areas in their own right..The main aim of the course is to introduce you to basic concepts from abstract algebra, especially the notion of a group. The course will help prepare you for further study in abstract algebra as well as familiarize you with tools essential in many other areas of mathematics. The other aim of this module is to provide the learner with the skills, knowledge and competencies to carry out their duties and responsibilities in an pure Mathematic environment. .Group theory is one of the great simplifying and unifying ideas in modern mathematics. It was introduced in order to understand the solutions to polynomial equations and has its full significance, as a mathematical formulation of symmetry, been understood. It plays a role in our understanding of fundamental particles, the structure of crystal lattices and the geometry of molecules.

Text Book (T)	Joseph A. Gallian (2017). Contemporary Abstract Algebra (9th edition). Cengage.
Reference book(s)	RamjiLal (2017). Algebra 1: Groups, Rings, Fields and Arithmetic. Springer.
Reference book(s)	Abstract Algebra (H.K. Pathak)

Lecture wise plan

Lect Nos.	Learning Objective	Topics to be covered	Reference (chapter/sec./Page Nos of Text/Ref. Books)
1-5	Group structure and Various types of Groups	Groups and its Elementary Properties Symmetries of a square, Definition and examples of groups including dihedral, permutation and quaternion groups, Elementary properties of groups.	Ch-1,2/31-54/T
6-11	Subgroup, Cyclic gruop	Subgroups and Cyclic Groups Subgroups and examples of subgroups, Cyclic groups, Properties of cyclic groups, Lagrange's theorem, Euler phi function, Euler's theorem, Fermat's little theorem.	Ch-3,4/60-95/T

12-16	Normal Subgroups , Simple group, Factor group	Normal Subgroups Properties of cosets, Normal subgroups, Simple groups, Factor groups, Cauchy's theorem for finite abelian groups;	Ch-9/185-200/T
17-21	Centre of group	Centralizer, Normalizer, Center of a group, Product of two subgroups; Classification of subgroups of cyclic groups.	
22-27	Permutation Groups	Permutation Groups Cycle notation for permutations, Properties of permutations, Even and odd permutations, alternating groups, Cayley's theorem and its applications.	Ch-5/99-118/T
28-33	Group Homomorphism	Group Homomorphisms, Rings and Fields Group homomorphisms, Properties of homomorphisms,	Ch-10/208-219/T
34-40	Group Isomorphism, Ring ,Field.	Group isomorphisms, Properties of isomorphisms; First, second and third isomorphism theorems for groups; Definitions and elementary properties of rings and fields.	Ch-6/127-138/T Ch-12/245-250/T Ch-19/349-355/T

Evaluation Scheme:

Student evaluation is based on the series of Tests and Quizzes conducted during the course of semester followed by a comprehensive examination.

Evaluation Component	Duration	Weightage	Date	Syllabus (Lec.No.)	Remarks
Test 1	60 Minutes	17	24.02.2022	1-11	CB
Test 2	60 Minutes	17	22.03.2022	12-27	CB
Test 3	60 Minutes	16	26.04.2022	28-40	CB
Quizzes (2)	20 Minutes each	10		**	CB
Comprehensive Exam	3 Hours	40	23.05.2022	1- 40	CB

** To be announced in the class

Make-up Policy: Make –up will be given only under genuine circumstances for Tests Only. However prior and proper intimation to the concerned instructor is must.

General: It shall be the responsibility of individual students to attend all sessions, to take prescribed Assessment Tests, Tests and Comprehensive Examinations, etc.

Dr. SHANTI SWARUP DUBEY
Instructor-In-charge

The ICFAI University, Raipur

Faculty of Science

Second Semester, 2021 – 2022

Course Handout

Course No	Course Title	L	P	U
HSC 221	**Physics (H2) (Basic Material Science)**	**4**	**2**	**5**

Instructor-In-Charge: Ms.VARSHA VERMA

Learning Outcomes:

The objective of a Materials science is to predict and control material properties through an understanding of atomic, molecular, crystalline, and microscopic structures of engineering materials. We study the properties of materials in order to better understand them, what they can do, and how they interact with their environment.

The fundamental aim of materials science and engineering is materials selection ensuring required functions and application properties of products, which are manufactured out of them. The tasks of that field of science in priority spheres of the world development are determined.

Text books T1	Chemistry for Degree Students (B.Sc. First) by Dr. K.N. Bapat, Dr. A. Pollai, S. Ghosh, P. Gupta & Dr. V. Ayachit
T2	Unified Physics for Degree Students (B.Sc. Final) by Dr.R.P. Goyal
Reference books R1	A textbook of Engineering Physics by MN Avadhanulu and PG Kshirsagar, S. Chand Publication, First Edition.
R2	Spectroscopy by H Kaur, PragatiPrakashan (2015)

Lecture-wise Plan

Lecture No.	Learning Objective	Topics to be covered	Reference
1-2	To characterize different materials	Single crystalline, polycrystalline and amorphous materials	R2 411-412
3		single crystals: unit cell, crystal systems, Bravaislattices,	T1 787-791

4		directions and planes in a crystal, Miller indices – inter-planar distances	T1 774-775
5-8	To understand the geometry of solids with different coordination number	coordination number and packing factor for SC, BCC,FCC	T1 777-780
9-16	To know the other properties of materials such as diffusion, dielectric breakdown, chemical durability.	crystal imperfections: point defects, line defects and Planner defects	T1 803-809
17-20		Voids, tetrahedral void, octahedral voids, Size of Spheres that fit into voids.	R1 490-492
21-22	To describe the physical characteristics such as electronic structure and optical and transport properties, and current-voltage characteristics of semiconductors.	Electrical Conduction, Band Theory, Conduction Mechanism,	R1 506-519
23-24		Intrinsic & Extrinsic Semiconductor, Effect of Temperature,	R1 527-548
25-26		Hall effect,	R1-547- 549
27		elementary idea about PN junction diode and BJT	R1 556-654 , 589-600
28-29	To understand how a changing magnetic field creates a changing electric field (and vice versa)	Magnetic field Strength, Magnetic moments, Magnetization, Magnetism, Magnetic Susceptibility, Magnetic Permeability	R1 608-612
30-32		Dia-magnetism, Para- magnetism, Ferro-magnetism, Anti-Ferro-magnetism, Ferri-magnetism, Hysteresis, Hard and Soft magnets	R1 613-640
33-35		Superconductivity, Bardeen-Cooper-Schrieffer (BCS) Theory, The Meissner effect, Types of Superconductors	R1 644-660
36-37	To understand the relationship between atomic structure and properties of materials.	Practical approach to understand the refinement of lattice parameters	Study Notes and Software will be provided
38-39		the material using Crystallographic Database	
40		Refinement software like Celref and Fullprof	

Physics II-Lab (Including Virtual Lab (VL)

S.No	Name of the Experiment
1	To estimate the percentage of iron in haematite ore solution..
2	To estimate the percentage of iron in magnetite ore solution.
3	Determination of Calcium and Magnesium in Limestones and Dolomites
4	The estimation of available chlorine in bleaching powder
5	To study various crystals structures. (VL)
6	To precipitate nickel from the solution by adding dimethyl glyoxime.(VL)
7	To determine and separate the constituents like Copper, Zinc, Tin, Lead, and Iron in brass (VL)

Evaluation Scheme:
Student evaluation is based on the series of Tests and Quizzes conducted during the course of semester followed by a comprehensive examination.

Evaluation Component	Duration	Weightage	Date	Syllabus (Lec.No.)	Remarks
Test 1	60 Minutes	08	25.02.2022	01-10	CB
Test 2	60 Minutes	08	23.03.2022	11-20	CB
Test 3	60 Minutes	08	27.04.2022	31- 40	CB
Lab	Throughout the Semester	20		**	CB
Comprehensive Exam	3 Hours	56	25.05.2022	01-40	CB

** To be announced in the class

Make-up Policy: Make –up will be given only under genuine circumstances for Tests Only. However prior and proper intimation to the concerned instructor is must.

General: It shall be the responsibility of individual students to attend all sessions, to take prescribed Assessment Tests, Tests and Comprehensive Examinations, etc.

Date: - 27.01.2022

Ms.VARSHA VERMA
Instructor – In-charge

The ICFAI University, Raipur

Faculty of Science

Second Semester, 2021 – 2022

Course Handout

Course No	Course Title	L	P	U
HSC 222	Chemistry (H2) (Solid State Chemistry)	4	2	5

Instructor-in-charge: Ms.VARSHA VERMA

Learning Outcomes:

(1) The objective of a solid state chemistry is to describe specific crystal structures by applying basic crystallographic concepts. give an account of the generation of X-ray radiation and its effects of on matter.

(2) To describe the experimental use of the diffraction phenomenon. use powder diffraction data for characterising cubic substances.

(3) In solid-state chemistry, we study the concept of a compound in a more deeper level. It basically helps us understand the compound from a molecular level to the crystal structure level.

Text books T1	Chemistry for Degree Students (B.Sc. First) by Dr. K.N. Bapat, Dr. A. Pollai, S. Ghosh, P. Gupta & Dr. V. Ayachit
T2	Unified Physics for Degree Students (B.Sc. Final) by Dr.R.P. Goyal
T3	Chemistry for degree students, Dr. R. L. Madan, S. Chand Publication.
Reference books R1	Spectroscopy by H Kaur, PragatiPrakashan.
R2	A textbook of Engineering Physics by MN Avadhanulu and PG Kshirsagar, S. Chand Publication, First Edition.

Lecture-wise Plan

Lect No.	Learning Objective	Topics to be covered	Reference
1-2	To understand how a changing magnetic field creates a changing electric field (and vice versa)	Magnetic field Strength, Magnetic moments, Magnetization, Magnetism: -	T2 466-469
3-4		Dia-magnetism, Para- magnetism, Ferro-magnetism, Anti-Ferro-magnetism, Ferri-magnetism, Hard and Soft magnets	T2 469-475 R2 613-640
5-7	To understand the Superconductivity and their property	Superconductivity, Types of Superconductors, Bardeen-Cooper-Schreiffer (BCS) Theory.	R2 644-660
8-9	To understand the types of crystal	Single crystalline, polycrystalline and amorphous materials	T2 411-412

10-14	To learn distinctive internal structures that in turn lead to distinctive flat surfaces, or faces.	single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances	T1 787-775
15-18	To understand the geometry of solids with different coordination number	coordination number and packing factor for SC, BCC, FCC -	T1 777-780
19-21		crystal imperfections: point defects, line defects	T1 803-809
22-23		Crystalline solid, non-crystalline solid, laws of crystallography	T1 773-775
24-25	To explain some basic concepts related to electrical *conduction*.	Electrical Conduction, Band Theory, Conduction Mechanism,	R2 506-519
26-27		Intrinsic & Extrinsic Semiconductor, Effect of Temperature, Di-electric property	R2 527-548
28-29	To explain some basic concepts related to symmetry oprations.	Symmetry elements and symmetry oprations	T1 780-786
30-31	To understand the synthesis of new solid-state materials	Solid state reactions – Ceramic method, sol-gel method	Digital Notes
32-33		Point group and space group	TI 786
34-35		Liquid crystals: Nematic, Cholesteric, Smectic.	T3 754-756
36-37		and scanning electron microscopy (only introduction and application).	
38-40	To Understand the basics of X-ray diffraction theory in terms of X-rays, diffraction and Bragg's Law.	X-ray structure determination (NaCl and KCl only) – powder methods	R1 694

Physics II-Lab (Including Virtual Lab (VL)

S.No	Name of the Experiment
1	The estimation of available chlorine in bleaching powder
2	Determination of Calcium and Magnesium in Limestones and Dolomites
3	To estimate the percentage of iron in magnetite ore solution.
4	To estimate the percentage of iron in haematite ore solution.
5	To determine and separate the constituents like Copper, Zinc, Tin, Lead, and Iron in brass (VL)

6	To precipitate nickel from the solution by adding dimethyl glyoxime.(VL)
7	To study various crystals structures. (VL)

Evaluation Scheme:

Student evaluation is based on the series of Tests and Quizzes conducted during the course of semester followed by a comprehensive examination.

Evaluation Component	Duration	Weightage	Date	Syllabus (Lec.No.)	Remarks
Test 1	60 Minutes	08	25.02.2022	01-10	CB
Test 2	60 Minutes	08	23.03.2022	11-20	CB
Test 3	60 Minutes	08	27.04.2022	31- 40	CB
Lab	Throughout the Semester	20		**	CB
Comprehensive Exam	3 Hours	56	25.05.2022	01-40	CB

** To be announced in the class

Make-up Policy: Make –up will be given only under genuine circumstances for Tests Only. However prior and proper intimation to the concerned instructor is must.

General: It shall be the responsibility of individual students to attend all sessions, to take prescribed Assessment Tests, Tests and Comprehensive Examinations, etc.

Date: 27/01/22

Ms.VARSHA VERMA
Instructor – In-charge

The ICFAI University, Raipur

Faculty of Science

Second Semester, 2021 – 2022

Course Handout

Course No	Course Title	L	P	U
HSC223	**Mathematics-IV (Partial Differential Equations and Calculus of Variations)**	**4**	**0**	**4**

Scope and Objective of the course:

To equip students with the concepts of partial differential equations and how to solve linear Partial Differential with different methods. Students also will be Introduced to some physical problems in Engineering models that results in partial differential equations.

Text Book(T)	Ordinary and Partial Differential Equations(Dr.M.D.Raisinghania,S.Chand)
Reference book(s)	Calculus of Variations with Applications (A.S.Gupta)

Lecture wise plan

Lecture Nos.	Learning Objective	Topics to be covered	Reference(chapter /sec./Page Nos of Text /Ref.Books)
1-5	First order partial differential equations	Order and Degree of PDE,Concept of linear and non-linear PDE,PDE of 1st order, Lagrange's method,Charpit'sgeneral method.	Ch-1.2,3/1.3-3.79/T
6-11	Second order partial differential equations with constant coefficients	Classification of linear PDE of 2nd order, Homogeneous and Non Homogeneous equations with constants coefficients.	Ch-4/4.1-4.34/T
12-16	Second order partial differential equations with variable coefficients	PDE reducible to equation with constant coefficients, 2nd orderPDE with variable coefficients, Classification of 2nd order PDE	Ch-5/5.1-5.38/T
17-21	Second order partial differential equations with variable coefficients	Reduction to canonicalor normal form, Monge's Method, Solution of heat and wave equations in one and two dimension by method of separation of variables.	Ch-5/5.1-5.38/T
22-27	Calculus of variations-Variational problems with fixed boundaries	Euler's equation for functional containing 1st order and higher order total derivatives, Functional containing First order partial derivates.	Ch-1,2/1-30/R

28-33	Calculus of Variation-Variational problem with moving boundaries.	Variational problem with moving boumdaries, Functional depends on one and two variables conditions.	Ch-3,4/31-67/R
34-40	Calculus of Variation-Variational problem with moving boundaries	One sided variations, Sufficient conditions for an extremum Jacobi and Legendre	Ch-3,4/31-67/R

Evaluation Scheme:

Student evaluation is based on the series of Tests and Quizzes conducted during the course of semester followed by a comprehensive examination.

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Evaluation Component	Duration	Weightage	Date	Syllabus (Lec.No.)	Remarks
Test1	60 Minutes	17	25.02.2022	1-11	CB
Test2	60 Minutes	17	23.03.2022	12-27	CB
Test3	60 Minutes	16	27.04.2022	28-40	CB
Quizzes(2)	20 Minutes each	10		**	CB
Comprehensive Exam	3 Hours	40	25.05.2022	1-40	CB

**To be announced in the class

Make-up Policy: Make –up will be given only under genuine circumstances for Tests Only. However prior and proper intimation to the concerned instructor is must.

General: It shall be the responsibility of individual students to attend all sessions, to take prescribed Assessment Tests, Tests and Comprehensive Examinations, etc.

Dr. SHANTI SWARUP DUBEY
Instructor-In-charge

The ICFAI University, Raipur

Faculty of Science

Second Semester, 2021 – 2022

Course Handout

Course No	Course Title	L	P	U
SC 321	**Physics VI (Basic Electronics & Electrical)**	**4**	**2**	**5**

Instructor-in-charge: Dr. RAVI SHRIVASTAVA

Learning Outcomes:

(1) The objective of this course is to make the students understand the basic electric circuits and the techniques of analyzing them.

(2) It also introduces the concepts of electronic devices, their applications and the basics of digital Electronics.

(3) This course forms the basis for understanding the subsequent courses in electrical and electronics

Text books T1	Fundamentals of Electrical Engineering, Leonard S. Bobrow, Oxford University Press, 2nd Edition.1996.
Reference books R1	Engineering circuit analysis, WH.Hayt , J.E. Kemmerly, McGraw Hill company, 6th Edition, 2000.
R2	Electronic Devices & Circuits, Millman & Halkias McGraw Hill, 2002.
R3	Analog Electronics L.K. Maheshwari and M.M.S. Anand, , 1st Ed., PHI,2005.

Lecture-wise Plan

Lecture No.	Learning Objective	Topics to be covered	Reference
1-2	To understand the concept of basic circuit elements	Introduction to Basic Circuit theory & Circuit elements	1.1
3	To understand the concept of basic electrical laws	Kirchhoff's Current & Voltage Laws	1.2, 1.3
4	To understand the concept of basic sources	Independent & Dependent Sources	1.4, 1.5
5-8	To understand the methods of circuit Analysis	Mesh & Nodal Analysis	2.1, 2.3, 2.4
9-16	Focuses on the basics of Ideal and Practical Operational Amplifier	An Ideal Op-amp Basic Configurations of Op-amps Practical Op-amp, Inverting, Non-inverting, Adder, Subtractor, Differentiator and Integrator.	R2 (2.1-2.5)

17-20	To understand the network theorems	Thevenin's& Norton's theorem	2.5
21-22	To understand the concept of basic theorems	Linearity, Superposition, Maximum power transfer theorems	2.5, 2.6
23-24	Learning characteristics of energy storage elements	Energy storage elements (Inductors & Capacitors) their relationships & their natural responses	3.1, 3.2, 3.3
25-26	To study forced and free response of a circuit.	First order & second order System responses	3.4, 3.5, 3.6
27	To study basics of semiconductors	Semiconductors: intrinsic and doped: p-n junction	6.1, 6.2
28-29	To study operation and characteristics of junction diodes	junction Diode & its characteristics	6.3, 6.4, 6.6
30-32	Application of diode	Rectifier circuits & filters	Lecture notes will be provided
33	Operation and application of Zener diodes	Zener Diode & its characteristics	6.6
34-35	To study operation of transistors	Introducing transistors	7.1
36-37	To study classification and characteristics of transistors	pnp and npn transistors and their characteristics & operation	7.2, 7.3
38-39	To study operations of FETS	FETS, their operations & characteristics	8.1
40	To study working of BJT	Biasing of BJT	9.1
41-42	Common emitter characteristics	BJT amplifier, common emitter configuration	9.1

Physics VI- Lab

S.No	Name of the Experiment
1	To study the characteristics of a PN junction diode.
2	To study the characteristics of a Zener diode.
3	To study the characteristics of a NPN Transistor
4	To study the Thevenin's theorem.
5	To study Norton's theorem.
6	To study Super position theorem.
7	To study Maximum Power Transfer theorem.
8	To verify the Kirchoff's Law

Evaluation Scheme:

Student evaluation is based on the series of Tests and Quizzes conducted during the course of semester followed by a comprehensive examination.

Evaluation Component	Duration	Weightage	Date	Syllabus (Lec.No.)	Remarks
Test 1	60 Minutes	08	23.02.2022	01-10	CB
Test 2	60 Minutes	08	21.03.2022	11-20	CB
Test 3	60 Minutes	08	25.04.2022	31- 42	CB
Lab	Throughout the Semester	20		**	CB
Comprehensive Exam	3 Hours	56	18.05.2022	1-42	CB

** To be announced in the class

Make-up Policy: Make –up will be given only under genuine circumstances for Tests Only. However prior and proper intimation to the concerned instructor is must.

General: It shall be the responsibility of individual students to attend all sessions, to take prescribed Assessment Tests, Tests and Comprehensive Examinations, etc.

Date: 03/01/22

Dr. RAVI SHRIVASTAVA
Instructor-In-charge

The ICFAI University, Raipur

Faculty of Science

Second Semester, 2021 – 2022

Course Handout

Course No	Course Title	L	P	U
SC 322	**Chemistry VI (Instrumental Method of Analysis)**	**4**	**2**	**5**

Instructor-in-charge: Ms.VARSHA VERMA

Learning Outcomes:

(1) Instrumental analysis is a field of analytical chemistry that investigates analytes using scientific instruments.

(2) Compared to simple laboratory tests, instrumental methods of analysis may give improved: speed (they are quick) accuracy (they reliably identify elements and compounds) sensitivity.

(3) To understand the major categories of instrumental methods such as the spectral, electroanalytical, and separatory.

Text books T1	Textbook of Quantitative Chemical Analysis by Vogel's, 5th Edition , British Library Cataloguing in Publication Data.
T2	Instrumental Methods of Chemical Analysis, G.R. Chatwal, S.K. Anand, 5th Edition, Himalaya publication House.
T3	College Analytical Chemistry, S.A. Zauri, D. Yogesh, V. Ghalsai,P. Sathe, S.S. Mangeskar, 4th Edition, Himaliyan Publication House.
Reference books R1	The Essence of Chromatography by Colin F. Poole
R2	Spectroscopy by H. Kaur, Pragati Prakashan.

Lecture-wise Plan

Lecture No.	Learning Objective	Topics to be covered	Reference
1-2	To understand the working of basic instrument for analysis	Principle and instrumentation of pH meter, Conductometer, Potentiometer	T2 2.487-2.488, 2.511-2.517
3-4		OPTICAL METHODS: General design – sources of radiation – wavelength selectors	T1 616-623
5-6		sample containers – radiation transducers, types of optical instruments	T3 86-118

7-9	study of the emission, absorption and scattering of electromagnetic radiation accompanying transitions among atomic or molecular energy levels.	MOLECULAR SPECTROSCOPY: Measurement of transmittance and absorbance – beer's law	R2 238-250
10-15		spectrophotometer analysis – qualitative and quantitative absorption measurements	T1 5-6
16-19		types of spectrometers – IR – Raman spectroscopy – instrumentation – theory.	R2 149, 220
20-21	To understand the separation, identification, and purification of the components of a mixture for qualitative and quantitative analysis.	Chromatography: Solvent extraction – principles of ion exchange, paper, thin layer	T1 213, 234
22-23		Chromatography techniques – Columns, adsorbents, methods, Rf values,	T1 198-200
24-25	To identify, quantify and purify a particular analyte or compound.	HPLC techniques – Adsorbents, columns, detection methods, estimations,	R1 860-883
26-27		Application of chromatographic ananlysis	T1 232
28-29	To determination of trace metals in many types of samples composed of organic or inorganic matrices.	Atomic Absorption Spectroscopy-Introduction, Principle	R2 565
30-31		Classification of atomis spectroscopic method, Instrumentation for AAS	R2 566, 568
32-33		Interferences in AAS, applications of AAS, Some typical analysis	R2 573-577
34-35	To determine and quantify the elemental composition of a material.	Atomic Emission Spectroscopy-Introduction, advantages and disadvantages	R2 582
36-37		Principle and instrumentation of AES	R2 584
38-39		Measurement of light intensity	R2 589
40		Application of emission spectroscopy.	R2 591

Chemistry VI-Lab (Including Virtual Lab (VL)

S.No	Name of the Experiment
1	To determine the pH of waste water collected from different water sources (VL)
2	To determine the pH value of given solution using pH meter. (VL)

3	Titration of Mixture of Weak Acid and Strong Acid with Strong Base Using Conductometer.
4	Determination of Dissociation Constant of Weak Acid (Acetic Acid) using PH - Meter
5	Titration of Mixture of Weak Acid and Strong Acid with Strong Base Using Potentiometer.
6	To Determine Maximum Wavelength of Absorption of FeSO4, to Verify Beer's Law and to Find Unknown Concentration of Ferrous ions (Fe2+) in Given Sample by Spectrophotomety / colorimetry
7	Determination of Fluoride Ion in Groundwater and Toothpaste.

Evaluation Scheme:

Student evaluation is based on the series of Tests and Quizzes conducted during the course of semester followed by a comprehensive examination.

Evaluation Component	Duration	Weightage	Date	Syllabus (Lec.No.)	Remarks
Test 1	60 Minutes	08	24.02.2022	01-10	CB
Test 2	60 Minutes	08	22.03.2022	11-20	CB
Test 3	60 Minutes	08	26.04.2022	31- 40	CB
Lab	Throughout the Semester	20		**	CB
Comprehensive Exam	3 Hours	56	20.05.2022	01-40	CB

** To be announced in the class

Make-up Policy: Make –up will be given only under genuine circumstances for Tests Only. However prior and proper intimation to the concerned instructor is must.

General: It shall be the responsibility of individual students to attend all sessions, to take prescribed Assessment Tests, Tests and Comprehensive Examinations, etc.

Date: 27/01/22

Ms.VARSHA VERMA
Instructor-In-charge

The ICFAI University, Raipur

Faculty of Science

Second Semester, 2021 – 2022

Course Handout

Course No	Course Title	L	P	U
SC323	**Mathematics-VI**	**4**	**0**	**4**

Instructor-in-charge: Dr SHANTI SWARUP DUBEY

Learning Outcomes:
After successful completion of the course student will be able to

1. The knowledge of auto orphism helps to study more on field theory.
2. Students learn on direct products, group actions, class equations and their applications with proof of all results.
3. This course helps to opt for more advanced courses in algebra and linear classical groups.
4. Ring theory-Ring homomorphism
5. Unique factorization domain

Text Book T1	Abstract Algebra by Dr H K Pathak
Text Book T2	Algebra & Trigonometry by Dr H K Pathak

Lecture wise plan

Lecture Nos.	Learning Objective	Topics to be covered	Reference (chapter/sec./Page Nos of Text/Ref. Books)
1-2	Group	Definition of group, groupoid, semi-group,	T2 Ch-7 pp-270-283
3-4	Automorphism, Inner automorphism, automorphism groups	Definition of automorphism, inner automorphism, automorphism groups problems	T1 Ch-1 pp-1-32
5-6	Applications of factor groups to automorphism groups.	Applications of factor groups to automorphism groups and its theorems	T1 Ch1 pp-23-17
7-9	Characteristic Subgroups. Conjugacy relation	Characteristic Subgroups. Conjugacy relation, and their properties and theorems	T1 Ch 1 pp-4-21
10-13	Normaliser Counting principle	Definition of Normalizer and Counting principle. Normalizer of an elements	R2 Ch-1 pp-20-22
14-19	Center for Group.	Definition of Center for Group, Center for Group of prime-order. Abelianizing of a group and its universal property	T1 Ch-1 pp-23-25
20-24	Sylow subgroup, Sylow's theorem	Definition of Sylow subgroup, and Proof of Sylow's theorem	T1 Ch-2 pp-33-64

25-27	Commutator subgroup	Definition of Commutator subgroup and its theorems.	T1 Ch- pp-48-56
28-32	Properties of external direct products,	Properties of external direct products, the group of units modulo n as an external direct product, internal direct products, Fundamental Theorem of finite abelian groups	T1 Ch-4 pp-168-195
33-34	Ring theory	Definition of Ring theory and examples	T2 Ch-16 pp-523-588
35-37	Ideals and Quotient Rings	Ring homomorphism. Ideals and Quotient Rings. Field of Quotients of an Integral Domain. Euclidean rings. Polynimial Rings. Polynomials over the Rational Field	T2 Ch-16 556-588
38-40	Unique factorization domain	Definition of Unique factorization domain and its theorems	T1 Ch-3 pp-144-162

Evaluation Scheme:

Student evaluation is based on the series of Tests and Quizzes conducted during the course of semester followed by a comprehensive examination.

Evaluation Component	Duration	Weightage	Date	Syllabus (Lec.No.)	Remarks
Test 1	60 Minutes	17	24.02.2022	1-12	CB
Test 2	60 Minutes	17	22.03.2022	13- 28	CB
Test 3	60 Minutes	16	26.04.2022	29- 40	CB
Quizzes (2)	20 Minutes each	10			CB
Comprehensive Exam	3 Hours	40	23.05.2022	1- 40	CB

** To be announced in the class

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Dr. SHANTI SWARUP DUBEY
Instructor-In-charge

The ICFAI University, Raipur

Faculty of Science

Second Semester, 2021 – 2022

Course Handout

Course No	Course Title	L	P	U
HSC 321	**Physics (H4) (Modern physics)**	**4**	**2**	**5**

Instructor-in-charge: Dr. RAVI SHRIVASTAVA

Learning Outcomes:

- Physics VI forms the Second part of a two-semester comprehensive course on corevel physics to be taught to all engineering students.
- The course aims at developing an understanding of the basic principles of physics and the application of concepts to problems of practical interest.
- The emphasis is on improving the problem solving skills of students.

Text books T1	Physics for Degree Students B.Sc. third year, by Arora C.L.,Hemne P.S.
Reference books R1	A Textbook of Engineering Physics by Avadhanulu and Kshirsagar, S. Chand & Company Ltd.

Lecture-wise Plan

Lecture No.	Learning Objective	Topics to be covered	Reference
1-2	To discuss about atoms nuclei and Rutherford scattering	Atoms, Nuclei and Solids: Rutherford scattering (detailed derivation),	R1 13.10-13.12
3-5	To study Compton scattering	Compton scattering and comparison with Raman scattering	R1 13.10-13.12
6-8	To discuss Mossbauer effect and solid state detectors	Mossbauer effect, Solid state detectors,	Digital Notes
9-11	To study mass spectrometer	Mass spectrometer (illustrated by Bainbridge and Aston spectrometer), Charge particles in magnetic field, Landau levels.	R1 5.11
12-13	To learn the concept of fundamental of quantum mechanics	Wave-particle duality, Photoelectric effect, Compton Effect, Matter waves	R1 13.23-13.25
14-16	Understanding particle wave duality of matter	de-Brogle wavelength. X-ray and neutron diffraction and Bragg's Law	R1 13.23-13.25
17-20	Understanding various spectras.	Electron waves and Davisson Germer experiment. Rutherford scattering and concept of	R1 13.23-13.25

		nucleus, Elementary ideas of atomic and molecular spectra.	
21-24	to study types of interaction, parameter	Types of Interaction, parameters	42.2
25-28	to discuss classification of particle and conservation law	classification, exact conservation laws	Digital notes
29-30	to discuss of conservation law and symmetry	approximate conservation laws, symmetry	Digital notes
31-33	to study Quarks model	quark model	44.1,44.2
34-35	to discuss elementry particle and it,s parameters	Elementary Particles & their classifications, Types of interaction, parameter, classification,	44.3
36-37	to study exact consxervation laws and some problems	exact conservation laws, relativistic problems, symmetry	44.4
38-39	to study about radioactivity, mean life ,half life	Radioactivity: stability of the nucleus; Law of radioactive decay; Mean life and half-life;	10.1,10.2, 10.3,
40-41	to discuss about various decays	Alpha decay; Beta decay-energy released	10.8,10.9, 10.10

Physics V- Lab (Including Virtual Lab (VL)

S.No	Name of the Experiment
1	To determine the dispersive power of prism using spectrometer
2	To determine the wavelength of a monochromatic light using Newton's Ring method (VL)
3	To find the grating element using spectrometer
4	To study the AC waveform using CRO
5	To study LCR resonance circuit
6	To study the characteristics of a solar cell
7	To study Magnetic field along the axis of current carrying coil - Stewart and Gee's method
8	To determine the Hall voltage developed across the sample material. (VL)
9	To draw the static current-voltage (I-V) characteristics of a junction diode. (VL)
10	To verify Newton's Law of Cooling of different materials and different liquids. (VL)

Evaluation Scheme:
Student evaluation is based on the series of Tests and Quizzes conducted during the course of semester followed by a comprehensive examination.

Evaluation Component	Duration	Weightage	Date	Syllabus (Lec.No.)	Remarks
Test 1	60 Minutes	16	23.02.2022	01-10	CB
Test 2	60 Minutes	17	21.03.2022	11-20	CB
Test 3	60 Minutes	17	25.04.2022	31- 41	CB
Lab	Throughout the Semester	10		**	CB
Comprehensive Exam	3 Hours	40	16.05.2022	01-41	CB

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Date: 05/01/22

Dr. RAVI SHRIVASTAVA
Instructor-In-charge

The ICFAI University, Raipur

Faculty of Science

Second Semester, 2021 – 2022

Course Handout

Course No	Course Title	L	P	U
HSC323	**Numerical Methods / Numerical Analysis**	**4**	**0**	**4**

Scope and Objective of the course:

. In reality "Solving a Math problem" generally involves finding an answer rather than exact answer.

. NUMERICAL ANALYSIS is the study of algorithims that use numerical approximation for the problems of mathematical analysis.

. A numerical method is a complete and definite set of procedures for the solution of a problem, together with computable error estimates. The study and implementation of such methods is the field of numerical analysis/numerical methods.

. A trick that lets you get closer and closer to an exact answer is a NUMERICAL METHOD.

Text Book (T)	Numerical Methods (M. K. Jain , S. R. K. Iyengar , R. K. Jain)
Reference book(s) R1	Mathematics Numerical Analysis (G ShankerRao)
R2	Numerical Analysis (Schaum's outlines -2nd Edition)

Lecture wise plan

Lecture Nos.	Learning Objective	Topics to be covered	Reference (chapter/sec./Page Nos of Text/Ref. Books)
1-5	Transcendental and Polynomial equations	Introduction ,Bisection method, Iteration methods based on first degree equation, Iteration methods based on second degree equation	Ch-1/1-13/T
6-11	Transcendental and Polynomial equations	Rate of convergence, general iteration methods, system of non linear equations, Methods for complex roots, Polynomial equations.	Ch-1/1-13/T
12-16	Linear algebraic equations and Eigen value problems	Introduction, Direct methods, Iteration methods, Eigen values and Eigen vectors , Bounds on Eigen values, Jacobi method for symmetric matrices.	Ch-2/71-86/T
17-21	Interpolation and Approximation	Introduction, Lagrange and Newton Interpolations, Finite difference operators, Interpolating polynomials using finite difference ,Gregory-Newton interpolations	Ch-3/144-158/T
22-27	Differentiation and integration	Introduction , Numerical differentiation, Partial differentiation, Numerical Integration ,Method based on Interpolation ,Method based on undetermined	Ch-4/212-231/T

		coefficients	
28-33	Differentiation and integration	Composite integration methods, Romberg Integration, Double Integration, Gaussian integration methods.	Ch-4/212-231/T
34-40	Numerical solution of ordinary differential equations	Introduction, Singlestep methods, Multistep methods, Predictor corrector methods, stability analysis, system of differential equations, shooting methods, finite difference methods.	Ch-272-296/T

Evaluation Scheme:

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Evaluation Component	Duration	Weightage	Date	Syllabus (Lec.No.)	Remarks
Test 1	60 Minutes	17	23.02.2022	1-11	CB
Test 2	60 Minutes	17	21.03.2022	12-27	CB
Test 3	60 Minutes	16	25.04.2022	28-40	CB
Quizzes (2)	20 Minutes each	10		**	CB
Comprehensive Exam	3 Hours	40	16.05.2022	1- 40	CB

** To be announced in the class

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