# Faculty of Science

# Second Semester, 2023–2024
# Course Handouts

# Table of Content

# The ICFAI University, Raipur
Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | Course Title | L | P | U |
|---|---|---|---|---|
| **SC120** | **English Language-I** | **3** | **0** | **3** |

**Instructor-in-charge: Dr.RITU BENJAMIN**

**Learning Outcomes:**
After successful completion of the course student will be able to
1. Use effective English Language
2. Write correct English.
3. Write effective formal letters
4. Understand the different aspects of English Language and to use it in real time verbally and non-verbally.
5. Understand and develop a liking for learning English.

| | |
|---|---|
| Text booksT1 | English Language Skills-I by Aruna Koneru |
| Reference Books R1 | Effective Technical Communication by Ashraf Rizvi, Tata McGraw Hill Publication. |
| Reference Book R2 | English Grammar & Composition by Wren and Martin, S Chand Publication |
| Reference Book R3 | Soft Skills- K.Alex |

**Lecture-wise-plan:**

| Lecture Nos | Learning Objective | Topics to be covered | Reference |
|---|---|---|---|
| 1-3 | To learn the sounds of English Language | Phonetics | R1 |
| 4-6 | To learn about silent letters | Silent letters | R1, R2, R3 |
| 7-9 | To understand the dictionary and to learn the way to use it | Dictionary- Its use | T1 |
| 10-12 | To learn the various methods to improve vocabulary | Vocabulary Extension | T1 |
| 13-14 | To understand prepositional phrase | Prepositional Phrases | R2 |

| Lecture Nos | Learning Objective | Topics to be covered | Reference |
|---|---|---|---|
| 15-16 | To understand Prepositional Verbs | Phrasal Verbs | R2 |
| 17-19 | To improve the reading Skills | Reading Skills | R1, R2, R3 |
| 20-22 | To improve listening Skills | Listening Skills | R1, R2, R3 |
| 23-25 | To learn correct usage of words | Effective use of words | R1, R2, R3 |
| 26-28 | To learn to build correct sentences | Effective sentences | R1, R2, R3 |
| 29-31 | To learn to draft different types of Business Letters | Structure of business letters | R1, R2, R3 |
| 32-34 | To learn to write business letters in different styles | Effective style of business correspondence | T1 |
| 35-37 | To understand business communication | Business correspondence | T1 |
| 38-40 | To improve communication skills | The art of conversation | T1,R2 |

**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 | 16 | 12-02-2024 | 1-9 | CB |
| Test 2 | 60 Minutes | 17 | 11-03-2024 | 10- 22 | OB |
| Test 3 | 60 Minutes | 17 | 15-04-2024 | 23- 31 | CB |
| *GD/P/CS | Throughout the Semester | 10 | ** | --- | CB |
| Comprehensive Exam | 3 Hours | 40 | 16-05-2024 | 1- 40 | CB |

*Group Discussion/ Presentation/ Case Study    ** 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: 08/01/2024**                                    **Dr.RITU BENJAMIN**
                                                        **Instructor-in-charge**

# The ICFAI University, Raipur

Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | Course Title | L | P | U |
|---|---|---|---|---|
| SC121 | Classical and Quantum Mechanics (PhysicsII) | 4 | 2 | 5 |

**Instructor-in-charge: Dr.ARUN KUMAR SINGH**

**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, Shivalal Agrawal & Company |
|---|---|
| T2 | Classical Mechanics by J.C. Upadhyay, Himalaya Publishing House, 2014 Edition |
| T3 | Quantum Mechanics by Satya Prakash, Kedar Nath Ram Nath Publication |
| Reference Books R1 | Classical Mechanics by J.C. Upadhyay, Himalaya Publishing House, 2014 Edition |
| Reference Books R2 | Introduction to Quantum Mechanics by David J. Griffiths, Prentice Hall |
| Reference Books R3 | Modern Physics by Arthur Beiser, Tata MC Graw Hill Company |

**Lecture-wise-plan:**

| Lecture No. | Learning Objective | Topics to be covered | Reference |
|---|---|---|---|
| 1-5 | Understanding Basic coordination system | Basics of Coordinate systems, Cartesian, polar, cylindrical and spherical coordinate system. | Digital Notes will be provided |
| 6-9 | Learning Basic aspects of classical mechanics | 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) |

| Lecture No. | Learning Objective | Topics to be covered | Reference |
|---|---|---|---|
| 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 Hamilton;s Variational principle for Non-conservative systems, Hamiltonian System. | 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, experimental demonstration of mater waves. | 3.1,3.2,3.5,3.8 |
| 30-33 | | Schrodinger 's equation, postulatory basis of quantum mechanics, operators, expectation values | 4.1,4.12, |
| 34-35 | Equations in quantum physics and its applications | 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 |

**Physic II Lab:**

| Sr. No | Name of the Experiment |
|--------|------------------------|
| 1 | To study and determination of Planck's constant. |
| 2 | To study the emission spectra of Hydrogen, Neon and mercury vapors. |
| 3 | To study and draw the characteristics of a solar cell. |
| 4 | To study and plot the characteristics of thermistor and hence find the temperature coefficient of resistance. |
| 5 | To study and generate sound waves using SEE lab-3.0. |
| 6 | To study digital sound waves using SEE lab-3.0. |
| 7 | To study light dependent resistor using SEE lab-3.0. |
| 8 | To study frequency response of Piezo sound using SEE lab-3.0. |
| 9 | To study velocity of sound using SEE lab-3.0. |
| 10 | To study of sound beats using SEE lab-3.0. |

**Evaluation Scheme:**

Student evaluation is based on the series of Tests, Quizzes and Presentation 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 | 12-02-2024 | 01-10 | CB |
| Test 2 | 60 Minutes | 17 | 11-03-2024 | 11-20 | OB |
| Test 3 | 60 Minutes | 17 | 15-04-2024 | 31- 42 | CB |
| Lab | Throughout the Semester | 10 | ** | ** | CB |
| Comprehensive Exam | 3 Hours | 40 | 18-05-2024 | 01-42 | CB |

** To be announced in the class      CB= Closed Book      OB= Open Book

**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: 08/01/2024                              Dr.ARUN KUMAR SINGH
                                               Instructor-in-charge

# The ICFAI University, Raipur
Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | Course Title | L | P | U |
|---|---|---|---|---|
| **SC122** | **Chemistry II** | **4** | **2** | **5** |

**Instructor-in-charge: Dr.PRATIK KUMAR JAGTAP**

**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. |
|---|---|
| Text Books T2 | Advance in Inorganic C hemistry, S.K. Agrawal, KeemtiLal, Pragati Prakashan 2021. |
| Text Book T3 | Organometallic Chemsitry A Unified Approach, R.C. Mehrotra, A. Singh, 2nd edition, New Age International Publishers 2003. |
| Text book 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. |
| Reference Books 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 |

| Lecture No. | Learning Objective | Topics to be covered | Reference |
|---|---|---|---|
| 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 Tetraammine copper(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 | 13-02-2024 | 01-10 | CB |
| Test 2 | 60 Minutes | 17 | 12-03-2024 | 11-20 | OB |
| Test 3 | 60 Minutes | 17 | 16-04-2024 | 31- 42 | CB |
| Lab | Throughout the Semester | 10 | ** | ** | CB |
| Comprehensive Exam | 3 Hours | 40 | 20-05-2024 | 01-42 | CB |

**\*\* To be announced in the class**

**Make-up-policy:** Make-up will be given only under genuine circumstance for Tests only. Howerver 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: 08/01/2024**                                                     **Dr.PRATIK KUMAR JAGTAP**
                                                                                      **Instructor-in-charge**

# The ICFAI University, Raipur
Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | Course Title | L | P | U |
|---|---|---|---|---|
| **SC123** | **Multivariable Calculus Mathematics II** | **4** | **0** | **4** |

**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 |

| Lecture Nos. | Learning Objective | Topics to be covered | Reference (chapter/sec./Page Nos of Text/Ref. Books) |
|---|---|---|---|
| 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 minima and maxima. | R1 Ch-4 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 | 13-02-2024 | 1-12 | CB |
| Test 2 | 60 Minutes | 17 | 12-03-2024 | 13- 28 | OB |
| Test 3 | 60 Minutes | 16 | 16-04-2024 | 29- 42 | CB |
| Quizzes (2) | 20 Minutes each | 10 | ** | | CB |
| Comprehensive Exam | 3 Hours | 40 | 22-05-2024 | 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: 10/01/2024**                                **Dr.SHANTI SWARUP DUBEY**
                                                              **Instructor-in-charge**

# The ICFAI University, Raipur

Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | Course Title | L | P | U |
|---|---|---|---|---|
| SC124 | Computers Science II | 4 | 2 | 5 |

**Instructor-in-charge: Dr.BHARATI PATEL**

| Scope and 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. |

| Text Book(s) T1 | "Programming with ANSI C", E. Balaguruswamy, TMH 4th edition, 2004. |
|---|---|
| Reference Book R1 | "Programming with C", Gottfried, Schaum -TMH, 2nd Edition, 2002. |
| Reference Book R2 | "A Book on C", Al Kelly & Ira Pohl, Pearsons, 4th Edition, 2001. |
| Reference Book 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 |

| Lecture Nos. | Learning Objective | Topics to be covered | Reference (Ch./Sec./ Page Nos.of Text Book) |
|---|---|---|---|
| 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) |

| Lecture Nos. | Learning Objective | Topics to be covered | Reference (Ch./Sec./ Page Nos.of Text Book) |
|---|---|---|---|
| 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 | 16 | 13-02-2024 | 1-10 | CB |
| Test 2 | 60 Minutes | 17 | 12-03-2024 | 11- 24 | OB |
| Test 3 | 60 Minutes | 17 | 16-04-2024 | 25- 42 | CB |
| Lab | Continuous | 10 | ** | ** | ** |
| Comprehensive Exam | 3 Hours | 40 | 20-05-2024 | 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: 09/01/2024**                                              **Dr.BHARATI PATEL**
                                                                           **Instructor-in-charge**

# The ICFAI University, Raipur
Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | Course Title | L | P | U |
|---|---|---|---|---|
| **SC125** | **Biology II** | 4 | 2 | 5 |

**Instructor-in-charge: Dr.AMENA BANO KHANANI**

| Learning Outcomes: |
|---|
| This course is offered in the first semester for the second year students of bachelor of sciences.<br><br>1. Explain what classifies an organism as an animal.<br>**2.** Identify members of the Animal Kingdom. |

| Textbook (s) T1 | R.L. KOTPAL Modern Textbook of Zoology |
|---|---|
| Textbook T2 | Unified Zoology by DR. H.N. Baijal |
| Reference Book (s) R1 | Biological Science: Taylor, Green & Stout |
| Reference Book R2 | Concepts in Biology; Enger & Ross. |

**Lecture-wise-plan:**

| Lecture Nos. | Learning objectives | Topics to be covered | Reference |
|---|---|---|---|
| 1-2 | Introduction to Animal kingdome, Major and Minor phyla, Protozoa, Porifera | General Characters, type study: Plasmodium, protozoa, and diseases. | T1-100-158T1-225-247 |
| 3-7 | | Sycon- Morphology, different types of cells in Sycon, canal system in Porifera. | |
| 8-12 | General Characteristics of Coelentrate | General Characters, type study: Obelia- Morphollogy of Obelia colony, life history. | T1-295-335 |
| 13-15 | Helminthes | Type, study: liver fluke- structure, life cycle. | T1-379 |

| Lecture Nos. | Learning objectives | Topics to be covered | Reference |
|---|---|---|---|
| 16– 23 | Annelida | General characters, type study: Nereis- Morphology; Digestive, Excretory and Reproductive systems. | T1-484-558 |
| 24-25 | Arthropoda | General Characters, type study: Cockroach- Morphology, Digestive, Respiratory and Reproductive systems. Economic importance of insects. | T1-645-769 |
| 26-31 | Mollusca | General Characters, type study: Pila- Morphology; Respiratory system. | T1-809-872 |
| | | **Echinodermata** General Character, type study: starfish- Morphology; Respiratory and Canal system | T1-907-927 |
| 32-38 | Chordata (Fishes,Amphibia) | General Character Screen Migration, parental care, Neoteny | T2-476505 |
| 39-40 | Reptiles Bird | General Character Screen Migration, parental care, Neoteny (Neoteny, poisonous and non poisonous snakes: poison apparatus and snake venom), (flight adaptation), (protheria and affinities) | T2-509-616 |

**Evaluation Scheme:**

Student Evaluation is based on the series of Tests and Quzzies Conducted during the course of semester followed by a comprehensive examination

| Evaluation Component | Duration | Weightage | Date | Syllabus (Lec.No.) | Remarks |
|---|---|---|---|---|---|
| Test-1 | 60 Minutes | 8 | 13-02-2024 | 1-15 | CB |
| Test-2 | 60 Minutes | 8 | 12-03-2024 | 16-30 | OB |
| Test-3 | 60 Minutes | 8 | 16-04-2024 | 31-40 | CB |
| Lab | 60 Minutes | 20 | ** | ** | CB |
| Comprehensive Exams | 3 Hours | 56 | 22-05-2024 | 1-40 | CB |

** To be decided 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: 09/01/2024**                                    **Dr.AMENA BANO KHANANI**
                                                        **Instructor-in-charge**

# The ICFAI University, Raipur
Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | Course Title | L | P | U |
|:---:|:---:|:---:|:---:|:---:|
| **SC220** | **Environmental Science** | **3** | **0** | **3** |

**Instructor-in-charge: Ms.YUKTI DEWANGAN**

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**Learning Outcomes:**

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

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| 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-wise-plan:**

| Lecture No. | Learning Objecives | Topics to be covered | Reference (Ch.Sec/Page No.of Page Nos. of Text Book |
|---|---|---|---|
| 1-3 | | Definition, Characteristics of Ecosystem: Structure of Ecosystem | T1:40-44 |
| 4-6 | Observe and describe habitats | Function of ecosystem, Food chain, Food web, Trophic level, Energy Flow, ecological Pyramids | T1: 46-54 |
| 7-9 | | Types of ecosystem: Aquatic ecosystems Terrestrial ecosystems | T1:59-71 |
| 10-11 | | Land pollution, Lithosphere, Polluants. | T2 110-120 |
| 12-14, 15-18 | To describe the challenges of maintaining Soil quality | Pollutants and their origin and effect, collection of solid waste Solid waste management, recycling and reuse of solid waste and their disposal techniques (open dumping, sanitary land filling, thermal, composting) | T2: 132-147 |
| 19-21 | To describe the challenges of maintaining surface and ground water quality. | Aquatic Environment, water pollutants, Eutrophication | R2: 201-220 |

| Lecture No. | Learning Objecives | Topics to be covered | Reference (Ch.Sec/Page No.of Page Nos. of Text Book |
|---|---|---|---|
| 22-25 | To describe the challenges of maintaining surface and ground water quality. | Chemical Speciation, monitoring techniques and methodology | R2: 12.11.1-12.11.12 |
| 26-27 | | Determination of temporary and permanent | T1 : 251-252 |
| 28-30 | | Waste water treatment | T1 153-162 |
| 31-33 | To understand the sources of air pollution and 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) | |

**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 | 12-02-2024 | 1-10 | CB |
| Test 2 | 60 Minutes | 17 | 11-03-2024 | 11- 24 | OB |
| Test 3 | 60 Minutes | 17 | 15-04-2024 | 25- 42 | CB |
| Lab | Continuous | 10 | ** | ** | ** |
| Comprehensive Exam | 3 Hours | 40 | 16-05-2024 | 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: 09/01/2024**                                        **Ms.YUKTI DEWANGAN**
                                                                    **Instructor-in-charge**

# The ICFAI University, Raipur

Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | Course Title | L | P | U |
|---|---|---|---|---|
| **SC221** | **Physics IV** | **4** | **2** | **5** |

**Instructor-in-charge: Dr.ARUN KUMAR SINGH**

| Learning Outcomes: |
|---|
| 1. The objective of this course is to make the students understand the basic Magnetism and way to analyze them.<br>2. It also introduces the concepts of Electromagnetic theory and, their applications using mathematical treatment.<br>**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 to roidal 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 |

| Lecture No. | Learning Objective | Topics to be covered | Reference |
|---|---|---|---|
| 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 | 12-02-2024 | 01-10 | CB |
| Test 2 | 60 Minutes | 08 | 11-03-2024 | 11-20 | OB |
| Test 3 | 60 Minutes | 08 | 15-04-2024 | 31- 42 | CB |
| Lab | Throughout the Semester | 20 | ** | ** | CB |
| Comprehensive Exam | 3 Hours | 56 | 18-05-2024 | 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 Test, Tests and Comprehensive Examinations, etc.

 Date: 09/01/2024                                              Dr.ARUN KUMAR SINGH
                                                                           Instructor-in-charge

# The ICFAI University, Raipur
Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | Course Title | L | P | U |
|---|---|---|---|---|
| **SC222** | **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.<br>2. Learn to recognize the alcohol, phenol, and ether functional groups.<br>3. Recognize the physical and chemical properties of for aldehydes and ketones.<br>4. Recognize the general structures of carboxylic acids, acyl halides, acid anhydrides, esters and amides.<br>**5.** To interpret the concept of aromaticity and the main properties of aromatic compounds**.** |

| | |
|---|---|
| Text Book T1 | Organic chemsirty, R. T. Morrison, R. N. Boyd, sixth edition, pearson education. |
| Text Book 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. |
| Reference Book R2 | Organic Chemistry, P.Y. Bruice, Third edition, Pearson Education. |
| Reference Book 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 |

| Lecture No. | Learning Objective | Topics to be covered | Reference |
|---|---|---|---|
| 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 |

| Lecture No. | Learning Objective | Topics to be covered | Reference |
|---|---|---|---|
| 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 acids | R1 791-815 |
| 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 courses of semester followed by a comprehensive examination.

| Evaluation Component | Duration | Weightage | Date | Syllabus (Lec.No.) | Remarks |
|----------------------|----------|-----------|------|--------------------|---------|
| Test 1 | 60 Minutes | 16 | 13-02-2024 | 01-10 | CB |
| Test 2 | 60 Minutes | 17 | 12-03-2024 | 11-20 | OB |
| Test 3 | 60 Minutes | 17 | 16-04-2024 | 31- 42 | CB |
| Lab | Throughout the Semester | 10 | ** | ** | CB |
| Comprehensive Exam | 3 Hours | 40 | 22-05-2024 | 01-42 | 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.

Date: 09/01/2024                                        **Dr.PIYUSH KUMAR THAKUR**
                                                        **Instructor-in-charge**

# The ICFAI University, Raipur
Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | Course Title | L | P | U |
|---|---|---|---|---|
| **SC223** | **Mathematics (Group Theory)** | **4** | **0** | **4** |

**Instructor-in-charge: Dr.SHANTI SWARUP DUBEY**

| Learning Outcomes: |
|---|
| After successful completion of the course student will be able to |
| A student learning this course gets idea on concept and examples of groups and their properties. He understands cyclic groups, permutation groups, normal subgroups and related results. After this course he can opt for courses in ring theory, field theory, commutative algebras, linear classical groups etc. and can be apply this knowledge to problems in physics, computer science, economics and engineering. |

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

**Lecture-wise-plan:**

| Lecture 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 |

| Lecture Nos. | Learning Objective | Topics to be covered | Reference (chapter/sec./Page Nos of Text/Ref. Books) |
|---|---|---|---|
| 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 Homo morphisms, Rings and Fields Group homo morphisms, Properties of homo morphisms, | 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 | 16 | 13-02-2024 | 1-11 | CB |
| Test 2 | 60 Minutes | 17 | 12-03-2024 | 12-27 | OB |
| Test 3 | 60 Minutes | 17 | 16-04-2024 | 28-40 | CB |
| Quizzes (2) | 20 Minutes each | 10 | ** | ** | CB |
| Comprehensive Exam | 3 Hours | 40 | 20-05-2024 | 1- 42 | 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.

**Date: 09/01/2024**                         **Dr.SHANTI SWARUP DUBEY**
                                              **Instructor-in-charge**

# The ICFAI University, Raipur
Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | Course Title | L | P | U |
|---|---|---|---|---|
| **SC224** | **Operating System** | **3** | **0** | **3** |

**Instructor-in-charge: Dr.PALAK KESHWANI**

| Learning Outcome – |
|---|
| After successful completion of the course student will be able to: |
| 1. To understand the basic concepts and functions of operating systems. |
| 2. To understand Process and Threads |
| 3. To analyze Scheduling algorithms. |
| 4. To understand the concept of Deadlocks. |
| 5. To analyze various memory management schemes. |
| **6.** To understand I/O management and File systems. |

| | |
|---|---|
| Textbook(s) T1 | Operating System Concepts, Silberschatz, A and Galvin, P.B, 7th edition, Addison, Wesley, 1998. |
| Textbook(s) T2 | Operating Systems- A concept bases approach, Dhamdhere D.M., 2nd edition, TMH 2006. |
| Reference book(s) R1 | Operating Systems, Stallings W, 4th edition, PHI, 2001. |
| Reference Book R2 | The design of the Unix operating System, Bach, M.J, PHI, 1986 |
| Reference Book R3 | Modern Operating Systems, Tanenbaum, A.S. PHI 1996 |
| NPTEL | https://nptel.ac.in/courses/106/105/106105214/ |

**Lecture-wise-plan:**

| Lecture Nos. | Learning Objective | Topics to be covered | Reference (Ch./Sec./ Page Nos.of Text Book) |
|---|---|---|---|
| 1 | To understand | Overview | T1 CH-1 |

| Lecture Nos. | Learning Objective | Topics to be covered | Reference (Ch./Sec./ Page Nos.of Text Book) |
|---|---|---|---|
| 2 | operating system, functions and its types | Operation System objectives and functions | T1 CH-1 |
| 3 | | The Evolution of operating Systems | T1 CH-1 |
| 4 | | Batch, interactive time sharing and real time systems | T1 CH-1 |
| 5 | | Operating System Structure, operating system service, | T1 CH-3 |
| 6 | To understand the concept of process and its various states | Process overview (State, PCB) | T1 CH-4 |
| 7-8 | | Process Scheduling | T1 CH-4 |
| 9 | | Threads | T1 CH-5 |
| 10 | | Inter Process Communication(IPC) | T1 CH-5 |
| 11 | To know what is scheduling and its importance | CPU Scheduling Overview | T1 CH-6 |
| 12-13 | | Scheduling Algorithms | T1 CH-6 |
| 14 | To understand the problem of Critical Section and its solution | Critical Section Problem | T1 CH-7 |
| 15 | | Multi Process Solution | T1 CH-7 |
| 16 | | Semaphores | T1 CH-7 |
| 17 | | Classical Problems of Synchronization | T1 CH-7 |
| 18-20 | To know what is deadlock and its handling | Deadlock Handling | T1 CH-8 |
| 21 | To understand various memory management schemes and their relative advantages and disadvantages | Memory Management Overview | T1 CH-9 |
| 22-23 | | Paging | T1 CH-9 |
| 24 | | Segmentation | T1 CH-9 |
| 25 | | Segmentation with Paging | T1 CH-9 |
| 26 | | Virtual Memory | T1 CH-10 |

| Lecture Nos. | Learning Objective | Topics to be covered | Reference (Ch./Sec./ Page Nos.of Text Book) |
|---|---|---|---|
| 27 | | Demand Paging | T1 CH-10 |
| 28 | | Page Replacement | T1 CH-10 |
| 29 | | Page Replacement Algorithms | T1 CH-10 |
| 30 | | Thrashing | T1 CH-10 |
| 31 | | File Operations | T1 CH-11 |
| 32-33 | To understand concept of files and brief introduction to distributive O.S | Directory and File system Structure | T1 CH-11 |
| 34-35 | | Allocation Methods, | T1 CH-12 |
| 36-38 | | Disk Scheduling | T1 CH-12 |
| 39-40 | | Types, features and uses of distributive O.S | T1 CH-12 |

**Evaluation Scheme:**

Student's 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 | 13-02-2024 | 1-10 | CB |
| Test 2 | 60 Minutes | 17 | 12-03-2024 | 11- 20 | OB |
| Test 3 | 60 Minutes | 17 | 16-04-2024 | 21- 30 | CB |
| Presentations/Lab | Continuous | 10 | ** | ** | ** |
| Comprehensive Exam | 3 Hours | 40 | 22-05-2024 | 1- 40 | CB |

** To be announced in the class    OB = Open Book Exam    CB = Closed Book Exam

**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: 09/01/2024**                                        **Dr.PALAK KESHWANI**
                                                              **Instructor-in-charge**

# The ICFAI University, Raipur

Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | Course Title | L | P | U |
|---|---|---|---|---|
| **HSC221** | **Basic Material Science** | **4** | **2** | **5** |

**Instructor-in-charge: Dr.ANIL KUMAR 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 BooksT1 | Physics for Degree Students (B.Sc. Third Year) by CL Arora and Dr. CP Hemne, S.Chand Publication, First edition |
| Text Books 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. ChandPublication, First edition. |
| Reference Books R2 | Spectroscopy by H Kaur, Pragati Prakashan (2015) |

**Lecture-wise-plan:**

| Lecture No. | Learning Objective | Topic to be covered | Reference |
|---|---|---|---|
| 1-2 | To characterize different materials | Single crystalline, polycrystalline and amorphous materials | R2 411-412 |
| 3-5 | | Single crystals: unit cell, crystal systems, Braais lattices, | T1 599-602 |
| 5-7 | | Directions and planes in a crystal Millerindices-inter-planar | T1 617-627 |

| Lecture No. | Learning Objective | Topic to be covered | Reference |
|---|---|---|---|
| 8-10 | To understand the geometry of solids with different coordination number | Coordination number and packing factor for SC, BCC, FCC | T1 777-780 |
| 11-15 | To know the other properties of | Crystal imperfections: point defects, line defects and planner defects | T1 803-809 |
| 16-20 | Materials such as diffusion, dielectric breakdown, chemical durability | 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 and Extrinsic Semiconductor, Effect of Temperature in Semiconductor | R1 527-548 |
| 25-26 | | Hall effect and its application | R1 547-549 |
| 27-29 | | Elementary idea about PN junction diode and BJT | R1 556-654, 589-600 |
| 39-31 | To understand how a changing electric magnetic field creates a changing electric field (and Vice Versa) | Magnetic field strength, Magnetic moments, Magneization, Magnetism, Magnetic Susceptibility, Magnetic Permeability | R1 608-612 |
| 32-36 | | Dia-magnetism, Para-magnetis, Ferro-magnetism Hysteresis, Hard and Soft magnets | R1 613-640 |
| 37-42 | | Superconductiviey, Bardeen-Cooper Schrieffer (BCS) Theory, The Meissner effect, Types of Superconductors | R1 644-660 |

**Physics II Lab (Including Virtual Lab)**

| S.No | Name of the experiment |
|------|------------------------|
| 1 | To study and measurement of e/m of an electron by Thomson,s method |
| 2 | To study and determine the dielectric constant of material |
| 3 | To study and determine Band gap of a semiconductor by four probe method |
| 4 | To study Hall effect in Semiconductor |
| 5 | To study of P-N junction characteristics |
| 6 | To study of BJT Junction Transistor characteristics. |
| 7 | To Study of magnetic hysteresis and plot magnetic hysteresis loop |
| 8 | To study various crystals structures (VL) |
| 9 | To precipitate nickel from the solution by adding dimethyl glyoxime (VL) |
| 10 | To determine and separate the constituent like Copper, Zinc, Tin, Lead and Iron in brass (VL) |

**Evaluation Scheme:**

Student evaluation is based on the series of Tests and presentation 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 | 14-02-2024 | 1-10 | CB |
| Test 2 | 60 Minutes | 17 | 13-03-2024 | 11- 20 | OB |
| Test 3 | 60 Minutes | 17 | 18-04-2024 | 21- 32 | CB |
| Presentations/Lab | Continuous | 10 | ** | ** | ** |
| Comprehensive Exam | 3 Hours | 40 | 27-05-2024 | 1- 42 | 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.

Date: 09/01/2024                                    Dr.ANIL KUMAR VERMA
                                                              Instructor-in-charge

# The ICFAI University, Raipur
Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | Course Title | L | P | U |
|---|---|---|---|---|
| **HSC223** | **Partial Differential Equation and Calculus of Variations** | **4** | **2** | **5** |

**Instructor-in-charge: Ms.YOGITA CHANDRAKAR**

| 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 $1^{st}$order, Lagrange's method, Charpit's general 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 $2^{nd}$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, $2^{nd}$orderPDE with variable coefficients, Classification of $2^{nd}$ order PDE | Ch-5/5.1-5.38/T |

| Lecture Nos. | Learning Objective | Topics to be covered | Reference (chapter /sec./Page Nos of Text /Ref. Books) |
|---|---|---|---|
| 17-21 | Second order partial differential equations with variable coefficients | Reduction to canonical normal form, Monge's Method, Solution of heat and wave equations in one and two dimensions 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 |

**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 |
|---|---|---|---|---|---|
| Test1 | 60 Minutes | 17 | 14-02-2024 | 1-10 | CB |
| Test2 | 60 Minutes | 17 | 13-03-2024 | 11-19 | OB |
| Test3 | 60 Minutes | 16 | 18-04-2024 | 20-27 | CB |
| Quizzes(2) | 20 Minutes each | 10 | ** | ** | CB |
| Comprehensive Exam | 3 Hours | 40 | 27-05-2024 | 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 prescribe Assessment Tests, Tests Comprehensive Examination, etc.

Date: 08/01/2024                                    Ms.YOGITA CHANDRAKAR
                                                                Instructor-in-charge

# The ICFAI University, Raipur
Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | Course Title | L | P | U |
|---|---|---|---|---|
| HSC225 | Bio Chemistry | 4 | 2 | 5 |

**Instructor-in-charge: Ms.YUKTI DEWANGAN**

**Learning Outcomes:**

This course is offered in the first semester for the second year students of bachelor of sciences.

1. Explain the comparative account anatomy of vertebrates.
2. Explain various physiological system of vertebrates.

| Text Books T1 | Cell Biology V K Agarwal |
|---|---|
| Text Book T2 | Comparative Anatomy of Vertebrates : S.Chand |
| Text Book T3 | Navbodh Unifed Zoology II: Dr.K. P Dwivedi |

Unit- I:

1. Comparative account of integuments and its derivatives of vertebrates.

2. Alimentary canal and digestive glands in vertebrates.

3. Respiratory organs in vertebrates.

Unit-II:

1. Endoskeleton: (A) Axial Skeleton- Skull and Vertebrae.

(B) Appendicular skeleton Limb & Girdle

2. Circulatory System: Evolution of Heart and Aortic Arches.

3. Urinogenital System: Kidney and Excretory Ducts.

Unit- III:

1. Nervous System: General Plan of Brain and Spinal Cord.

2. Ear and Eye: Structure and Function.

3. Gonads and Genital Ducts.

Unit-IV:

1. Digestion and Absorption of Dietary Components

2. Physiology of Heart, Cardiac Cycle and ECG.

3. Blood Coagulation.

4. Respiration: Mechanism and Control of Breathing.

Unit-V:

1. Excretion, Physiology of Excretion, Osmoregulation.
2. Physiology of Muscle Contraction.
3. Physiology of Nerve Impulse, Synaptic Transmission

**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 |
|---|---|---|---|---|---|
| Test1 | 60 Minutes | 17 | 14-02-2024 | 1-11 | CB |
| Test2 | 60 Minutes | 17 | 13-03-2024 | 12-27 | OB |
| Test3 | 60 Minutes | 16 | 18-04-2024 | 28-40 | CB |
| Quizzes(2) | 20 Minutes each | 10 | ** | ** | CB |
| Comprehensive Exam | 3 Hours | 40 | 27-05-2024 | 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 prescribe Assessment Tests, Tests Comprehensive Examination, etc.

**Date: 09/01/2024**                                          **Ms.YUKTI DEWANGAN**
                                                              **Instructor-in-charge**

# The ICFAI University, Raipur

Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | Course Title | L | P | U |
|---|---|---|---|---|
| SC320 | Foundation Course Soft Skills | 3 | 0 | 3 |

**Instructor-in-charge: Mr.ZAFIR KHAN**

| Learning Outomes: |
|---|
| After successful completion of the course student will be able to<br><br>1. Understand the concept, importance and types of soft skills.<br>2. Learn the usage of effective soft skills and draw benefit from it.<br>3. Develop listening, writing and speaking skills.<br>4. Personality development and attributes of success.<br>5. Prepare students for interviews, group discussions and make them ready for corporate life. |

**Lecture-wise-plan:**

| Lecture Nos | Learning Objective | Topics to be covered | Reference |
|---|---|---|---|
| 1,2 | Learning basic concepts & definitions | Introduction to soft skills, Basics of Communication | PC-Unit1-chapter1 |
| 3,4 | Develop effective speaking skills | Speaking skills - Theory & Concept, Practical (Extempore) | PC-Unit4-chapter26 |
| 5,6 | Develop effective listening skills | Listening - Concept & Techniques, Practical Orientation | PC-Unit4-chapter22 |
| 7,8 | Develop effective writing skills | Language Fluency, abstract and summary | PC-Unit3-chapter17 |
| 9,10 | Importance and build Postive attitude | Attitude - Concept & Techniques, Positive attitude | YCW-chapter1,2 |
| 11,12 | Motivation | Motivation-importance, process, benefits | YCW-chapter6 |

| Lecture Nos | Learning Objective | Topics to be covered | Reference |
|---|---|---|---|
| 13,14,15 | Personality development | Grooming, development, positive personality | YCW-chapter10 |
| 16,17,18 | Attributes of success | Adaptability, habits-develop and maintain | YCW-chapter3,4 |
| 19,20,21 | Written official comm | Office circulars & notices, Report writing | PC-Unit2-chap10, Unit3-chap13 |
| 22,23 | General awareness-methods to develop | General Awareness - Building & Importance | NA |
| 24,25,26 | Build effective presentation skills | Presentation Skills - Concept, Techniques, Class activity | PC-Unit4-chapter26 |
| 27,28 | Personal Interview | Professional Self-introduction, Specific Skills for PI | Practical |
| 29,30 | Effective interview skills | Mock Interviews & GD | Practical |
| 31,32 | Profile writing and explaining | Role of CV in Selection, Defending & Validating CV | PC-Unit4-chapter24 |
| 33,34 | Internships-learning and expectations | Sectoral Interest, Company Updates, Achievements, Learnings | Practical |
| 35,36 | Prepare for interviews and GD | Mock Interviews & GD | Practical |
| 37,38 | Self-awareness | Self-Evaluation, Career Expectations, Goal Setting & Initiatives | YCW-chapter4 |
| 39,40 | Corporate overview | Corporate Expectations, Demand-Supply Dynamics | Current state |

**Classroom Practical:**

| S.No | Name of the Practical |
|------|----------------------|
| 1 | Professional Self-introduction, Specific Skills for PI |
| 2 | Presentation and pitch delivery |
| 2 | Mock Interviews & GD |
| 3 | Sectoral Interest, Company Updates, Achievements and Internship Learnings |

**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 | 12-02-2024 | 01-10 | CB |
| Test 2 | 60 Minutes | 08 | 11-03-2024 | 11-20 | OB |
| Test 3 | 60 Minutes | 08 | 15-04-2024 | 31- 40 | CB |
| Lab | Throughout the Semester | 20 | ** | ** | CB |
| Comprehensive Exam | 3 Hours | 56 | 16-05-2024 | 1-40 | CB |

** To be announced in the class

Make-up-policy: Make-up will be given under genuine circumstances for Test 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: 08/01/2024**                                              **Mr.ZAFIR KHAN**
                                                                 **Instructor-in-charge**

# The ICFAI University, Raipur
Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | Course Title | L | P | U |
|---|---|---|---|---|
| **SC321** | **Basic Electrical and Electronics** | **4** | **2** | **5** |

**Instructor-in-charge: Dr.ANIL KUMAR VERMA**

| Learning Outcomes: |
|---|
| 1. The objective of this course is to make the students understand the basic electric circuits and the techniques of analyzing them. <br> 2. It also introduces the concepts of basic of semiconductor and electronic devices like Diode and Transistor, with their applications in Rectifier, Amplifier etc. <br> **3.** This course forms the basis for understanding the subsequent courses in electrical and electronics Sciences**.** |

| 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. |
| Reference Book R2 | Electronic Devices & Circuits, Millman & Halkias McGraw Hill, 2002. |
| Reference Book 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 |
| 3-5 | To understand the concept of basic electrical laws | Kirchhoff's Current & Voltage Laws | 1.2, 1.3 |
| 6 | To understand the concept of basic sources | Independent & Dependent Sources | 1.4, 1.5 |
| 7-9 | To understand the methods of circuit Analysis | Mesh & Nodal Analysis | 2.1, 2.3, 2.4 |
| 10-13 | To understand the network theorems | Thevenin's & Norton's theorem | 2.5 |

| Lecture No. | Learning Objective | Topics to be covered | Reference |
|---|---|---|---|
| 14-17 | To understand the concept of basic theorems | Linearity, Superposition, Maximum power transfer theorems | 2.5, 2.6 |
| 18-20 | Learning characteristics of energy storage elements | Energy storage elements (Inductors & Capacitors) their relationships | 3.1, 3.2, 3.3 |
| 21-23 | To study basics of semiconductors | Semiconductors: intrinsic and doped: p-n junction | 6.1, 6.2 |
| 24-26 | To study operation and characteristics of junction diodes | junction Diode & its characteristics | 6.3, 6.4, 6.6 |
| 27-32 | Application of diode | Rectifier circuits, filters and their types. | R2 4.8, 4.9, 4.10 |
| 33-34 | Operation and application of Zener diodes | Zener Diode & its characteristics | 6.6 |
| 35 | To study operation of transistors | Introducing transistors & their types | 7.1 |
| 36-38 | To study classification and characteristics of transistors | PNP and NPN transistors and their characteristics & operation | 7.2, 7.3 |
| 39-40 | To study working and characteristics of BJT | Biasing and Stability of BJTs, BJT amplifier, common emitter configuration | 9.1, 9.2 |
| 41-42 | To study operations of FETS/MOSFET | FETs/ MOSFETs with their operations & characteristics | 8.1 |

**Physics VI Lab**

| S.No | Name of the Experiment |
|---|---|
| 1 | To study the characteristics of a PN junction diode. (SEE Lab 3.0) |
| 2 | To study the characteristics of a Zener diode. |
| 3 | To study and verify Half wave rectifier using PN Junction. (SEE Lab 3.0) |
| 4 | To study and verify Full wave rectifier using PN Junction. (SEE Lab 3.0) |
| 5 | To study the characteristics of a NPN Transistor. (SEE Lab 3.0) |
| 6 | To study and verify the Kirchoff's Law |

| S.No | Name of the Experiment |
|------|------------------------|
| 7 | To study and verify the Thevenin's theorem. |
| 8 | To study and verify Norton's theorem. |
| 9 | To study and verify Maximum Power Transfer theorem. |
| 10 | To study and verify Super position theorem. |

**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 | 12-02-2024 | 01-10 | CB |
| Test 2 | 60 Minutes | 08 | 11-03-2024 | 11-20 | OB |
| Test 3 | 60 Minutes | 08 | 15-04-2024 | 31- 42 | CB |
| Lab | Throughout the Semester | 20 | ** | ** | CB |
| Comprehensive Exam | 3 Hours | 56 | 18-05-2024 | 1-42 | CB |

** To be announced in the class

Make-up-policy: Make-up will be given under genuine circumstances for Test 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: 10/01/2024                              Dr.ANIL KUMAR VERMA
                                             Instructor-in-charge

# The ICFAI University, Raipur

Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | Course Title | L | P | U |
|:---:|:---:|:---:|:---:|:---:|
| SC322 | Chemistry VI | 4 | 2 | 5 |

**Instructor-in-charge: Dr.PIYUSH KUMAR THAKUR**

| 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, electro analytical, and separatory. |

| Text Books T1 | Textbook of Quantitative Chemical Analysis by Vogel's, 5th Edition , British Library Cataloguing in Publication Data. |
|---|---|
| Text Books T2 | Instrumental Methods of Chemical Analysis, G.R. Chatwal, S.K. Anand, 5th Edition, Himalaya publication House. |
| Text Books 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 |
| Reference Books 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, Conduct meter, 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 |

| Lecture No. | Learning Objective | Topics to be covered | Reference |
|---|---|---|---|
| 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 analysis | 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 atom is 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 |

**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 | 13-02-2024 | 01-10 | CB |
| Test 2 | 60 Minutes | 08 | 12-03-2024 | 11-20 | OB |
| Test 3 | 60 Minutes | 08 | 16-04-2024 | 31- 40 | CB |
| Lab | Throughout the Semester | 20 | ** | ** | CB |
| Comprehensive Exam | 3 Hours | 56 | 20-05-2024 | 1-40 | CB |

** To be announced in the class

Make-up-policy: Make-up will be given under genuine circumstances for Test 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: 08/01/2024**                                   **Dr.PIYUSH KUMAR THAKUR**
                                                                   **Instructor-in-charge**

# The ICFAI University, Raipur

Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | 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 morphism 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 |

| Lecture Nos. | Learning Objective | Topics to be covered | Reference (chapter/sec./Page Nos of Text/Ref. Books) |
|---|---|---|---|
| 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 | 08 | 13-02-2024 | 01-10 | CB |
| Test 2 | 60 Minutes | 08 | 12-03-2024 | 11-20 | OB |
| Test 3 | 60 Minutes | 08 | 16-04-2024 | 31- 40 | CB |
| Lab | Throughout the Semester | 20 | ** | ** | CB |
| Comprehensive Exam | 3 Hours | 56 | 22-05-2024 | 1-40 | CB |

** To be announced in the class

**Make-up-policy:** Make-up will be given under genuine circumstances for Test 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: 09/01/2024**                                    **Dr.SHANTI SWARUP DUBEY**
                                                                      **Instructor-in-charge**

# The ICFAI University, Raipur
Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | Course Title | L | P | U |
|:---:|:---:|:---:|:---:|:---:|
| **HSC321** | **Modern Physics** | **4** | **0** | **4** |

**Instructor-in-charge: Dr.ARUN KUMAR SINGH**

**Learning Outcomes:**
1. Physics VI forms the Second part of a two-semester comprehensive course on corevel physics to be taught to all engineering students.
2. The course aims at developing an understanding of the basic principles of physics and the application of concepts to problems of practical interest.
3. 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 |

| Lecture No. | Learning Objective | Topics to be covered | Reference |
|---|---|---|---|
| 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 nucleus, Elementary ideas of atomic and molecular spectra. | R1 13.23-13.25 |
| 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, |
| 40-42 | To discuss about various decays | Alpha decay; Beta decay-energy released | 10.8,10.9, 10.10 |

**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 | 14-02-2024 | 01-10 | CB |
| Test 2 | 60 Minutes | 08 | 13-03-2024 | 11-20 | OB |
| Test 3 | 60 Minutes | 08 | 18-04-2024 | 31- 42 | CB |
| Lab | Throughout the Semester | 20 | ** | ** | CB |
| Comprehensive Exam | 3 Hours | 56 | 24-05-2024 | 1-42 | CB |

** To be announced in the class

Make-up-policy: Make-up will be given under genuine circumstances for Test 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: 09/01/2024**                                        **Dr.ARUN KUMAR SINGH**
                                                                      **Instructor-in-charge**

# The ICFAI University, Raipur

Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | Course Title | L | P | U |
|---|---|---|---|---|
| **HSC322** | **Chemistry D-Block Element** | **4** | **2** | **5** |

**Instructor-in-charge: Dr.PIYUSH KUMAR THAKUR**

| Learning Outcomes: |
|---|
| 1. To acquire knowledge on Transition metals and their electronic configuration oxidation states, spin properties, Colour property, magnetic properties and Catalytic applications of d-block elements. |
| 2. To understand the Bonding in metals, Conductivity of metals, Semiconductors and its applications. |
| 3. To acquire the knowledge on structures of Compounds of d-block elements, EAN and stability of metal carbonyls. |
| 4. To acquire knowledge on properties of Lanthanides and Actinides, Oxidation states related to stability, colour and magnetic properties, |
| **5.** Lanthanide and actinide contraction and its consequences**.** |

| | |
|---|---|
| Textbook (s) T1 | Chemistry for degree students, for II Year by Dr. R.L. Madan S.Chand Publication. |
| Textbook T2 | Chemistry for degree students, for III Year by Dr. R.L. Madan S.Chand Publication. |
| Reference Book (s) R1 | Advanced Inorganic Chemistry by S.K. Agrawal and Keemti Lal, Pragati Publication |
| Reference Book R2 | Inorganic Chemistry 3rd Edition G.L. Mieessler and D.A. Tarr |

**Lecture-wise-plan:**

| Lecture Nos. | Learning objectives | Topics to be covered | Reference (Ch./Sec./ Page Nos.of Text Book) |
|---|---|---|---|
| 1-2 | Metal Ligand Bonding In Transition Metal Complexes: | Limitations of Valence Bond Theory, an elementary idea of crystal field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, | T2 25-44 |

| Lecture Nos. | Learning objectives | Topics to be covered | Reference (Ch./Sec./ Page Nos.of Text Book) |
|---|---|---|---|
| 3-5 | | factors affecting the crystal field parameters. Thermodynamic and kinetic aspects of metal complexes. | T2 45-48 |
| 6-7 | | A brief outline of thermodynamic stability of metal complexes and factors affecting the stability of square planar complexes | R1 227 |
| 8-12 | To understand the Chemistry of elements of first transition series | Introduction, characteristic properties(electronic configuration, complex formation, magnetic property, formation of colour, catalytic activity, periodic properties)of d-block Elements, | T1 3-24 |
| 13-15 | | properties of the element of first transition series, Relatively stability of their oxidation state, coordination number | T1 25-70 |
| 16– 18 | | Introduction, characteristic properties(electronic configuration, | T1 79-80 |
| 19-20 | To understand the Chemistry of the elements of Second &Third transition series | complex formation, magnetic property, formation of colour, complex formation | T1 85 |
| 21-23 | | catalytic activity, periodic properties)of d-block Elements, properties of the element of Second &Third transition series, | T1 86-93 |
| 24-25 | | Relatively stability of their oxidation state, coordination number | T1 94-101 |
| 26-27 | Magnetic Properties of Transition Metal complexes: | Types of magnetic behaviour, methods of determining magnetic susceptibility, | T2 58- 65 |
| 28-29 | | spin only formula, L-S coupling, correlation of $\mu_s$ and $\mu_{eff}$ values, orbital contribution | T2 68-74 |

| Lecture Nos. | Learning objectives | Topics to be covered | Reference (Ch./Sec./ Page Nos.of Text Book) |
|---|---|---|---|
| | | to magnetic moments, application of magnetic moment data for 3d metal complexes. Electronic spectra of Transition Metal complexes. | |
| 30-31 | | Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series. Orgel energy level diagram for $d^1$ and $d^2$ states, discussion of the electronic spectrum of [Ti $(H_2O)_6]^{3+}$ complex ion. | T2 84-113 |
| 32-34 | Co-ordination Compounds | Werners coordination theory, | T1 174-175 |
| 35-37 | | effective atomic number concept, chelates, | T1 176- 178 |
| 38 | | nomenclature of coordination compounds, | T1 180-183 |
| 39-40 | | valence bond theory of transition metal complexes. | T1 194- 200 |

**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 | 14-02-2024 | 1-15 | CB |
| Test 2 | 60 Minutes | 08 | 13-03-2024 | 16- 30 | OB |
| Test 3 | 60 Minutes | 08 | 18-04--2024 | 31- 40 | CB |
| Lab | 60 Minutes | 20 | ** | ** | CB |
| Comprehensive Exam | 3 Hours | 56 | 24-05-2024 | 1- 40 | CB |

** To be decided 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: 08/01/2024**                             **Dr.PIYUSH KUMAR THAKUR**
                                                                 **Instructor-in-charge**

# The ICFAI University, Raipur

Faculty of Science
Second Semester, 2023-2024
Course Handouts

| Course Code | Course Title | L | P | U |
|---|---|---|---|---|
| **HSC323** | **Numerical Analysis** | **4** | **0** | **4** |

**Instructor-in-charge: Dr.ANIMESH KUMAR SHARMA**

| **Scope and Objective of the course:** |
|---|
| 1. In reality "Solving a Math problem" generally involves finding an answer rather than exact answer.<br>2. Numerical Analysis is the study of algorithms that use numerical approximation for the problems of mathematical analysis.<br>3. 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.<br>**4.** 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) |
| Reference Books 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, Method of False Position, Newton-Raphson Method, Secant Method | Ch-1/1-13/T |

| Lecture Nos. | Learning Objective | Topics to be covered | Reference (chapter/sec./Page Nos of Text/Ref. Books) |
|---|---|---|---|
| 6-11 | 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 |
| 12-16 | Interpolation and Approximation | Introduction, Lagrange and Newton Interpolations,  Finite difference operators, Interpolating polynomials  using finite difference ,Gregory-Newton interpolations | Ch-3/144-158/T |
| 17-21 | Differentiation and integration | Introduction , Numerical differentiation, Newton Forward and Backward Interpolation differentiation first and second order differentiation , | Ch-4/212-231/T |
| 22-27 | Differentiation and integration | Method based on Interpolation(For unequal intervals), Numerical Integration , NewtonCote Quadrature formula, Simpson's $1/3^{rd}$ and $3/8^{th}$ rule, Weddle's rule | Ch-4/212-231/T |
| 28-33 | Numerical solution of ordinary differential equations | Introduction, Euler's method, Picard's Method | |
| 34-40 | Numerical solution of ordinary differential equations | Taylor's Series Method, Runge-Kutta's Fourth order method . | Ch-272-296/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 | 14-02-2024 | 1-11 | CB |
| Test 2 | 60 Minutes | 17 | 13-03-2024 | 12-27 | OB |
| Test 3 | 60 Minutes | 16 | 18-04-2024 | 28-40 | CB |
| Quizzes (2) | 20 Minutes | 10 | ** | ** | CB |
| Comprehensive Exam | 3 Hours | 40 | 24-05-2024 | 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.

**Date: 07/01/2024**                                    **Dr.ANIMESH KUMAR SHARMA**
                                                       **Instructor-in-charge**