Far Western University
Mahendranagar, Kanchanpur
Faculty of Science and Technology

B. Sc. Fourth Semester Physical Group

FAR WESTERN UNIVERSITY

Faculty of Science and Technology

Course Title: Basic Chemistry IV F.M.: 100
Course No.: CHM241 P.M.: 45%
Nature of Course: Theory Credit: 3
Level: B. Sc. Number of hours per week: 3
Year: Second, Semester: Fourth Teaching Hours: 45

1. Course Description

The course intends to enable the students to be acquainted with some aspects of basic concepts of chemistry, in all three branches physical, organic and inorganic chemistry. Students will be familiarized with the fundamentals of electrochemistry, thermodynamics as well as chemistry of carbonyl group, carboxylic acid and *d*-block elements.

2. Course Objectives

The general objectives of the course are as follows:

- To acquaint the students with basic concept of electrochemistry.
- To enable the students to understand the fundamentals of chemical thermodynamics.
- To enable the students to understand basic chemistry of aldehydes, ketones and carboxylic acids.
- To acquaint the students with the fundamental chemistry of *d*-block elements.
- To enable the students to appreciate the importance of chemistry in day to day life and value the scientific methodof chemical research and investigation.

3. Specific Objectives and Contents

Specific Objectives	Physical Chemistry Contents
• Explain electrolytic conductance. • State and explain Debye-Huckel Theory of activitycoefficient. • Describe about Debye-Huckel-Onsagar equation. • Explain the effect of concentration, solvent, dielectric constant and temperature on conductance. • Explain theory and applications of conductometric titrations. • Explain the difference between Galvanic and Electrolytic Cells. • Describe what EMF is and how to measure it. • Show how calculation of Cell's EMF is done. • Describe types, classification and description ofelectrodes. • Explain theory and applications ofpotentiometric titration. • Explain different types of commercial cells.	**Unit I: Electrochemistry (7)** Electrolytic conductance; Activities and activity coefficients of strong electrolytes; Debye-Huckel Theory of activity coefficient; Debye-Huckel- Onsagar equation; Effect of concentration, solvent, dielectric constant and temperature on conductance. Conductometric titrations involving neutralization and precipitation reactions; Advantages of conductometric titrations. Galvanic and Electrolytic Cells; Electromotive force and its measurement; Standard cells; Single electrode potentials; Cell reactions and EMF; Calculation of Cell's EMF from single electrode potentials; applications of EMF measurements; Types, classification and description of electrodes; Reference electrodes; Indicator electrodes; Determination of pH using hydrogen quinhydrone, glass and antimony electodes; Potentiometric titrations; Commercial cells (The Leclanche or Dry cell, the Lead Storage cell, Nickel Cadmium Cell, Fuel Cell).
☐ State and explain first law of Thermodynamics. ☐ Describe The Thermodynamic system. ☐ Explain the relation between Cp and Cv. ☐ Describe The Joule- Thomson effect. ☐ Describe the Carnot cycle. ☐ Explain what entropy is. ☐ State and explain second law of Thermodynamics. ☐ Explain entropy change in ideal gases and entropy change in physical transformations. ☐ Enable the students to solve the numerical problems related first and second laws of thermodynamics.	**Unit II: Themodynamics(8)** First law of Thermodynamics; The Thermodynamic system; Reversibility and maximum work; Enthalpy of a system; Heat capacity; Relation between Cp and Cv; Isothermal and adiabatic processes; Isothermal and adiabatic processes in ideal gases; The Joule- Thomson effect; The Carnot cycle; The Thermodynamic efficiency. Entropy; Entropy change in isolated system; The Second Law of Thermodynamics; Entropy change for a system; Dependence of entropy on variables of a system; Entropy change in ideal gases; Entropy change in physical transformations; Entropy change in chemical reactions; Spontaneous and non-spontaneous changes; Free energy, work function and their significance; Criteria for spontaneity of the reactions.

□ Explain the concept of the free energy, work function and their significance as well as criteria forspontaneity of the reactions.	
• Explain the nomenclature and bonding of aldehydes and ketones. • Describe different ways of preparation of aldehydes and ketones. • Explain the major reactions shown by aldehydesand ketones with mechanism. • Discuss 1, 2-addition vs 1, 4-addition reactionsand the factors that favour them. • Describe the reactions involving organolithium, Grignard reagents, OraganocopperOrganocadmium reagents. • Explain the nomenclature and bonding of carboxylic acids. • Describe different ways of preparation of carboxylic acids with mechanism. • Describe ways to prepare derivatives of carboxylic acids and their major reactions with mechanism. • Describe chemistry and applications of malonic ester and acetoacetic ester syntheses with mechanism. • Describe the characteristic features of *d*-blockelements. • Discuss Werner's contribution in understanding the chemistry of coordination compounds. • Describe the geometry of coordination compounds. • Discuss bonding in transition metal complexes with reference to valence bond theory andCrystal field theory. • Define and explain the importance of chelates. • Describe some important catalytic reactions stressing on mechanism and applications. • Explain basic bioinorganic chemistry of Fe, Cr and Cu.	**Unit III. Aldehydes and Ketones (8)** Kinds of carbonyl compounds; Nature of carbonyl group; General reactions of carbonyl compounds. Names of aldehydes and ketones; Preparation of aldehydes and ketones; Oxidation of aldehydres and ketones; Nucleophilic addition reactions of aldehydes and ketones; The Hydration reaction; Cyanohydrin formation reaction; Nucleophilic addition of Grignard and Hydride reagents; Imine and enamine formation; The Wolff- Kishner reaction; Nucleophilic addition of alcohols: acetal formation; The Wittig reaction; The Cannizzaro reaction; 1,2-addition vs 1,4-addition reactions;1,2- addition by organolithium and Grignard reagents; Conjugate addition of Oraganocopper reagents, Organocadmium reagents. **Unit IV. Carboxylic Acids (7)** Introduction; Names of carboxylic acids; Structure and properties of carboxylic acids; Substituent effects on acidity; Preparation of carboxylicacids; Reactions of carboxylic acids; Formation of salt, acid chloride, anhydride, amide and ester and their major reactions; Chemistry and applications of Malonic ester and Acetoacetic ester syntheses **Inorganic Chemistry content** **Unit V. The *d*-Block Elements (15)** Electronic configuration; Metallic character; Variable oxidation states; Size of atoms and ions; Density; Melting and boiling points; Reactivity ofmetals; Ionization energies; Colors; Magnetic properties. Coordination compounds; Werner's contribution on coordination compounds; *d* orbital; Recent methods of studying complexes; Effectiveatomic number; Nomenclature; Coordination number and geometry;Effective atomic numbers; Bonding in transition metal complexes;Valence bond theory; Crystal field theory; Effect of Crystal field splitting;Jahn-Teller distortion; Square planar and tetrahedral arrangement;Chelates; Molecular orbital theory; Uses of coordination compounds. Catalytic properties of $TiCl_4$, TiO_2, V_2O_5, $FeCl_3$, $PdCl_2$, PtO_2, Ni, Ziegler-Natta catalyst); Bioinorganic chemistry of Fe, Cr and Cu.

Note: The figures in the parentheses indicate the approximate periods for the respective units.

4. Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weightage**	**Marks**	**Practical**	**Weightage**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separatetable at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	

		Internal Exams	50%				
Total External	60	Total Internal	100 %	20		100%	20
Full Marks 60+20+20 = 100							

5. External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. **External Practical Evaluation**:
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination.

Failed student will not be eligible to appear in the end semester examinations.

6. Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.
Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.
Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.
Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.
Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.
Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.
Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period.

7. Prescribed Texts

1. S. H. Maron, C. Prutton, **Principles of Physical Chemistry,** Oxford and IBH Publication and Co., 1992.
2. John McMurry, **Introduction to Organic Chemistry**, Brookes/Cole, 2007.
3. J.D. Lee, **Concise Inorganic Chemistry**, 5th Edition, John Wiley and sons. Inc., 2007.

8. Reference

4. F. Daniels, R. F. Alberty, **Physical Chemistry**, John Wiley & Sons, Latest Edition.
5. Gilbert. W. Castellan, **Physical Chemistry**, Narosa Publishing House, 1985.
6. R. T. Morrison, R. N. Boyd, **Organic Chemistry**, Prentice- Hall of India Pvt. Ltd., 2008.
7. J. S. H. Pine, **Organic Chemistry**, McGraw Hill International Edition Series, New York, USA, 1987.
8. F.A. Cotton, G. Wilkinson, C. Gaus**, Basic Inorganic Chemistry**, John Wiley & Sons (Asia) Pvt. Ltd., 2007.
9. D. F. Shriver, P. W. Atkins, **Inorganic Chemistry**, W. H. Freeman and Co., London, 1999.
10. B. R. Puri, L. R. Sharma , K. C. Kalia, **Principles of Inorganic Chemistry**, Shoban Lal Nagin Chand and Co., Delhi, India, 1996.

FAR WESTERN UNIVERSITY

Faculty of Science and Technology

Course Title: Basic Chemistry IV PR Credit: 1
Course No.: CHM241 Number of hours per week: 3
Nature of Course: Practical Teaching Hours: 45
Level: B. Sc.
Year: Second, Semester: Fourth

1. Course Description

The course intends to enable the students to be skilful in the basic chemical laboratory techniques. Students will be introduced to scientific method of experimentation. Students will develop skill on performing an experiment, observing and recording results and judiciously interpreting the results.

2. Course Objectives

The general objectives of the course are as follows:

- To enable students to perform experiments on the conductometric and potentiometric titrations..
- To enable the students to develop basic skills on the identification of single organic compound.
- To enable the students to develop skill on the Gravimetric estimation.
- To enable students to develop skill on observation, recording and interpretation of an experiment.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Enable the students to undertake experiments on the conductometric titrations and interpret the results obtained. • Enable the students to undertake experiment on the potentiometric titration and interpret the results obtained. • Enable the students to use pH meter to determine pH of a solution. • Enable the students to perform experiment to identify the given organic compound. • Enable the students to perform experimentson Gravimetric analysis	**Physical Chemistry Content** 1. An experiment on conductometric titration of strong acid against strongbase. 2. An experiment on conductometric titration of weak acid against strongbase. 3. An experiment on potentiometric titration of strong acid against strongbase. 4. An experiment on calibration of pH meter and determination of pHusing glass electrode. **Organic Chemistry content** **1.** Experiments on determination of a single organic compound with preparation of at least one derivative (carbohydrate, carbonyl compound, carboxylic acid, phenol, amines, amide) **Inorganic Chemistry Content** **1.** Experiments related to the following Gravimetric estimation are to be performed. • Estimation of sulphate as barium sulphate. • Estimation of barium as barium chromate. • Estimation of copper as copper thiocyanate. • Estimation of copper in an alloy.

4. Instructional Techniques

Before the start of an experiment, the instructor presents a lecture on the details of the experiment including thesafety considerations. Each student will perform independently all the experiments prescribed.

5. Evaluation

There will be continuous examination of the students. After the submission of the report of each experiment by the students, the instructor provides the grade. Besides this, the instructor takes quizzes and short examinations on the experiments done at frequent intervals amounting to 25 % of total grade. The final grade will be the accumulation of all individual grades. There will be no final examination

6. Attendance in Lab: Students should complete all the experiments prescribed.

7. Texts

1. David P. Shoemaker, Carl W. Garland, Joseph W. Nibler, **Experiments in Physical Chemistry,** 5th edition, McGraw-Hill BookCompany, **1989**. (Latest Edition).
2. B. P. Levitt, ed. **Findlay's Practical Physical Chemistry**, Longman, London, **1973**. (Latest Edition)
3. J. N. Gurtu, R. Kapoor, **Advanced Experimental Chemistry** (Vol I – III), S. Chand and Co., New Delhi, India, **1989**. (Latestedition).
4. B. S. Furniss, A. J. Hannaford, P. W. G. Smith, A. R. Tatchel, **Vogel's Text Book of Practical Organic Chemistry**, 5th Edition,Person Education, **2005**.
5. A. L, Vogel, **Qualitative Inorganic Analysis**, Prentice Hall, Latest Edition.
6. L. Shriner, R. C. Fusion, D. Y. Curtin, **The Systematic Identification of Organic Compounds, A Laboratory Manual**, John Wlley and Sons Inc, New York, USA , **1980**. (Latest Edition).
7. N. S. Gnanapragasam, G. Ramamurthy, **Organic Chemistry – Lab Manual,** S. Viswanathan Co., Pvt., India, **1998.**
8. **Vogel's Text Book of Inorganic Qualitative Analyses**, 4th Edition, ELBS, London, **1974**. (Latest Edition).
9. Moti Kaji Sthapit, R. R. Pradhananga, **Experimental Physical Chemistry**, Taleju Prakasan, Kathmandu, Nepal, **1998**.
10. K. N. Ghimire, M. R. Pokhrel K. P. Bohara**, University Experimental Inorganic Chemistry**, Quest Publication, Kirtipur,Kathmandu, Nepal, **2008**.
11. N. M. Khadka, S. D. Gautam, P. N. Yadav**, A Core Experimental Chemistry for B.Sc** , Kaea Book Centre, Kathmandu, Nepal,
    2008.
12. K. N. Ghimire, K. P. Bohara, **University Experimental Physical Chemistry**, Quest Publication, Kirtipur, Kathmandu, Nepal,
    2008.

FAR WESTERN UNIVERSITY

Faculty of Science and Technology

Course Title: Biochemistry F.M.: 100
Course No.: BHM241 P.M.: 45%
Nature of Course: Theory Credit: 3
Level: B. Sc. Number of hours per week: 3
Year: Second, Semester: Fourth Teaching Hours: 45

1. Course Description

The course intends to enable the students to be acquainted with the general human biochemistry and explain the role of biomolecules in the living organisms. The aim of the course is to provide fundamental knowledge of structure, properties andbiological functions of amino acids, proteins, carbohydrates, lipids, nucleic acids and vitamins.

2. Course Objectives

After the completion of the course the students will be able to understand:

- Explanation of basic tenets of Biochemistry
- Biochemical Explanation of life, structure and roles of biomolecules in the living organisms.

3. Specific objectives and Contents

Specific Objectives	Contents
• To discuss Introduction, short history of biochemistry and Biochemicalexplanation of life.	**Unit I: Introduction to Biochemistry and Basic Concept of Life (2)** • Definition and short history of biochemistry • Biochemical explanation of life • Water as the universal solvent for life, Biological Buffers
• To describe the structure, and biological functions of classification, properties amino acids, proteins, carbohydrates and lipids.	**Unit II: Biomolecules** **(15) Amino Acids and Proteins**: • Structure and characteristics of common amino acids • Classification and nomenclature of amino acids • Physical and chemical properties of amino acids • The peptide bond • Terminal group analysis of amino acid sequence • Biological functions of amino acids • Classification of amino acids • Structure of protein molecules • Quantities estimation of proteins • Biological role of protein **Carbohydrates** • Characterization of carbohydrates • Properties of carbohydrates • Classification of carbohydrates • Structure of common monosaccharides, diaccharides andpolysaccharides • Biological role of carbohydrates **Lipids:** • Characteristics of lipids • Fatty acids (saturated and unsaturated fatty acids) • Classification of lipids • Physical and chemical properties of lipids • Biological role of lipids
• To explain process biochemistry and biological significance of Principle of Bioenergetics	**Unit III: Metabolisms** **(10) Carbohydrates metabolisms:**

carbohydrates, protein and lipid metabolisms in human.	• Glycolysis, TCA cycle, Pentose phosphate pathway, Electron transportchain **Protein metabolisms:** • Transamination, Oxidative and non-oxidative deamination
	• Urea cycle • Metabolism of Glycogenic and ketogenic amino acids **Lipid metabolisms:** • Hydrolysis of triacylglycerols • Detailed account of ß-oxidation of fatty acids • Ketogenesis, Ketosis and ketoacidosis in physiology and pathology
• To explain enzyme nomenclature andclassification system. • To describe fundamentals of enzymekinetics • To discuss the biological role of enzyme	**Unit IV: Enzymes (8)** • Classification and nomenclature of enzymes • Specificity of enzyme action (lock and key model) • Properties of enzymes • Enzyme catalysis: Proximity and Orientation effect, covalent catalysis,acid-base catalysis, metal ion catalysis • Regulatory enzymes: Allosteric (ATCase) & covalently modulated(Glycogen phosphorylase) enzymes • Enzyme kinetics: Improtance of measuring intial velocities, derivation ofMichaelis-Menten equation • Enzyme inhibition and effect of pH, temperature, substrate concentrationand incubation time on enzyme action
• Explain structure, types and functions of DNA and RNA • To describe the nucleoside and nucleotide, genetic code • To discuss the process of DNA replication, transcription and translation and explain regulation of gene expression	**Unit V: Nucleic acid and Genetics (10)** • Purine and pyrimidine bases, nucleisides and nucleotide • Structure and types of nucleic acids • DNA and RNA are genetic material for organisms • Watson and Crick model of DNA • DNA replication (Semiconservative method) • RNA synthesis and genetic code • Biosynthesis of protein • DNA repair and sequencing • Recombinant DNA technology • Regulation of gene expression

Reference Books for Basic Biochemistry

1. David L. Nelson and Michael M. Cox, ***Lehinnger's Principle of Biochemistry,*** 4th edition, Worth Publisher, New York, USA.
2. Lubert Stryer, ***Biochemistry***, W. H. freeman and company, New York, USA, 1975
3. Pamela C. Champe, Richard A. Havrvey and Denise R. Ferrier, ***Lippincott's Illustrated Reviews Biochemistry,*** 5th edition, Walter Kluwer (India) Pvt, Ltd., New Delhi.
4. J. L. Jain, ***Biochemistry***, Sultan Chand and company Co., 1999.
5. A. C. Deb, Fundamental of Biochemistry, New Central Book agency (p) Ltd, India, 2012.
6. Elliott W.H. and D. C. Elliot, Biochemistry ***and Molecular Biology,*** 4th edition, Oxford University press, New Delhi.
7. T. Devsena, ***Enzymology***, Oxford University Press, New Delhi, India, 2010.

Evaluation System

Undergraduate Programs				
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**
End semester examination		Assignments	10%	
(Details are given in the separate table at the end)		Quizzes	10%	
		Attendance	10%	

	60	Presentation	10%	40
		Mid-Term & Pre-board exam	50%	
		Group work	10%	
Total External	60	Total Internal	100%	40

External evaluation

End semester examination

It is a written examination at the end of the semester. The questions will be asked covering all the units of the course.

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination.

Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests willbe conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term & Pre-board examination: These are written examination and the questions will be asked covering all the topics inthe session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Term Paper writing
- Case study
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam.

FAR WESTERN UNIVERSITY
Faculty of Science and Technology

Course Title: **Electronics**
Course No.: **PHY 241**
Nature of the Course: **Theory**
Year: **Second**, Semester**: 4th**
Level: **B.Sc.**

Credit: **3**
Number of hours per week: **3**
Total hours: **45**

1. Course Description

The course intends to enable the students to be acquainted with the basic concepts of Electronics. Students will be familiarized with the fundamentals of Circuit Analysis, Diodes, Transistors, Amplifiers, Oscillators and Digital circuits.

2. Course Objectives

At the end of this course the students should be able:

- to acquire sufficient basic knowledge in Electronics
- to apply this knowledge base for studying major courses in physics.
- to solve mathematical problems in related topics.
- to deduce mathematical equations and formulas.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Describe the circuit analysis using various network theorems • Explain superposition theorem • Explain and use The venin's and Norton's theorems • Describe maximum power transfer theorem	**Unit I: Network Theorems (4)** Superposition theorem, The venin's theorem, Norton's theorem, Maximum power transfer theorem
• Describe the formation and working of P-N junction diode • Explain the characteristics and applications of the diode • Describe the uses of diode as half-wave and full-wave rectifiers • Explain the working of Zener diode	**Unit II: Diodes (6)** P-N junction diode: characteristics and applications, half-wave and full-wave rectifiers, Zener diode and voltage regulation, LED and photodiodes

- Describe voltage regulation
- Explain the working of LED and photodiodes

- Describe NPN and PNP characteristics
- Explain various transistor biasing and their equivalent circuits
- Explain DC load line, Q point and stability factor
- Derive and explain the relation between currents

Unit III: Transistors (10)

NPN and PNP characteristics, transistor biasing: CB, CC and CE configurations, DC load line, Q point, stability factor, DC and AC equivalent circuits

- Explain the working of transistors as amplifiers
- Explain the classification of Amplifiers
- Describe class A, B and C amplifiers
- Explain the working of RC-Coupled Amplifiers

Unit IV: Amplifiers (7)

CB, CE and CC amplifiers, Classification of Amplifiers: Class A, B and C amplifiers, RC-Coupled Amplifiers

- Derive and explain the Berkhausen criterion
- Explain the working of Hartley, Colpitts, phase shift and Wien bridge oscillators
- Describe the uses and working of Astable, monostable and bistable of of, multivibrators

Unit V: Oscillators (8)

Berkhausen criterion, Hartley, Colpitts, phase shift and Wien bridge oscillators, multivibrators: Astable, monostable and bistable

- Explain various number systems and their interconversion
- Describe Boolean algebra
- Explain the De Morgan's theorem
- Describe the construction of logic gates using diodes and transistors
- Explain the working of various gates
- Explain the universal gates
- Explain the construction of half adder, full adder, half subtractor and full subtractor using the gates

Unit VI: Digital circuits (10)

Decimal, binary, octal and hexadecimal number systems, Boolean algebra, De Morgan's theorem, logic gates (OR, AND,NOT,NAND,NOR, X-OR and X-NOR gates using diodes and transistors), half adder and full adder, half subtractor and full subtractor

4. Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weightage**	**Marks**	**Practical**	**Weightage**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100 %	20		100%	20
Full Marks 60+20+20 = 100							

5. External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course.
2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

6. Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all thetopics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation inthe classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List ofinstructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period.

7. Prescribed Text

- Theraja B. L., Basic Electronics Solid State, S.Chand and Company Ltd, New Delhi

8. Reference

- Malvino A. P., Electronic Principles, Tata McGraw Hil Pub.
- Bogart T. F. , Electronic Devices and Circuits, Universal Book Stall, New Delhi

FAR WESTERN UNIVERSITY
Faculty of Science and Technology

Course Title: Electronics PR Year: 2
Course No.: **PHY241** Semester: 4th
Nature of the Course: Practical Credit: 1

Objectives:
By the end of the course the student should be able to:
measure correctly the basic physical
quantitiesdetermine errors in measurements
analyze raw data and make valid
conclusions validate corresponding
theoretical componentdevelop proper
laboratory skills
design basic physics experiments
interpret experimental results and draw logical
conclusionsrelate theoretical concepts to practical
skills
List of Experiments:
To determine the resonant frequency and quality factor of series LCR
circuitTo verify the maximum power transfer theorem
To verify The venin's and Norton's
theoremsTo study the CB characteristics of
a transistor To study the CE characteristics
of a transistor To study the CC
characteristics of a transistor
To construct a regulated power supply using Zener
diodeTo study OR, AND and NOT gates using DTL
and TTL
To study NOR and NAND gates using DTL and TTL
To verify NAND and NOR gates as the universal gates

Note:
Student must perform 6 Hours of lab work (2 Hours x 3 times or 3 Hours x 2 times) every week
In every semester, at least Eight experiments are to be performed.Additional experiments
may beadded subject to availability of time.

The practical exam will be graded on the basis of the following marking scheme:

In-Semester Evaluation	20%
Final Exam Written	60%
Final ExamOral	20%

References:

1. Arora, C. L., B.Sc. Practical Physics, S Chand and Company Ltd.
2. Squires, G. L., Practical Physics, Cambridge University Press.
3. Shukla, P. K. and Srivastava, A., 2006, *Practical Physics,* New Age International (P) Limited,Publishers

FAR WESTERN UNIVERSITY

Faculty of Science and Technology

Course Title: Environmental Pollution and Control Techniques TH Year: 2
Course No.: **ENV241** Semester: 4th
Nature of the Course: Theory Credit: 3

Course Objectives:
Upon completion of this course, Students will be able to

- Understand basic science about various type of environmental pollution,
- Understand the process behind these phenomenon
- Incept the knowledge and theory of pollution control technologies.
- Understand the discipline of ecotoxicology and fate of toxicants in environment.

Specific Objectives	Contents
• To make students able to understand the basic concept of Air pollution. • To provide scientific knowledge about process behind Air Pollution • To explain students about effect of Air pollution	**Unit I: Basic Concept of Air pollution (5 hours)** Basic concepts: Definition, Natural vs. Contaminated Air; Types of Air pollution: origin, chemical composition and State of Matter; Source of Air pollution; Mode of formation of criteria air pollutants (Ozone, COx, NOx, SOx, Particulate matters): Toxic Air Pollutants; Aerosols: Mode of formation, Types, Vertical variation of Aerosols; Effects of Air Pollution: Effects on human health: Effects on Vegetation: Effects on properties/materials: Effects on visibility: Effects on climate/Weather; Laws Governing Air Pollution: Gas Laws, Gaussian Plume dispersion Model, Plume Rise; Atmospheric Brown Cloud, Green House Effect, Ozone Depletion, Trans-boundary Air pollution; Indoor Air Pollution: Introduction and Effects
• To provide knowledge about various type of air pollution control technologies • To explain the working principle of air pollution control measures	**Unit II: Air pollution Control Technologies (7 hours)** Introduction to Air Pollution Control; Approach to Air PollutionControl: Improve Dispersal (Atmospheric Cleansing Process),Preventive and Control Technologies, Equipment selection, Best Available Technology (BAT), Process Change and Use of Devices (Control Devices of Particulate Matter: Gravitational Settling Chambers, Centrifugal Collectors, Wet Collectors, Electrostatic Precipitators; Control of gaseous pollutants: Absorption, Adsorption and Combustion; Vehicular Emission Control); Air Pollution Control Strategies: Fundamental Approaches, Guiding Principles (Short term and Long Term); Indoor Air Pollution Control: ICS, Building Design; Legal and Regulatory Tools for Air Pollution Control: National Vehicular Emission Control

• To make students able tounderstand the basic concept of Water pollution. • To provide scientific knowledge about process behind Water Pollution • To explain students about effect of Water pollution	**Unit III: Basic concept of Water Pollution (5 hours)** Properties of Water; Criteria of Safe Drinking water: Drinking Water quality parameters; Water pollution: Cause and Sources (Point and Non-Point sources); Water Pollutants: Types, sources, Mode of Formation; Surface water Pollution: Water pollution parameters: Bio-chemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Nitrification in Surface Water, Deoxygenation Oxygen Sag Curve, Eutrophication, Thermal Stratification, Acidification; Ground Water Pollution: Darcy's law, Flow Velocity, Cone of Depression, Groundwater Plumes and its Effect; Waste water: Types and Source; Characteristics of Municipal and Industrial Wastewater; Environmental Impacts of Water pollutants;
• To provide knowledge aboutvarious type of water pollution control measures • To familiarize students about various type of water treatment system • To study the legal instruments related to water pollution	**Unit IV: Water Pollution Control Technologies (5 hours)** Water Treatment System: Municipal Water treatment and Waste Water Treatment; Drinking Water treatment System: Process; Household drinking water treatment methods; Waste water Treatment Methods: Types and General Approaches; Primary Treatment: Working Mechanism; Biological Treatment: Process and general Principal: Advance treatment: Introduction and Principal, Constructive Wetlands; Groundwater Pollution Control methods; Legal and Regulatory Tools for Water Pollution Control; Water Quality Criteria and Guidelines; Water Legislative Tools in Nepal
• To make students able to understand the basic concept of Noise pollution. • To provide scientific knowledge about process behind Noise Pollution • To explain students about effectof Noise pollution • To provide knowledge about various type of Noise pollution control measures	**Unit V: Noise Pollution (8 hours)** Sound: Properties (Frequency, Wavelength, Pressure); Noise – How it differs from Sound; Human Sensitivity to Sound; Types of Sound/Pattern of Noise; Source of Noise; Sound Physics: Measurement of Sound Level, Sound Level vs Distance, Inverse Square Law; Environmental Impact of Noise; Noise Pollution Control: Source Control, Path Control and Receiver Control Technologies; Legal and Regulatory Tools for Noise Pollution Control; Noise Control Strategies and Guidelines;

• To make students able to understand the basic concept of Soil pollution. • To provide scientific knowledge about process behind Soil Pollution • To explain students about source and effect of Soil pollution • To accustom students about waste and Waste management system	**Unit VI: Soil Pollution (8 hours)** Properties of Soil; Role of Soil in Environment; Soil Pollution: Changes in Soil Characteristics, Sources; Environmental Impact of Soil Pollution: Soil Quality Index and Salinity Hazard; Concept of Soil Health; Residual Toxicity; Soil Pollution Control Technologies: Sustainable Soil Management Techniques, Farmer to Farmer Diffusion Model, Soil Conservation and Watershed Management Modules; Legal and Regulatory Tools for Soil Pollution Control; Waste: Definitions and Concept; Types of waste; source of waste; Municipal Solid waste; hazardous Waste; E-waste; Environmental impact of waste; Waste management Issue;

• To make students capable of understand the discipline of eco-toxicology and fate of toxicants in environment. • To accustom students about effect of toxicants in environment	**Unit VII: Environmental Toxicology (7 hours)** Introduction to Toxicology and eco-toxicology; Types of Eco-toxicants: Toxic Elements and elemental form, Toxic Inorganic compounds, Toxic organic compounds, Radio-nuclides: Sources, Radioactive decay; Distribution and fate of Toxic substances: Types of Toxicity-Acute and chronic Toxicity, Persistence, Chemical interaction, Relative Toxicity, Xenobiotic and Endogenous substances, Toxicological chemistry: Phase I and Phase II Reactions, Phases of Toxicants movements; Dose response relationships; Toxic Effects: Independents, Additive, Synergetic, Antagonism, Teratogenesis, Mutagenesis, Carcinogenesis, Estrogenesis; Factors that influence Toxicity, Routes of Exposure; Environmental effects of toxicants: Terrestrial and Aquatic Environments, Effects on Human health; Eco-toxicological Tests; Ecological Risk Assessments: Hazard Identification, Exposure Assessment, Dose response assessment, Risk Characterization; Environmental Toxicity management: Technical Approach, Environmental Regulation

Text Books:

1. De, A. K., 2008. Environmental Chemistry. New Age International Publishers, New Delhi.
2. Manahan S. E., 2000. Environmental Chemistry (7th edition). CRC Press, LLC BocaRaton. ISBN 1-56670-492-8 U.S.
3. Masters, G.M., 2008. Introduction to Environmental Engineering and Science 4th Edition. Prentice Hall, New Delhi

Reference Books:

1. APHA, 1998. Standard Methods for the Examination of Water and Wastewater. American Public Health Association, Washington, DC.
2. Asthana and Asthana 2010. Environment: Problems and solutions, S. Chand and Company ltd.
3. Banerji, S. k., 2003. Environmental Chemistry, Prentice Hall of India Private Limited
4. Goel, P.K., 2001. Water pollution: Causes, Effects and Control, New age Internationalpublishers

5. Mark, Z.J., 2002. Atmospheric Pollution: History, Science and Regulation. CambridgeUniversity Press, Cambridge.
6. Miller, Jr. G.T., 2010. Environmental Science. Thirteen Edition. Brooks/Coles Ceenagelearning, USA
7. Sharma, P.D., 1998. Environmental Biology and Toxicology. Rastogi Publications, NewDelhi.
8. Sapkota, B., 2004 Fundamental of Noise pollution, Department of Physics, Pulchowkcampus

FAR WESTERN UNIVERSITY
Faculty of Science and Technology

Course Title: Modern Algebra F.M.: 100
Course No.: MTH242 P.M.: 45%
Nature of Course: Theory Credit: 3
Level: B. Sc. Number of hours per week: 3
Year: Second, Semester: Fourth Teaching Hours: 45

1. **Course Description:**
   This course of Mathematics is designed to gain the knowledge about binary operations, groups, rings and fields as well as system of linear equations and their skills are used in different fields of general and technical sciences. The course emphasizes both theoretical and applicable aspects of groups, rings and fields as well as system of linear equations.
2. **Course Objectives:**
   The general objectives of the course are as follows:
   - To enable the students to gain basic concepts about binary operations, equivalence relations.
   - To enable the students to know about groups, rings and fields.
   - To enable the student to know about system of linear equations.

3. **Specific Objectives and Contents of Subject Matter:**

Specific Objectives	Contents in Detail
* Discuss about binary operation and algebraic structure. * State elementary properties of integrals and primenumbers. * Define equivalence relation and equivalence classes. * Define divisors and greatest common divisors. * Discuss about prime factors. * State unique factorization theorem (not proof). * Discuss congruences and residue classes. * Solve some related problems.	**Unit 01: Equivalence Relations and Classes 6 Hrs** Binary operations and algebraic structure Properties of integers and prime numbers Equivalence relations and equivalence classes Divisors and greatest common divisors Prime factors Unique factorization theorem (without proof) Congruences and residue classes Related problems
* Define seimi-groups with examples. * Define groups with examples. * State some elementary properties of groups (with proof). * Define integral power of an element. * Define sub-group and their properties. * Define cosets and order of an element. * State and prove Lagrange's theorem. * Define centralizer and normalizer.	**Unit 02: Groups 10 Hrs** Introduction of algebraic structure Semi-groups Groups with examples Elementary properties of groups Integral power of an element Cyclic groups Subgroups and their properties Cosets, order of an element Lagrange's theorem Centralizer, normalizer and related problems
* Define permutation group. * Discuss about cyclic, even and odd permutations. * Define normal subgroups, quotient groups and theirproperties. * Define homomorphism, automorphism and groupisomorphism. * State properties of group homomorphism (with proof). * State properties of group isomorphism (with proof). * Solve related problems	**Unit 03: Groups (continued) 9 Hrs** Permutation groups Cyclic, even and odd permutations Normal subgroup Quotient groups and their properties Homomorphism Kernel and image of homomorphism Isomorphism and properties
* Discuss about algebraic structures with two binaryoperations. * Define ring with examples.	**Unit 04: Rings 9 Hrs** Algebraic structures with two binary operations Rings with examples

* Discuss some special classes of rings. * Define integral domain, division ring and field. * State elementary properties of rings (with proof). * Define Boolean rings, sub-rings and ideals. * State and prove some theorems on special classes ofrings. * Define ring homomorphism and isomorphism withproperties. * Define quotient ring. * State and prove first isomorphism theorem for rings. * Define maximal ideal of rings.	Special classes of rings Integral domain, division ring and field Elementary properties of rings Boolean ring Subrings and ideals Some theorems on special classes of rings Ring homomorphism Quotient rings First isomorphism theorem for rings Maximal ideal of rings
* Define linear equations and system of homogeneous and non-homogeneous linear equations. * Solve the system of homogeneous and non-homogeneous linear equations. * Define rank of matrices related to linear systems, Echelon form, properties of rank, row rank and column rank. * State elementary row operations. * State consistency and inconsistency of a system of linear equations. * Solve homogeneous linear equations. * Discuss about characteristic equation of a matrix. * State Caley-Hamilton theorem for a square matrix (without proof). * Solve some related problems.	**Unit 05: System of Linear Equations 11 Hrs** Linear equations System of homogeneous and non-homogenous linear equations Solution of a system of linear equations Rank of matrices related to linear systems, Echelon form, linearly dependence and independence Elementary row operations of matrix Rank, properties of rank, row rank and column rank of a matrix Rank of the product matrices Consistency and inconsistency of a system of linear equations Solution of non-homogeneous system of equations by using inverse Solution of homogeneous linear equations Characteristic equation of a matrix Caley-Hamilton theorem for a square matrix (without proof) Related problems

4. Evaluation System:

Undergraduate Programs				
External Evaluation	**Marks**	**Internal Evaluation**	**Weightage**	**Marks**
End semester examination	60	Assignments	10%	40
(Details are given in the separate table at the end)		Quizzes	10%	
		Attendance	10%	
		Presentation	10%	
		Term papers	10%	
		Mid-Term exam	40%	
		Group work	10%	
Total External	60	Total Internal	100%	40
Full Marks 60+40 = 100				

(I). External evaluation

End semester examination: It is a written examination at the end of the semester. The questions will be asked covering all the units of the course.

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

(II). Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Term paper: Term paper must be prepared by using computer in a standard format of technical writing and must contain the required number of pages. It should be prepared and submitted individually. The stipulated time for submission of the paper will be seriously taken as one of the major criteria of the evaluation.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Self-study
- Assignments
- Presentation by Students
- Term Paper writing
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam.

5. Prescribed Books and References:

i. Linear Algebra – R. M. Shrestha and S. Bajracharya, Sukunda Pustak Bhawan
ii. Algebra – I. N. Hertain
iii. Algebra – Dr. Chandika Prasad, Pothishala Pvt. Ltd.
iv. Algebra – Jeevan Kafle, etc
v. Linear Algebra – S. Lang

FAR WESTERN UNIVERSITY

Faculty of Science and Technology

Course Title: Real Analysis II — F.M.: 100
Course No.: MTH241 — P.M.: 45%
Nature of Course: Theory — Credit: 3
Level: B. Sc. — Number of hours per week: 3
Year: Second, Semester: Fourth — Teaching Hours: 45

1. Course Description:

This course aims to enable the students to gain basic knowledge about functions, limit and continuity of function, differentiability and integrability of functions, Riemann integral and fundamental theorem of calculus which are considered to be back bone of real analysis.

2. Course Objectives:

The general objectives of this course are as follows:

- To enable the students about functions, limits, continuity of functions.
- To enable the students about basic knowledge of differentiability and continuity and mean value theorem.
- To enable the students about basic knowledge of Riemann integration and fundamental theorems of calculus.

3. Specific Objectives and Contents of Study:

Specific Objectives	Contents in Detail
* Define a function in different forms. * State types of function with description and examples. * Define composition of functions. * Define inverse of a function. * Discuss about functional values of functions at differentpoints in IR.	**Unit 01: Functions (Revision) 3 Hrs** Functions and types of functions Composition of functions Inverse of a function. Meaning of functional values at different points in realline
* Define limit of a function at a point on set and on interval. * Discuss about sequential criterion for limits. * Define one sided limits. * State different properties of limits. * State continuity of function and its sequential criterion. * Define discontinuous function. * State continuity in closed interval. * State sign preserving property. * State and prove Bolzano's theorem. * Define uniform continuity. * State Lipsclritz condition. * Define monotone function. * State and prove continuous inverse theorem.	**Unit 02: Limits and Continuity 13 Hrs** Limits (definition) Sequential criterion for limits One sided limits Properties of limits Continuity of functions and sequential criterion forcontinuity Discontinuities Continuity in closed interval Sign preserving property Intermediate value theorem Bolzano's theorem Uniform continuity Lipschitz condition Monotone function Continuity of monotone inverse function

* Define derivative of a real valued function of single variable. * Discuss derivative of a function at a point and in an interval. * State sequential criteria for derivatives. * State relation between differentiability and continuity. * State and prove Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem with their geometrical interpretation. * Define higher order derivatives. * Define monotonic functions. * Discuss extreme values of a function. * State and prove Taylor's Theorem. * State Maclaurin's theorem in finite form and infinite form. * Taylor's theorem in infinite form and applications.	**Unit 03: Differentiation** **14 Hrs** Derivative of a function of single variable Differentiability at a point and in an interval Sequential criterion for derivatives Differentrability and continuity Mean value theorems - Rolle's theorem with geometrical interpretations - LMVT with geometrical interpretations - CMVT with geometrical interpretations Higher order derivatives Monotonic functions Extreme values Taylor's theorem with remainder Maclaurin's theorem in finite form Taylor's and Maclaurin's infinite series Application of Taylor's theorem in extreme value problems and related examples
* Define partition, norm and refinement of partitions. * Define bounded function with examples. * Define upper and lower Riemann sums and integrals. * State Riemann integrability and conditions of integrability. * Mention elementary properties of Riemann integrals. * State Riemann integral of step functions.	**Unit 04: Riemann Integration** **11 Hrs** Partitions and refinement of partitions Bounded functions with examples Upper and lower Riemann sums Riemann integrable functions Relation between lower and upper integrals Conditions of integrability Elementary properties of Riemann integrals Riemann integral of step function
* State and prove first mean value theorem form Riemannintegrals and its generalized form. * State and prove generalized second mean value theoremof Riemann integral. * Discuss about primitives of a function. * State and prove first fundamental theorem of integralcalculus. * State and prove second fundamental theorem of integralcalculus. * Discuss about integration by parts. * State change of variable in an integral. * Solve some related problems.	**Unit 05: Fundamental Theorem of Calculus 4 Hrs** First mean value theorem for Riemann integral and its generalized form Generalized second mean value theorem of Riemann integral Primitives and fundamental theorem of integral calculus - First fundamental theorem of integral calculus - Second fundamental theorem of integralcalculus Integration by parts Change of variable in an integral and related examples

4. Evaluation System:

Undergraduate Programs				
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(Details are given in the separate table at the end)		Quizzes	10%	
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		Mid-Term exam	40%	
		Group work	10%	
Total External	60	Total Internal	100%	40
Full Marks 60+40 = 100				

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5. Prescribed Books and References:

i. Real Analysis – P. M. Bajracharya, Buddha Publication
ii. Mathematical Analysis – R. M. Shrestha, Sukunda Pustak Bhawan
iii. Real Analysis – S. M. Maskey
iv. Mathematical Analysis – N. P. Pahari
v. Mathematical Analysis – T. M. Apostol
vi. Real Analysis – Shanti Prasad, S. Chand and Company Ltd., New Delhi