Far Western University
Mahendranagar, Kanchanpur
Faculty of Science and Technology

B. Sc. Second Semester Physical Group

FAR WESTERN UNIVERSITY

Faculty of Science and Technology

Course Title: Basic Chemistry II F.M.: 100
Course No.: CHM121 P.M.: 45%
Nature of Course: Theory Credit: 3
Level: B. Sc. Number of hours per week: 3
Year: First, Semester: Second 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 equilibrium process, colligative and colloidal properties, ionic and covalent bonds, stereochemistry, substitution and elimination reactions.

(2). Course Objectives:

The general objectives of the course are as follows:

- ☐ To acquaint the students with basic concept equilibrium process.
- ☐ To enable the students to understand the fundamentals of the colligative and colloidal properties.
- ☐ To enable the students to understand the basic concepts of stereochemistry as well as substitution and elimination reactions.
- ☐ To acquaint the students with the fundamentals of ionic and covalent bonds.
- ☐ To enable the students to appreciate the importance of chemistry in day to day life and value the scientific method of chemical research and investigation.

(3). Specific Objectives and Contents:

Specific Objectives	Physical Chemistry Contents
• Explain the law of mass action. • Describe the relationship between KP and KC. • State Le Chatelier – Braun principle and describe its applications. • Describe Ostwald's dilution law and its limitations. • Describe pH and pH scale. • Discuss about buffer solution, buffer capacity and buffer range. • Explain the theory of acid base indicator. • Discuss the solubility principle and its applications. • Enable the students to solve numerical problems related to equilibrium, pH, buffer and solubility product principle.	**Unit I: Equilibrium (8)** Law of mass action; Various forms of equilibrium constants; Relation between KP and KC; Properties of equilibrium constant; Vant Hoff isotherm; Derivation of thermodynamic equilibrium constant and its relationship with free energy changes under standard conditions; Application of law of mass action and Le Chatelier – Braun principle; Application of Le Chatelier – Braun principle; Strong and weak electrolytes; Ostwald's dilution law and limitations; pH and pH scale; Common ion effects in ionic equilibrium; Buffer solution; Buffer capacity and buffer range, pH change in acid base titration (weak and strong); Theory of acid base indicator; Ostwald's theory, quinonoid theory; Selection of acid base indicators in titrations; Solubility and solubility product principle; Applications of solubility product principle
• Define the term 'colligative property'. • Describe Raoult's law giving examples. • Describe laws of elevation of boiling point and depression of freezing point. • Show how molecular weight of a compound is determined from boiling point elevation. • Discuss abnormalities in solution due to association and dissociation. • Define colloidal state. Show how sols are prepared. • Discuss optical, kinetic and electrical properties of the sols.	**Unit II: Colligative and Colloidal Properties (7)** Solution of nonelectrolytes; Lowering of vapour pressure; Raoult's law; Laws of elevation of boiling point and depression of freezing point; Determination of molecular weight from boiling point elevation; Osmosis and osmotic pressure; Reverse osmosis; Van't Hoff factor; Colligative properties of electrolytes; Abnormalities in solution due to association and dissociation Colloidal dispersions; Lyophilic and lyophobic sols; Sols and preparations; Optical, kinetic and electrical properties of the sols; Electrophoresis and electroosmosis; Emulsions; Gels

• Explain electrophoresis, electroosmosis, emulsions and gels. • Enable the students to solve numerical problems related to colligative properties.	
Organic Chemistry	
• Explain the basic principle of stereochemistry. • Describe the criteria for a compound to be chiral. • Explain the following terms with examples:	**Unit III: Stereochemistry (6)** Enantiomers and the tetrahedral carbon; Chirality; Optical activity; Pasteur's discovery of enantiomers; Sequence rules for specifying configurations;
tetrahedral carbon, enantiomers, diastereomers, meso compounds and racemic mixture. • Explain the methods for the resolution of racemic mixture. • Describe the reactions involving addition of H_2O to an achiral alkene and a chiral alkene. • Describe chirality of nitrogen, phosphorous and sulphur compounds. • Illustrate and explain prochirality, chirality in nature and chiral environments.	Diastereomers; Meso compounds; Recemic mixture and the resolution of the racemic mixture; Review of isomersm; Addition of H_2O to an achiral alkene; Addition to H_2O to a chiral alkene; Chirality of nitrogen, phosphorous and sulphur; Prochirality; Chirality in nature and chiral environments
• Explain the structures of organohalides. • Explain IUPAC system of naming organohalides. • Describe the different methods of preparation (radical halogenation, allylicbromination, Grignard reagent) of alkyl halides. • Describe organometallic coupling reactions, oxidation and reductions. • Describe the SN2 reactions in terms of kinetics, mechanism and stereochemistry. • Describe the SN1 reactions in terms of kinetics, mechanism and stereochemistry. • Describe the E2 reactions in terms of kinetics, mechanism and stereochemistry. • Describe the E1 reactions in terms of kinetics, mechanism and stereochemistry. • Explain biological substitution and elimination reactions.	**Unit IV: Substitution and Eliminations (9)** Organohalides; Nomenclature of organohalides; Structure of alkyl halides; Preparing alkyl halides from alkanes (radical halogenation); Preparing alkyl halides from alkanes (allylicbromination); Stability of the alkyl radicals; Preparing alkyl halides from alcohols; Reactions of alkyl halides (Grignard reaction); Organometallic coupling reactions; Oxidation and reduction Discovery of the nucleophilic reactions; The S_N2 reaction; Characteristics of S_N2 reaction; Steric effects in S_N2 reactions; The role of the nuleophile, leaving group and solvent in S_N2 reactions; the S_N1 reaction; Characteristicsof the S_N1 reaction; The role of substrate, leaving group, nucleophile and solvent in S_N1 reactions; Biological substitution reactions; Elimination reactions of alkyl halides (Zaitsev's rule); The E2 reaction and the deuterium effect; The E2 reaction and cyclohexane conformation; The E1 and E1cB reactions; Orientations in elimination reactions (Zaitsev and Hofmann rules); Biological elimination reactions
Inorganic Chemistry	

□Explain the conditions for formation ofionic bonds. □Discuss the properties of ionic bonds. □ExplainBorn – Lande equation (noderivation required). □Discuss factors affecting lattice energy. □Explain Born – Haber cycle with examples. □Describe polarization and Fazan's rules. □Describe the structures of some selectedionic solids.	**Unit V: Ionic Bond (7)** Ionic bond; Conditions for formation of ionic bonds; Properties of ionic bonds; Ionic crystals; Lattice energy of ionic crystals; Radius ratio rule and its limitations; Born – Lande equation; Factors affecting lattice energy; Born – Haber cycle; Covalent character in ionic compounds; Polarization and Fazan's rules; Effect of polarization – solubility, melting point and thermal stability of ionic compounds; Bond moment and dipole moments; Percentage ionic character; Characteristics of ionic compounds; Structure of ionic solids; Ionic compounds of type AX (NaCl, CsCl, ZnS), AX_2 (CaF_2TiO_2), layer structures, stoichometric and non-stoichometric defects
□Explain the Lewis theory, octet rule and itsexception. □Describe different types of hybridizationwith examples. □Illustrate VSEPR theory withrepresentative examples. □Explain the principle behind hydrogen bonding and metallic bond with examples. □Explain basic ideas of valence bond andmolecular orbital theory with examples.	**Unit VI: Covalent Bond (8)** Lewis theory; The octet rule and its exception; Sidgwick Powel theory – prediction of molecular shapes; Sigma and pi bonds; Hybridization (sp, sp^2, sp^3, d^2sp^3, dsp^2, sd^3, dsp^2, dsp^3); Multiple bonding; Three electron bond; Two electron three centered bond; Bond length and bond order; Bond strength; Valence shell electron pair repulsion theory (VSEPR); Shapes of simple inorganic molecules and ions containing bonds and lone pairs (NH_3, SF_4, BO_3^{3-}, NH_4^+, ClF_3, ICl_4^-, ICl_2, PCl_5, XeF_4, XeF_6); Hydrogen bond (theories of hydrogen bonding, valence bond treatment); Metallic bond (free electron theory and bond theory); Conductors, insulators and semiconductors; Elementary idea of L.C.A.O. and concept of united atoms in molecular orbital theory; Bonding, antibonding and non-bonding orbitals; M.O. configurations of simple diatomic molecules (H_2, He_2, N_2, O_2, F_2, CO, NO, HCl)

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

(4). Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Viva-voce**	**Weight age**	**Mark**
End semester examination		Assignments	20%		Report and Presentation on any topic	50%	
(Details are given in the separate table at the end)	60	Quizzes	10%	20	Presentation	25%	20
		Attendance	20%		Viva	25%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 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.

External Evaluation (Viva):

After completing the end semester theoretical examination, viva examination will be held. External examiner will evaluate report/presentation & take viva exam and will do above mentioned evaluation. Students should make a small report by relating any of the studied topics in the subject to some application areas/examples. Reports can be made in groups. There will be an internal examiner to assist the external examiner. 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.

(II). Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment willbe 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. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam.

(5). Prescribed Texts:

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

(6). 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: Calculus of Several Variables F.M.: 100
Course No.: MTH121 P.M.: 45%
Nature of Course: Theory Credit: 3
Level: B. Sc. Number of hours per week: 3
Year: First, Semester: Second Teaching Hours: 45

(1). Course description

The course intends to enable the students the basics of calculus in order to jump for advanced calculus. In this course, students will be familiar with the concept that how the partial derivative differs with ordinary derivative. At the same time, students get much idea to solve double and triple integral.

(2). Course objectives

The general objectives of the course are as follows:

- ☐ To acquaint the students with basics of calculus which helps to further study advanced calculus.
- ☐ To enable the students to understand the geometry of spaces.
- ☐ To enable the students differentiate between partial and ordinary differentiation.
- ☐ To enable the students to understand multiple integral concept.

(3). Specific objectives and course contents

Specific objectives	Contents in Detail
• Explain the meaning of parametric equation and their relation. • Discuss the calculus with parametric curves. • Discuss polar coordinates. • Describe the areas and length in polar coordinates. • Define conic section. • Explain conic section in polar coordinates.	**Unit 1: Parametric Equation and Polar Coordinates (10 hours)** Curves defined by parametric equations Calculus with parametric curves Polar coordinates Areas and length in polar coordinates Conic section Conic section in polar coordinates
• Explain the concept of functions of several variables. • Explain the meaning of limit and continuity. • Define partial derivatives. • Compare directional derivatives and partialderivatives. • State the chain rule with proof. • Explain the Lagranges multiplier method. • Describe the homogenous method. • Compute the total differential of a function. • Obtain the solution of composite and implicit function. • Calculate the repeated limits.	**Unit 2: Partial Differentiation (14 hours)** Functions of several variables Limit and continuity in higher dimensions Partial derivatives Directional derivative and gradient vectors Tangent planes and differentials The chain rule Extreme values and saddle points Lagranges multiplier Homogenous functions Eulers theorem on homogenous functions of two orthree variables Total differential Approximation calculation Composite functions Implicit function
• Explain the meaning of double integral and evaluation of double integral. • Describe the process of changing of order of integration. • Define the term iterated integral and triple integral. • Explain the method of evaluating triple integral. • Study Jacobean's method. • Give the application of multiple integral to obtain area and volume.	**Unit 3: Multiple Integrals (11 hours)** Double integral, evolution of double integral Change of order of integration for two variables Double integration in polar coordinates Iterated integral Triple integral Evaluation of triple integral Jacobean's, change of variables (results without proof) Application to area and volume

• Explain the meaning of vector function and space curve. • Explain the concept of limit and continuity in vector valued function. • Obtain the derivative and integral of vector function. • Calculate the arc length and curvature of some curves.	**Unit 4: Vector Valued Functions** **(10 hours)** Vector functions and space curves Limit and continuity Derivative and integral of vector function
• Describe the concept of motion in space as velocity and acceleration.	Arc length and curvature Motion in space: velocity and acceleration

(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 classroomdiscussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques isas 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). Prescribes Books and References Prescribed Books

1. Stewart J., *Calculus with Early Transcendental Functions*, 6th Edition, Cengage Learning India, New Delhi
2. Thomas G. B. and Finney R. L., *Calculus and Analytical Geometry*, Pearson Education
3. Widder D. V., *Advanced Calculus*, 2nd Edition, Prentice Hall of India, New Delhi

References

1. Apostol T. M., *Calculus Volume II*, 2nd Edition, Wiley India, 2007
2. Anton H., Bivens I. and Davis S., *Calculus*, 97th Edition, Wiley and Sons (Asia) Pvt. Ltd., Singapore, 2002
3. Strauss M. J., Bradely G. L. and Smith K. J., *Calculus*, 3rd Edition, Doorling Kindersley India Pvt. Ltd., PearsonEducation, Delhi, 2007

FAR WESTERN UNIVERSITY
Faculty of Science and Technology

Course Title: English for Communication F.M.: 100
Course No.: C. Eng. 121 P.M.: 45%
Nature of Course: Theory Credit: 3
Level: B. Sc. Number of hours per week: 3
Year: First, Semester: Second Teaching Hours: 48

(1). Course Introduction

This is a compulsory English course for B. Sc. students irrespective of their major subjects. The course exposes the students to the basic communication skills that they require in their day to day academic settings at undergraduate level. The course begins with the four basic skills of language i.e. listening, speaking, reading and writing integrated with the vocabulary and grammar associated with them. Additionally, there is a separate chapter that focuses on the acquisition of the academic vocabulary in use.

(2). Objectives

General objectives of this course are to:

a) develop communicative competence in order to successfully participate in the academic discourse
b) make students critical readers
c) expose students to the varieties of reading text from different disciplines
d) help students develop critical thinking skills
e) expose them to the wealth of academic vocabulary in context
f) help students develop strategies of communication in speaking and writing

(3). Contents in detail with Specific Objectives

Specific Objectives	Contents in Detail
• Listen for main ideas and details • Make inferences • Listen for opinions • Follow a summary • Listen for specific information • Understand figurative expressions to interpret speaker's intention • Listen for signposts to understand the structure of the text • Listening for rhetorical questions to understand the structure of a lecture	**Unit 1: Listening** Listening for gist – skimming Listening for detail understanding Making inferences and forming opinions from listening Summarizing what was listened Listening for comprehension Comprehending figurative expressions and rhetorical expressions in speech
• Participate in a conversation • Make notes to prepare for a presentation or group discussion • Take turns to make conversation go smoothly • Give advice, ask for clarification, express reasons, ask for reasons, ask questions • Lead discussions in group • Prepare dialogues with a partner for various conversations	**Unit 2: Speaking** Engaging in conversation Presentation skills Turn taking Language functions in the academic settings Dialogues and group discussion Leading group discussions
• Use graphic organizers to understand texts • Read and find the central idea of the text • Comprehend different types of texts • Locate specific information in the texts • Identify source of information	**Unit 3: Reading** Using graphic organizers to understand texts Reading for central theme Comprehending different text types Locating specific information in texts Identifying source of information
• Analyze and develop paragraphs of different genres • Plan for writing • Revise, edit and rewrite • Write summaries • Write personal response to the texts • Write different letters	**Unit 4: Writing** Analyzing and writing paragraphs Process writing Summary writing Letter writing Responding to the texts in writing Essay writing

• Write different types of essays	
• Use the academic vocabulary in professional communication • Select and use academic vocabulary in writing assignments • Recall and use appropriate vocabulary in a range of academic discourse • Apply appropriate strategies to enrich their academic vocabulary	**Unit 5: Vocabulary** Academic vocabulary Word combinations Vocabulary at the academic institutions Vocabulary of academic conversation Reading and vocabulary Writing and vocabulary
• Explain ideas and reflect on them • Connect ideas across texts or readings • Relate personal experience to the topic • Blend information from various texts • Evaluate experiences and events	**Unit 6: Critical Thinking** Comparing and contrasting information Connecting ideas across texts or reading Writing with personal reflections and experience Synthesizing information from various sources Evaluating ideas

(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). References

1. Daise, D., Norloff, C. and Carne, P. (2011) *Q: Skills for Success (Reading and Writing) – 4*, New York Oxford University Press.
2. Freire, R. and Jones, T. (2011) *Q: Skills for Success (Listening and Speaking) – 4*, New York Oxford University Press.
3. McCarthy, M. and O'Dell, F. (2008) *Academic Vocabulary in Use*, New Delhi Cambridge University Press. (Unit V)

(6). Dictionary

Hornby. A.S. (2010). Eighth Edition. Oxford Advanced Learner's Dictionary. Oxford: Oxford University Press.

FAR WESTERN UNIVERSITY

Faculty of Science and Technology

Course Title: Environmental Aspects of Meteorology and Hydrology

Course No.: ENV121

Nature of the Course: Theory **Total Credit: 3**

Level: B.Sc (Undergraduate) **Instruction hours/week: 3**

Year: First

Semester: Second

1. Course Description

The aim of the course is to provide knowledge on Hydro- Meteorology, Climatology, and Limnology. The course has been divided into four units. The first unit familiarizes the students about limnology and its application. Second unit deals with concept and principles of Environmental Hydrology and its application.Third and Fourth unit give emphzise on aspect of Meteorology and climatology and their implication in environmental science.

2. Course Objectives

The objectives of the course are as follows:

- To enhance students understanding on broader aspects of environmental Science linking it with limnology, hydrology, climatology and meteorology to develop analytical skills.
- To make students familiar with scope and application of Limnology.
- To familiarize the students with the importance and application of hydrology.
- To aquatint the students with principles and process of Climatology and Meteorology.
- To familiarize the students about climate and climatic systems.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Provide knowledge on concept, Scope and importance of Limnology. • Discuss about Physico-Chemical and Biological Characteristics of water. • Describe on conservation aspects and ecosystem services of wetlands.	**Unit 1: Limnology** **10 hrs** Introduction: Scope and Application; Fresh water Environment: Defination, Types,and limiting factors; Characteristics of lotic and lentic environment; Morphometry of Fresh water body; Physico - Chemical properties; Physico Chemical and Biological water quality index; Fresh water biodiversity;

	Wetlands: Concept, Types, Roles, Threats, Challenges and Conservation with focus to Nepal; Fresh Water habitat degradation; Ecosystem Services of aquatic ecosystem :case studies; Concept of water footprints, Ecological and economic importance of freshwater environment.
• Provide Knowledge about hydrological cycle, Global water budget and Nepal's water budget. • Discuss about precipitation, types and forms and its measurement techniques. • Explain about basin characteristics, drainage patterns, runoff and its components. • Provide knowledge on stream flow measurement. • Discuss about sedimentation process, its estimation and sedimentation problems in Nepal. • Describe about floods, its causes, measurement and forecasting techniques. • Highlight about concept of hydrogeology.	**Unit-2:Environmental-Hydrology 20 hrs** Environmental Science and Hydrology: Definition and scope; hydrological cycle; global water budget; Nepal's water budget; Precipitation : Forms, measurement of precipitation: recording and non-recording rain gauges; analysis and interpretation of rainfall data; estimation of missing precipitation records; mass rainfall curve and hyetograph; intensity duration of rainfall; basin characteristics; drainage patterns; runoff: surface, subsurface and direct runoff, factors affecting runoff, Stream flow: components of runoff, factor affecting runoff, stream flow measurement and stage-discharge relationship; discharge measurement; hydrographs; evaporation, evapo-transpiration and infiltration: measurement and estimate, factor affecting evaporation, evapo-transpiration and infiltration, Sedimentation: Introduction and sources of sediment, factors affecting sediment yield, control measures, sedimentation problems in Nepal, Floods: causes, factor affecting and types; flood flow determination; Flood measurements: frequency analysis, reconstruction of hydrological data, control techniques and forecasting; hydrogeology: porosity, permeability, specific yield, specific retention, water table, aquifer, ground water flow measurement: Darcy's law.

• Discuss about Earth-Sun relationship, factors affecting the receipt of insolation by earth. • Estimation and of radiation and heat budget. • Explain about temperature, pressure, wind, general atmospheric circulation and their components. • Discuss about different types and forms of precipitations. • Provide Knowledge on meteorological principle to transport and diffusion of pollutants. • Explain; wind roses; lapse rate and temperature inversion; scavenging process.	**Unit 3: Principles of Meteorological Fundamentals 8 hrs** Earth-Sun relationship; factors affecting the receipt of insolation by earth; radiation and heat budget; Insolation and factors affecting distribution of insolation; temperature: records, distribution, air temperature and its measurement; pressure: atmospheric pressure, pressure –height relationship, pressure distribution; air pressure and wind; wind: direction and speed; factors affecting wind; local wind systems; general atmospheric circulation and jet stream; thermal circulation; humidity: definition(absolute and relative), precipitation: general processes, Forms and types; atmospheric stability; stable, unstable and neutral atmosphere; turbulence and diffusion; meteorological principle to transport and diffusion of pollutants; wind roses; lapse rate and temperature inversion; scavenging process.
• Provide knowledge on concept, Scope and importance of climatology. • Discuss about weather and climate and its elements. • Describe climatic classification and climate types. • Explain about climate and seasons of Nepal and climatic factors affecting human settlement and livelihood. • Explain the meaning and concept of Dendro-Climatology and its application. • Explain about climate and climatic hazards.	**Unit 4: Climatology 10 hrs** Climatology: Introduction, importance and types; composition and structure of the atmosphere; weather and climate; factors determining climate; microclimate; elements of weather and climate World climate and climatic systems; climatic classification; objectives and basis; koppen's, Thornwaite classification; climate types: tropical climate, temperate climate, highland climate, tundra climate; climate and seasons of Nepal; monsoon and its environmental significance; monsoon of Nepal; rainfall and temperature variation with east-west, north south, intraregional variation in Nepal; climatic factors affecting human settlement and livelihood in Nepal, concept of dendro-climatology. Climate and climatic hazards: drought; flood; climate and food security; thunderstorms, tornadoes, hurricanes and EL- Nino/ ENSO

Text Books :

1. Adoni, A.D. A text book of Limnology, Prathibha Publishers, Sagar.
2. Critchfield, H.J. *General Climatology*
3. Reddy, J.P. 2011, *A Text Book of Hydrology*, 3rd edition, Laxmi Publication, New Delhi.
4. Subramanya, K, 2002, *Engineering Hydrology*, Tata Mc Graw-Hill Publishing Company Limited, New Delhi, India.

References:

1. Critchfield, H.J. *General Climatology*
2. Grag, S.K. 2000, *Hydrology and Water Resources*, Khanna Publishers, Delhi.
3. Hewlett, J.D. 1982, *Prince of Forest Hydrology*, University of Georgia Press, Athens, Georgia.
5. Kohler, L. and Paulhus, 1992, *Applied Hydrology*, Tata McGraw-Hill Publishing Company Ltd., New Delhi, India.
6. Frey, D.G. and Fry, F.E.J. Fundamentals of Limnology. TorontoUniversity Press, Canada.
7. Lockwood, J.G. *World Climatology*
8. Reddy, J.P. 2000, *A Text Book of Hydrology*, Laxmi Publication, New Delhi.
9. Suresh, R.1997, *Watershed Hydrology*, Standards Publishers and Distributors, Delhi.
10. Burkhard von Rabenau, 1993, *Project Financial Analysis for Physical Planners*, GTZ/DHUD/MHP, Kathmandu/Nepal and Columbus, Ohio/ USA
11. WECS 2002. *Water Resources Strategy Nepal,* Water and Energy Commission Secretariat, Kathmandu, Nepal.
12. Cunningham, W.P & Cunningham, M.A. (2004). *Principles of Environmental Science: Inquiry and Applications,* Second Edition. Boston: Mc Grow Hill.
13. Mather J. R, Water Resources, distribution, use and management, wiley, New York.

Course Title: Environmental aspects Of Meteorology and Hydrology
Course No: -Env121
Year: First
Semester: Second
Nature of Course: Practical

Total Credit: 1

Practical No.

1. Study of macrophytes and macro invertebrates communities from lentic and lotic environment (sampling methods, sampling sites, density distribution, composition and diversity)

2. Qualitative and quantitative estimation of phytoplankton and Zooplankton.

3. Determination of Temperature, pH, turbidity, conductivity, Dissolved Oxygen, Hardness, alkalinity, chloride, phosphate and Nitrogen.

4. Measurement of river discharge (float method, current meter method weir and bucket method)
5. Estimation of optimum number of rain gauge stations.
6. Estimation of missing precipitation data.
7. Analysis of flood frequency and estimate extreme flood events.
8. Study of infiltration of water through soil curve.
9. Estimation of potential evapo- transpiration.
10. Construction of Hydrograph, unit hydrograph, base flow and rating curve.
11. Field observation of agro-meteorological and hydro- meteorological stations
12. Analysis of weather parameters (temperature, precipitation, humidity)
13. Estimation of missing weather data (temperature, precipitation and humidity)
14. Study on classification of temperature and precipitation zones of Nepal.
15. Wind rose Construction.

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Some major points related to aforementioned practical:

1. Students have to carry out *one day field visit* to nearby lentic and lotic ecosystem for conducting practical number **1, 2, and 11**. Since the field work is for complete academic purpose. For this purpose University will have to support students for necessary transportation cost.

2. Students have to prepare a field report for practical no. **11** and submit during practical examination.

3. Students have to submit a field note book of all field visits during practical examination.

FAR WESTERN UNIVERSITY

Faculty of Science and Technology

Course Title: Computer Programming F.M.: 100
Course No.: COM121 P.M.: 45%
Nature of Course: Theory + Lab Credit: 3+1
Level: B. Sc. Number of hours per week: 3+3
Year: First, Semester: Second Total Hours: 45

1. Course Introduction

This course aims to introduce students to the discipline of computing with good program design, programming styles and structured programming language C. The course provides fundamental knowledge of Cprogramming.

2. Objectives

- To develop a programming logic.
- To write algorithm and draw flow chart for the problem.
- To teach basic principles of programming.
- To develop skills for writing programs using 'C'.

3. Specific Objectives and Detailed Course Contents:

Specific Objectives	Contents
o Define computer program. o Describe different notations of algorithms. o Develop algorithms and flowcharts. o Differentiate between POPs and OOPs. o Describe program development life cycle.	**Unit 1: Problem Solving Using Computers (5 hrs)** Program and Programming languages Generations of programming languages. Language Processors: Interpreters ,compilers and Linkers Programming Approaches: procedural and object oriented Problem Analysis Algorithm development and Flowcharting Writing pseudo codes Program development Life Cycle
o Understand structure of C program. o Writing simple C programs. o Understand basic C tokens. o Write and execute C programs. o List out header files o Define keywords. o Input different types of data and produce output in desired form.	**Unit 2 : Fundamentals of C Programming (7 hrs)** Introduction and History of C Structure of C program, compilation and execution of program Character Set, keywords, identifiers Data types Variables, definition and declaration, constants. Escape sequences, preprocessor directives, header files Expressions, Statements, Comments, Symbolic constants. Input and Output in C(formatted and unformatted functions)
o Write programs using C operators. o Understand and write type conversion and casting. o Understand precedence of operators.	**Unit 3 : Operators and Expression (3 hrs)** Arithmetic operators Increment operator, decrement operator Relational operators, Logical operators ,Assignment operator (=) Conditional operator (? :), Bitwise operators , Comma operator Precedence and Associativity of operators Arithmetic expressions Type conversion in expressions
o Understand selection, looping and jumping statements in C. o Alter the sequence of program execution.	**Unit 4: Control Statements (6 hrs)** Introduction to Control Statements(selective, iterative) Selection: If , If else , Nested if-else , Else if ladder, Switch Looping statements: while, do while and for loops Break statement, Continue statement, Goto statement

o Understand function and is needs. o Define and implement function in programs. o Understands macros. o Declare function prototype. o Understand scope and storage class.	**Unit 5: Functions** **(6 hrs)** Introduction to Functions User defined and Library functions Components of Function Call by value and Call by reference Scope of variable, storage classes, macros Recursive function
o Understand needs of arrays. o Understands to define and implement arrays. o Understands sorting and searching techniques. o Understands strings	**Unit 6: Arrays and Strings** **(5 hrs)** introduction : Array, Accessing array elements Single and multi dimensional array Sorting and searching(bubble sort, sequential and binary) Arrays and functions String and String handling functions
o Define and declare structures o Be able to understand the relationship between arrays and structures o Be able to define structures within structures	**Unit 7: Structures and Unions** **(4 hrs)** Defining structures, processing structures, array of structures User defined Type(typedef), Array within structures Passing structures to function Structures within structures Union
o Understands pointers and its declarations. o Understands pointer operations. o Understands dynamic memory allocations	**Unit 8: Pointers** **(4 hrs)** Declaration ,initialization and Uses of pointers Pointer Operations Array of pointers Pointers and 1-D and 2-D Arrays Dynamic memory allocation
o Understands file handling in C o Read and write data to or from file.	**Unit 9: File Handling** **(3 hrs)** File types, files opening and closing ,file opening modes File functions for Reading/Writing from / to a file Random Access file
o Understand built in graphics functions o Write simple graphics programs.	**Unit 10 : Graphics** **(2 hrs)** Introduction Initialization and graphics mode Simple program using built in functions

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				

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

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failing to get such score will be given NOT QUILIFIED (NQ) and the student will not be eligible to appear in the end semester examinations.

Practical examination: Practical examination will be taken at the end of the semester. Students must demonstrate the knowledge of the subject matter.

Internal evaluation

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

5. Text and Reference Books:

- ☐ Introduction to Algorithms (Second Edition): *Cormen*, Leiserson, Rivest, Stein, PHI (Chapter 1, 2, 3, 10).
- ☐ Programming in ANSI C (Third Edition) : E Balguruswamy TMH (Chapters 2 to 13)
- ☐ Fundamental Algorithms (Art of Computer Programming Vol. I: Knuth Narosa Publishing House.
- ☐ Algorithms in C (Third Edition): Robert Sedgewick, Pearson Education Asia.
- ☐ Let us C by Yashwant Kanetkar, BPB
- ☐ Programming in ANSI C by Ram Kumar, Rakesh Agrawal, TMH
- ☐ Programming with C (Second Edition): Byron S. Gottfried. (Adapted by Jitender Kumar Chhabra) Schaum'sOutlines (TMH)
- ☐ Programming with C: K.R. Venugopal, Sudeep R. Prasad TMH Outline Series.
- ☐ Deitel, C.: **How to Program**, 2/e (With CD), Pearson Education.
- ☐ Byron S. Gottefried, " *Theory and Problems of Programming with C*", Mc-Graw Hill.

Laboratory Work Guidelines:

Students will have to complete the assigned practical work throughout the semester and Practical

This course requires a lot of programming practices. Each topic must be followed by a practical session. Practical sessions for each unit should be conducted and should include writing the C-programs. The instructors are highly encouraged to prepare lab sheets for individual units covering the mathematical problems as per the requirement. The sample lab sessions can be as following descriptions,

Assignment List for Lab Work

All the students will have to complete the following set of programming. Lab in-charge may assign additional assignment depending upon the time available.

1. Assignment to demonstrate use of data types, simple operators (expressions)
2. Assignment to demonstrate decision making statements (if and if-else, nested structures)
3. Assignment to demonstrate decision making statements (switch case)
4. Assignment to demonstrate use of simple loops
5. Assignment to demonstrate use of nested loops
6. Assignment to demonstrate menu driven programs.
7. Assignment to demonstrate writing C programs in modular way (use of user defined functions)
8. Assignment to demonstrate recursive functions.
9. Assignment to demonstrate use of arrays (1-d arrays) and functions
10. Assignment to demonstrate use of multidimensional array(2-d arrays) and functions
11. Assignment to demonstrate use of pointers
12. Assignment to demonstrate concept of strings (string & pointers)
13. Assignment to demonstrate array of strings.
14. Assignment to demonstrate use of bitwise operators.
15. Assignment to demonstrate structures (using array and functions)
16. Assignment to demonstrate structures and unions
17. Assignment to demonstrate command line arguments and pre-processor directives.
18. Assignment to demonstrate file handling (text files)
19. Assignment to demonstrate file handling (binary files and random access to files)
20. Assignment to demonstrate graphics using C

FAR WESTERN UNIVERSITY

Faculty of Science and Technology

Course Title: Thermodynamics F.M.: 100
Course No.: PHY121 P.M.: 45%
Nature of Course: Theory Credit: 3
Level: B. Sc. Number of hours per week: 3
Year: First, Semester: Second Teaching Hours: 45

(1). Course Description

The course intends to enable the students to be acquainted with the basic concepts of Thermodynamics and Statistical Physics. Students will be familiarized with the fundamentals of kinetic theory of gases, laws of thermodynamics and their applications, thermodynamic relations, transport phenomenon, black body radiation and statistical physics.

(2). Course Objectives:

At the end of this course the students should be able

- ☐ to acquire sufficient basic knowledge in thermodynamics and statistical physics
- ☐ 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 in Detail
• Describe the equipartition of energy. • Explain the specific heat of monatomic, di- and triatomic gases. • Describe the adiabatic expansion of an ideal gas. • Deduce Van der Waal's equation. • Explain the Joule expansion and Joule coefficient. • Describe Boyle temperature and inversion temperature. • Explain the principle of regenerative cooling and cascade cooling. • Explain liquefaction of hydrogen and helium gas and refrigeration cycles.	**Unit I: Kinetic Theory of Gases and Fundamental Concepts (9)** Review of kinetic theory, Equipartition of energy, Specific heat of monatomic, di- and triatomic gases, Adiabatic expansion of an ideal gas, Van der Waal's equation, Joule expansion and Joule coefficient Boyle temperature and inversion temperature, Principle of regenerative cooling and of cascade cooling, Liquefaction of hydrogen and helium gas, Refrigeration cycles
• Describe the transport phenomena in gases. • Explain mean free path and collision cross section. • Derive and explain the equations of transport of mass, momentum and energy and their interrelationship.	**Unit II: Transport Phenomenon (5)** Transport phenomena in gases, Mean free path and collision cross sections, Transport of mass, momentum and energy and interrelationship, Dependence on temperature and pressure
• Describe Kirchhoff's law of black body radiation. • Explain the spectrum and energy density of radiation. • Explain Stefan-Boltzmann law, Planck's law, Wien's law and Rayleigh-Jean's law. • Discuss their interrelationships.	**Unit III: Black Body Radiation (3)** Kirchhoff's law of black body radiation, Spectrum and energy density, Stefan-Boltzmann law, Planck's law, Wien's law, Rayleigh-Jean's law

• State and explain the laws of thermodynamics. • Distinguish reversible and irreversible process. • Explain Carnot cycle and its efficiency. • Relate the Carnot theorem and the second law of thermodynamics. • Entropy and second law. • Explain the principle of increase of entropy. • Describe Maxwell's general relationships. • Explain phase transition, Joule-Thomson cooling and adiabatic cooling in a general system, Van der Waal's gas, Clausius-Clapeyron heat equation. • Define thermodynamic potentials and equilibrium of thermodynamical systems. • Derive and explain relationship among the thermodynamical variables.	**Unit IV: Laws of Thermodynamics and Their Applications (12)** The zeroth and first law of thermodynamics, Reversible and irreversible processes, Carnot cycle and its efficiency, Carnot theorem and the second law of thermodynamics, Entropy, Principle of increase of entropy Third law of thermodynamics, Maxwell's general relationships, Phase transition, Joule-Thomson cooling and adiabatic cooling in a general system, Van der Waal's gas, Clausius-Clapeyron heat equation, Thermodynamic potentials and equilibrium of thermodynamical systems, relation with thermodynamical variables
• Explain the basis of statistical mechanics. • Describe probability and thermodynamic probability and principle of equal a prior probabilities. • Describe accessible and inaccessible states. • Explain the concept of μ-space and its properties. • Describe one-dimensional harmonic oscillator. • Explain the concept of probability and entropy. • Explain statistical interpretation of second law of thermodynamics. • Deduce and explain Boltzmann canonical distribution law and its applications. • Explain distribution of speeds and velocities and its experimental verification. • Distinguish between mean rms and most probable speeds. • Explain Doppler broadening of spectral lines. • Describe Bose-Einstein and Fermi-Dirac statistics distributions. • Discuss the transition from classical to quantum statistics. • Describe photons in black body and free electrons in a metal. • Explain Fermi level and Fermi energy.	**Unit V: Statistical Physics (16)** The statistical basis of thermodynamics: Probability and thermodynamic probability, principle of equal a prior probabilities, Accessible and inaccessible states, The μ (mu) – space representation, division of μ-space into energy sheets and into phase cells of arbitrary size, Applications to one- dimensional harmonic oscillator and free particles, Equilibrium before two systems in thermal contact, Bridge with macroscopic physics, Probability and entropy, Boltzmann entropy relation, Statistical interpretation of second law of thermodynamics, Boltzmann canonical distribution law and its applications Maxwellian distribution of speeds in an ideal gas: Distribution of speeds and of velocities, experimental verification, distinction between mean rms and most probable speed values, Doppler broadening of spectral lines, Bose- Einstein and Fermi-Dirac statistics distributions, Photons in black body chamber, Free electrons in a metal, Fermi level and Fermi energy

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

(4). Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weigh tage**	**Marks**	**Viva-voce**	**Weigh tage**	**Mark**

End semester examination	60	Assignments	20%	20	Report and Presentation on any topic	50%	20
(Details are given in the separate table at the end)		Quizzes	10%		Presentation	25%	
		Attendance	20%		Viva	25%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 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.

External Evaluation (Viva):

After completing the end semester theoretical examination, viva examination will be held. External examiner will evaluate report/presentation & take viva exam and will do above mentioned evaluation. Students should make a small report by relating any of the studied topics in the subject to some application areas/examples. Reports can be made in groups. There will be an internal examiner to assist the external examiner. 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.

(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.

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. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam.

(5). Prescribed Texts:

- Haung K., *Statistical Physics*, Wiley Eastern
- Kittel C. and Kroemer H., *Thermal Physics*, CSB Publishers
- Singhal S., Agrawal J. P. and Prakash S., *Heat, Thermodynamics and Statistical Physics*, Pragati Prakashan

(6). Reference:

- Laud B. B., *Introduction to Statistical Mechanics*, Macmillan
- Reif F., *Statistical Physics*, McGraw Hill
- Sears F. W. and Salinger G. L., *Thermodynamics, Kinetic Theory and Statistical Thermodynamics*, Addison Wesley
- Brij Lal and Subrahmanyam N., *Heat and Thermodynamics*, S. Chand and Company

FAR WESTERN UNIVERSITY

Faculty of Science and Technology

Course Title: Physics Practical Credit: 1
Course No.: PHY121 Number of hours per week: 3
Nature of Course:
PracticalLevel: B. Sc.
Year: First, Semester: Second

(1). Course Description

(2). Course Objectives

By the end of the course the student should be able to:

- ☐ measure correctly the basic physical quantities
- ☐ determine errors in measurements
- ☐ analyze raw data and make valid conclusions
- ☐ validate corresponding theoretical component
- ☐ develop proper laboratory skills
- ☐ design basic physics experiments
- ☐ interpret experimental results and draw logical conclusions
- ☐ relate theoretical concepts to practical skills

(3). List of Experiments:

To determine the value of Stefan's constant
To determine the ratio of Cp and Cv by Clement and Desorme's apparatus
To find the coefficient of thermal conductivity of a bad conductor by Lee's method
To determine the mechanical equivalent of heat by Callender and Barne's constant flow methodTo determine the sensitivity and constant of Ballistic galvanometer
To determine the capacitance by Ballistic galvanometer
To determine the high resistance by the method of leakageTo determine the low resistance by Carey Foster bridge
To determine the efficiency of an electric kettle (or heating element) under varying input voltagesTo determine the unknown frequency of a given source by using Lissajous figure

Note:

Student must perform 6 hours of lab work (2 hours × 3 times or 3 hours × 2 times) every week.
In every semester, at least eight experiments are to be performed. Additional experiments may be added subject toavailability 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 Exam Oral	20%

(4). References:

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