Far Western University
Mahendranagar, Kanchanpur
Faculty of Science and Technology

B. Sc. Fifth Semester Physical Group

FAR WESTERN UNIVERSITY
Faculty of Science and Technology

Course Title: Basic Chemistry V — F.M.: 100
Course No.: CHM351 — P.M.: 45%
Nature of Course: Theory — Credit: 3
Level: B. Sc. — Number of hours per week: 3
Year: Third, Semester: Fifth — Teaching Hours: 45

1. Course Description

The course intends to enable the students to be acquainted with the basic concepts of chemistry in all three branches physical, organic and inorganic chemistry. Students will be familiarized with the fundamentals of the Phase Rule, Solutions and colloids. Furthermore, chemistry of carboxylic acid derivatives, *f*-Block elements and the Noble gases will be made familiarized to the students.

2. Course Objectives

The general objectives of the course are as follows:

- To acquaint the students with basic concepts of the Phase Rule, Solutions and colloids.
- To enable the students to understand the principles behind the basic chemistry of carboxylic acid derivatibes andcarbonyl alpha-substitution reactions
- To acquaint the students with chemistry of essential concepts of *f*-block elements and the Noble gases.
- To enable the students to appreciate the importance of chemistry in day to day life and value the scientific method ofchemical research and investigation.

3. Specific Objectives and Contents

Specific Objectives	Physical Chemistry Contents
☐ Describe the concept of the phase rule. ☐ Explain one-component systems; Two-componentsystems of phase diagram. ☐ Describe Simple eutectic diagram. ☐ Explain diagram formation of compound withcongruent melting point. ☐ Explainthe concept behind Complete and PartialMiscibility in Solid States. ☐ Discuss the types of solutions and factors affectingsolubility. ☐ Explain, derive and write applications of Henry'sLaw. ☐ Describe the theory behind Azeotropic mixtureand explain its applications. ☐ Derive and Discuss The Nernst Distribution Law. ☐ Explain what is the solvent extraction and itsapplications. ☐ Explain the properties colloids. ☐ Discuss the concept double layers in colloids. ☐ Enable students to understand Zeta potential,electrophoresis, and electro osmosis.	**Unit I: The Phase Rule (5)** Concept of phase; Definitions; One-component systems; Two-component systems; Gibbs phase rule; Simple eutectic diagram formation of compound with congruent melting point; Complete and partial miscibility in solid states. **Unit II: Solutions (5)** Types of solutions: Factors affecting solubility; Ideal and non-ideal liquid mixtures; Distillation of binary liquids; Henry's Law, Azeotropes; Fractional distillation; Partially miscible mixture; The Nernst Distribution Law and applications; Distribution of solute between two phases; The Solvent extraction. **Unit III: Colloids (5)** Colloids; Colloidal dispersions; Properties of the colloids; Helmholtz and double layers in colloids; Zeta potential; Electrophoresis; Electroosmosis; Stability of suspensoids; Precipitation of sols; Emulsions; Gels; Hardy Schutz law; Determination of molecular weight by osmometry, viscosity measurement and sedimentation method.
	Organic Chemistry Contents

• ExplainCarboxylic acid derivatives and theirnomenclature • Discuss Nucleophilic acyl substitution reactions • Discuss relative reactivity of carboxylic acid derivatives, • Explain Chemistry of acid halides, acid anhydrides, esters, amides and thioesters with mechanism and examples. • Give introductory notes on polyamides, polyesters and biodegradable polymers. • Introduce Keto-enol tautomerism with examples. • Show how enols are formed and its alpha-substitution reactions with mechanism. • Discuss alpha halogenation of aldehydes and ketones with mechanism. • Describe Hell-Volhard-Zelinskii reaction with	**Unit I: Carboxylic Acid Derivatives (9)** Carboxylic acid derivatives and their nomenclature; Nucleophilic acyl substitution reactions; Relative reactivity of carboxylic acid derivatives; Nucleophilic acyl substitution reactions of carboxylic acids; Chemistry of acid halides, acid anhydrides, esters, amides and thioesters; Polyamides and polyesters; Biodegradable polymers. **Unit II: Carbonyl Alpha–Substitution Reactions (6)** Keto-enol tautomerism; Formation of enols and mechanism of alpha- substitution reactions; Alpha halogenation of aldehydes and ketones; Hell-Volhard-Zelinskii reaction; Enolate ion formation; Reactivity of enolate ions; Direct alkylations of ketones, esters and nitriles; Biological alkylations.
mechanism. ☐ Explain how enolate ion formation takes place as well as reactivity of enolate ions. ☐ Discuss recatins involving direct alkylations of ketones, esters and nitriles with mechanism.	
	Inorganic Chemistry Contents
☐ Explain general characteristics of the *f*-block elements. ☐ Describe electronic structure and oxidation states of the *f*-block elements. ☐ Explain abundance, isotopes, extraction and uses of the *f*-block elements. ☐ Explain various techniques of separation of lanthanide elements. ☐ Describe chemistry of different oxidation states of lanthanide elements. ☐ Describe chemistry of the noble gases in terms of electronic structure, occurrence, recovery and uses. ☐ Explain giving diagram structure and bonding in XeF2, XeF4and XeF6.	**Unit I: *f*- Block Elements (10)** The Lanthanide Series; Electronic Structure; Oxidation States; Abundance and isotopes; Extraction and Uses; Separation of lanthanide elements (precipitation, thermal reaction, fractional crystallization, complex formation, solvent extraction, valency change, ion exchange); Chemistry of (+iii) Compounds; Oxidation State (+iv); Oxidation State (+ii); Solubility; Colour and spectra; Magnetic properties. **Unit II: The Noble Gases (5)** Electronic structure; Occurrence and recovery; Uses of the elements; Chemical properties; Structure and bonding in XeF_2 , XeF_4 and XeF_6.

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**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	10 %	20	Practical Note copy	25%	20
(Details are given in theseparate table at the end)		Quizzes	10 %		Viva	25%	
		Attendance	10 %		Experimental	50%	
		Presentation	10 %				
		Term papers	10 %				

		Mid-Term exam	40 %				
		Group work	10 %				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

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.

Internal evaluation

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

2. 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.

3. 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.

4. 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.

5. 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.

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

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

8. 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. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

5. Prescribed Texts

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

6. Reference

- F. Daniels, R. F. Alberty, Physical Chemistry, John Wiley & Sons, Latest Edition.
- Gilbert. W. Castellan, Physical Chemistry, Narosa Publishing House, 1985.
- R.T. Morrison, R.N. Boyd, Organic Chemistry, Prentice- Hall of India Pvt. Ltd., 2008.
- J. S. H. Pine, Organic Chemistry, McGraw Hill International Edition Series, New York, USA, 1987.
- F.A. Cotton, G. Wilkinson, C. Gaus, Basic Inorganic Chemistry, John Wiley & Sons (Asia) Pvt. Ltd., 2007.
- D. F. Shriner, P. W. Atkins, Inorganic Chemistry, W. H. Freeman and Co., London, 1999.
- 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 V PR Credit: 1
Course No.: CHM351 Number of hours per week: 3
Nature of Course: Practical Total hours: 45
Level: B. Sc.
Year: Third, Semester: Fifth

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 phase rule and colloids.
- To enable the students to develop basic skills on two step organic preparation and natural product isolation.
- To enable the students to develop skill on qualitative analysis of simple inorganic analysis basing onspectrophotometer.
- To enable students to develop skill on observation, recording and interpretation of an experiment.

3. Specific Objectives and Contents

Students to perform experiments on critical solution temperature of phenol-water system; partition coefficient, the Nernst Equation, the Fractional distillation and preparation of colloids. Enable students to perform experiments on two step organic preparation and isolation of caffeine, lactose and camphor. Enable students to determine the hardness, phosphate, chromium and iron in a given sample of water

Physical Chemistry Content

1. Determination of critical solution temperature of phenol-water system and its composition.
2. Determination of partition coefficient of iodine in chloroform and water.
3. Verification of the Nernst Equation.
4. An experiment on Fractional distillation.
5. Preparation of lyophilic and lyophobic sols and study their properties.

Organic Chemistry content

1. Organic synthesis involving two steps (two experiments)
2. Isolation of lactose from milk.
3. Isolation of caffeine from tea.
4. Isolation of camphor from Eucalyptus leaves

Inorganic Chemistry Content

1. Determination of total permanent and temporary hardness in a given sample of water.
2. Determination of phosphate in a given sample of water specrophotometrically.
3. Determination of chromium in a given sample of water specrophotometrically
4. Determination of iron in a given sample of water specrophotometrically.

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.

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

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**.

FAR WESTERN UNIVERSITY
FACULTY OF SCIENCE AND TECHNOLOGY

Course Title: Earth and Space Science **Credit: 3**
Course No: ESS 351 **Total hours: 45**
Nature of the Course: Theory **Full Marks: 100**
Year: Third, Semester: V **Pass Marks: 45**
Level: Undergraduate (B.Sc.)

1. Course Introduction

The course intends to enable the students to be familiar with the basic concepts and principles of space and earth related science and technology. This course will focus on the three basic areas; earth science, astronomy and methods of observing earth and space.

2. Objectives

At the end of this course the students should be able to understand and apply;

- ☐ Basic concepts of the universe and solar system.
- ☐ Basic concepts of earth and earth's climate system.
- ☐ Basic concept of fundamentals of remote sensing.
- ☐ Basic concept of Space flight.
- ☐ Basic concept of stellar evolution.

3. Specific Objectives and Contents:

Specific Objectives	Contents
• Understand the basic concept of observational astronomy. • Knowledge about different coordinate systems. • Knowledge about different types of telescopes.	**Unit I: Spherical and Observational Astronomy (8hrs)** The Role of Astronomy, Astronomical Objects of Research, Spherical Trigonometry, Meridians and Parallels, Celestial latitude and longitude and their use in Positioning Stars, Ecliptic System, Galactic co-ordinates, Perturbation of co-ordinates, Stellar Parallax and Proper Motion of Star, Distance Estimation of Star, Positional Astronomy, Observation through Atmosphere, Optical Telescope, Radio Telescope.
• Understand components of the universe • Understand our solar system. • Knowledge about components of solar system.	**Unit II: The universe and Solar system(3hrs)** The universe, Galaxies, Stars, Globular Clusters, Nebula, Blockhole, Neutron star, Pulsar, White dwarf &Solar system and its Origin, Types of planets, Terrestrial, Jovian and Exoplanets, Comets, Meteoroids and Asteroids, Satellites, Albedos.

• Understand the process of classification of stars. • Understand the stellar energy sources. • Understand the equilibrium of stars.	**Unit III: Stellar Astronomy (10hrs)** Intensity, Flux Density and Luminosity, Stellar Magnitudes: apparent and absolute Magnitudes, Distance Magnitude Relation, Extinction and Optical Thickness, Internal Equilibrium Conditions of Star: hydrostatic and mass continuity, Linear Stellar Model, Types and Population of Stars, Stellar Spectra, Harvard Classification, H-R diagram, Stellar Nucleosynthesis: p-p chain and CNO cycle, ISM, ISM cycle: heating and cooling process.
• Understand the dynamics of space. • Understand the origin of space. • Understand the parameters of space.	**Unit IV: Space Dynamics (5hrs)** Virial Theorem, Jeans Instability and Gravitational Collapse, Jeans Mass and Jeans Length, Primordial Nucleosynthesis, CMBR, Evolution of universe: Red Shift and Hubble's Law, Galaxy Rotation Curve, Dark Matter and Dark Energy.
• Understand the methods of observing earth surface. • Understand the fundamental principles of remote sensing. • Understand the applications of remote sensing.	**Unit V: Principles of Remote Sensing (8hrs)** Definition, Spatial Data Acquisition, Remote Sensing Types, Process and Principles of Remote Sensing, Electromagnetic Spectrum and its use in Remote Sensing, Energy Interaction with Earth Surface and Atmosphere, Physical Basis of Signature: Vegetation, Soil and Water, Application of Remote Sensing: Agriculture, Forestry, Snow Glacier and Wetland Management, Geographic Information System.
• Understand the formation of earth and its atmosphere. • Understand the components of earth's atmosphere. • Understand the earth's climate system.	**Unit VI: Earth System and Climate Science (8 hrs.)** Components of Earth System: Atmosphere, Hydrosphere Cryosphere, Biosphere and Lithosphere, Earth's Crust and Mantle, The Hydrological Cycle in the Earth System, The Carbon Cycle in the Earth System, Oxygen in the Earth System, Climate System and Feedback Process in Climate System, Examples of Feedback in Climate System; Ice-Albedo Feedback, Water vapor Feedback, Carbon Cycle Feedbacks.
• Understand the basic mechanics of orbits and space travel. • Understand the history and possible future of space travel.	**Unit VII: Space System (3hrs)** Basic Orbital Mechanics: Kepler's Laws, Orbits and Types of Orbits, Aerodynamics, Spacecraft Navigation: Mission Design, Orbit Determination and Flight Path Control, Rocket Launch Technology, Manned and Unmanned Space Travel: History and Development.

Prescribed Text:

- ☐ *Hale, F. J. - Introduction to Space Flight, Prentice Hall (1994).*
- ☐ *Joseph G. - Fundamentals of Remote Sensing, Second Edition, Universities Press (2005)*
- ☐ *Wallace J. M. and Hobbs P. V. - Atmospheric Science, An Introductory Survey, International Geophysical Series (2006)*
- ☐ *Carroll B W &Ostlie D A - An Introduction to Modern Astrophysics, Latest Edition, Addison-Wesley.*
- ☐ *Fundamental Astronomy H. Karttunen, P. Kröger, H. Oja, M. Poutanen, K. J. Donner (Eds.), Fifth Edition.*

Reference:

- ☐ *Wertz, J. R. and Larson, W. J. (eds.) - Space Mission Analysis and Design, Microcosm Press (2006).*
- ☐ *Campbell J.B .- Introduction to Remote Sensing, Fourth Edition, The Guilford Press (2008)*
- ☐ *Sparke and Gallaghar - Galaxies in the Universe: An Introduction, Latest Edition, Cambridge University Press(2007)*
- ☐ *A test book on spherical astronomy by W.M. Smart (sixth edition revised –R.M. Green*

Far-Western University
Institute of Science and Technology
Physics V semester

Course Title: Electricity and Magnetism **Credit: 3**
Course No. : PHY351 **Number of hours per week: 3**
Nature of the Course: Theory **Total hours: 45**
Year: Third, Semester: Fifth
Level: B.Sc.

1. Course Description:
The course intends to enable the students to be acquainted with the basic concepts of Electricity and Magnetism. Students will be familiarized with the fundamentals of Coulomb's law, Electric field and Potential, Electric field in dielectric media, Biot-Savart law, Ampere's circuital law, Magnetic properties and magnetic field, A.C. and D.C. circuit and Maxwell's equation.

2. Course Objectives:
At the end of this course the students should be able:
*to acquire sufficient basic knowledge in Electricity and Magnetism.
*to apply this knowledge base for studying major courses in physics.
*to solve mathematical problems in related topics.
*to deduce mathematical equations and formulae.

3. Specific Objective and contents:

Specific Objectives:	Contents:
*Describe point function and field *Define gradient, divergence and curl *Able to know physical meaning of gradient, divergence and curl *Solve mathematical problems related with Gradient, divergence and curl *Explain Gauss's and Stoke's theorems *Define Green's theorem, Laplace and Poisson's equations	**Unit 1.Elementary vector analysis: (6hrs)** Review of vector algebra, Polar and axial vector, Point function and field, Gradient of scalar function, Divergence and curl of vector function in Cartesian co-ordinates, Physical meaning of gradient, divergence and curl, Gauss's and Stoke's theorems, Green's theorem, Laplacian operator, Introduction to Laplace and Poisson's equations.
*State and explain Coulomb's law *Define electric field and electric flux *Apply Gauss law in different cases *Calculate electric field and potential *Define electric potential and equipotential surface *Method of electrical image.	**Unit 2.Electrostatic Potential and Field: (6hrs)** Coulomb's law, Charge densities, Electric field and its calculation(on the axis of ring of charge and uniformly charged disc, Field of a line of charge), Electric flux, Gauss's law and its applications, Differential form of Gauss law, Electric potential and Equipotential surface, Electric field and potential due to electric dipole, Method of electrical image (Charged metallic plate and point charge & Grounded conducting sphere and point charge).
*Define dielectric *Define polar and non-polar molecules *Explain electric polarization *Deduce Gauss law in dielectric medium *Derive Clausius-Mossotti relation *Derive Langevin Debye formula *Define ferroelectric and paraelectric dielectric	**Unit 3.Electric field in dielectrics: (6hr)** Polar and Non-polar dielectrics, Electric polarization, Three electric vectors $\vec{E}$, $\vec{D}$ & $\vec{P}$, Gauss's law in dielectric medium, Boundary conditions of field vectors, Clausius-Mossotti relation, Langevin-Debye formula, ferroelectric and paraelectric dielectrics.

*Define magnetic field and magnetic flux *Apply Biot-Savart law in different cases *Define Helmholtz coil *Apply Ameper's circuital law in different cases *Derive forces between current carrying parallel wires *Explain Hall effect	**Unit 4.Magnetic field of moving charges: (6hrs)** Magnetic field and magnetic flux, Biot-Savart law and its applications, Ampere's circuital law and its applications, Magnetic dipole, Curl and divergence of $\vec{B}$, Forces between current carrying parallel wires, Magnetic vector potential, Magnetic scalar potential, Helmholtz coil, Gauss law in magnetostatics, Magnetic bottle, Hall effect.
*Define various types of magnetic materials *Explain magnetization *Derive Langevin theory of dia & para magnetism *Explain Cuire Weiss law *Derive relation between three magnetic vectors *Define ferromagnetic theory * Define hysteresis loss * Derive relation between μ & χ	**Unit5. Magnetic properties and Fields: (6hrs)** Types of magnetic materials, Magnetic dipole moment of a current loop and angular momentum, Magnetization, Langevin's theory of diamagnetism and Paramagnetism, Relation between three magnetic vectors B, $\vec{H}$ & $\vec{M}$, Cuire Weiss law, Ferromagnetic theory, Hysteresis loss, Magnetic permeability (μ) & magnetic susceptibility (χ).
*Explain Faraday's laws *Define self & mutual induction *Calculation of self inductance & mutual inductance *Derivation of energy stored in magnetic field *Describe transformer, Search coil, moving coil galvanometer, Flux meter and Earth inductor	**Unit 6.Electromagnetic Induction: (6hrs)** Faraday's laws, Self induction, Calculation of self inductance of solenoid, Toroid (rectangular and circular cross section), Two long parallel wires, two coaxial cylinders, Mutual induction, Energy stored in magnetic field, Transformer, Search coil, Flux meter Moving coil galvanometer, Earth inductor.
*Define A.C. and D.C. *Explain charging and discharging of condenser through resistance *Growth and decay of current in RL and LC circuit *Describe LCR series circuit *Define sharpness of resonance, quality & power factor *Describe LCR parallel circuit	**Unit7. D.C. and A.C. circuits: (4hrs)** A.C. and D.C. sources, Charging and discharging of capacitor through resistance, Growth and Decay of current in RL and LC circuit, LCR-series circuit, Sharpness of resonance, Quality factor, Power factor, LCR-parallel circuit.
*Derive Maxwell's equations *Derive energy of charged particle in electromagnetic field *Explain Poynting vector *Derive electromagnetic wave equation	**Unit8. Electromagnetic Wave: (5hrs)** Maxwell's equations (General form and for free space), Energy of a charged particle in an electromagnetic field, Poynting vector, Electromagnetic wave equation.

Evaluation System:

<table>
<tr><th colspan="8">Undergraduate Programs</th></tr>
<tr><th>External Evaluation</th><th>Marks</th><th>Internal Evaluation</th><th>Weightage</th><th>Marks</th><th>Practical</th><th>Weightage</th><th>Marks</th></tr>
<tr><td rowspan="4">End Semester Examination (Details are given in the separate table at the end)</td><td rowspan="4">60</td><td>Assignments</td><td>20%</td><td rowspan="4">20</td><td>Practical Report Copy</td><td>25%</td><td rowspan="4">20</td></tr>
<tr><td>Quizzes</td><td>10%</td><td>Viva</td><td>25%</td></tr>
<tr><td>Attendance</td><td>20%</td><td rowspan="2">Practical Exam</td><td rowspan="2">50%</td></tr>
<tr><td>Internal Exams</td><td>50%</td></tr>
<tr><td>Total External</td><td>60</td><td>Total Internal</td><td>100%</td><td>20</td><td></td><td>100</td><td>20</td></tr>
<tr><td colspan="8">Full Marks 60+20+20 = 100</td></tr>
</table>

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 Practical Evaluation:

After completing end semester theoretical examination, practical examination will be held. External examiner will conduct examination according to the above mentioned evaluation. There will be an internal examiner. Three hour 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 te 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 will be conducted twice per semester. The student will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percentage 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 presentation 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 discussion.

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 student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period.

Text Book:

1. Foundation of Electromagnetic Theory, J. R. Reitz, F.J. Milford, R.W. Christy, Narosa Publishing House, New Delhi, 3rd Ed, 1998.

Reference Books:

1. Electricity and Magnetism, Edward M. Purcell (McGraw-Hill Education, 1986).
2. Fundamentals of Electricity and Magnetism, Arthur F. Kip (McGraw-Hill, 1968)
3. Electricity and Magnetism, J. H. Fewkes & John Yarwood. Vol. I (Oxford Univ.Press,1991).
4. Electricity and Magnetism, D. C. Tayal (Himalaya Publishing House, 1988).
5. David J. Griffiths, Introduction to Electrodynamics, 3rd Ed, (Benjamin Cummings, 1998).
6. Electricity and Magnetism with Electronics, K. K. Tiwari, S. Chand & Company LTD.
7. Electricity and Magnetism, V.P. Arora, M.C. Saxena, S. Prakash, Pragati Prakashan, Meerut, 18th Ed,2007.
8. Electromagnetics, B.B. Laud, Wiley Eastern, Ltd, 2nd Ed,1992.

Far-Western University
Institute of Science and Technology

Course Title: Electricity and Magnetism PR **Year: III**
Course No.:PHY351 **Semester: V**
Nature of the Course: Practical **Credit: 1**

Objectives:
By the end of the course the student should be able to:
*measure correctly in measurement
*determine errors in measurements
*analyze raw data and make valid conclusions
*validate corresponding theoretical component
*develop proper laboratory skills
*design basic physics experiment
*interpret experimental results and draw logical conclusion
*relate theoretical concept to practical skills

List of experiments:
1. To find out ballistic constant 'K' of a moving coil galvanometer.
2. To find out high resistance by the method of leakage.
3. To study charging of a condenser through resistor and trace charging cuve.
4. To study discharging of a condenser through resistor and trace discharging cuve.
5. To find out impedance of LCR-series circuit.
6. To find out quality factor of LCR-series circuit.
7. To find out impedance of LCR-parallel circuit.
8. To find out time constant of RL-circuit during growth of current.
9. To find out time constant of RL-circuit during decay of current.
10. To find out transformer ratio and percentage efficiency of transformer.
11. To find out Hall voltage and Hall coefficient of given sample.
12. To trace hysteresis loop using oscilloscope.

Note:
*Student must perform 6 hours of lab work (2hours×3times or 3hours ×2times) every week.
*In every semester, at least eight experiments are to be performed. Additional experiments may be added 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 oral exam 20%

References:
*Arora C.L., B.Sc. Practical Physics, S Chand and Company Ltd
*Squires G.L., Practical Physics, Cambridge University Press
*Shukla P.K. and Srivastava, 2006, Practical Physics, New Age International (P) Ltd, Publisher
* Gupta S.L. and Kumar V., Practical Physics, Pragati Prakashan, Meerut.

FAR WESTERN UNIVERSITY

Faculty of Science and Technology

Course Title: Geometry F.M.: 100
Course No.: MTH351 P.M.: 45%
Nature of Course: Theory Credit: 3
Level: B. Sc. Number of hours per week: 3
Year: Third, Semester: Fifth Teaching Hours: 45

1. **Course Description:**
   This course of Mathematics is designed to gain the knowledge about transformation of coordinates, conic sections and their properties, polar equation of conic, general equation of the second degree, coordinates in 3D, plane, straight line, sphere and cone and cylinder and their skills are used in different fields of general and technical sciences. The course emphasizes both theoretical and applicable aspects of transformation of coordinates, conic sections, sphere, cone and cylinder etc.
2. **Course Objectives:**
   The general objectives of this course are as follows:
   - To enable the students to gain the basic concepts about transformation of coordinates in 2D, conic sections in plane.
   - To enable the students to know about general equations of second degree.
   - To know about coordinates in space plane, straight lines in plane.
   - To enable the students to know about sphere, cone and cylinders in space.
3. **Specific Objectives and Contents of Subject Matter:**

Specific Objectives	Contents in Detail
* Describe about to change the origin of coordinates withoutchanging the directions of the axes. * Describe about to change the direction of the axes withoutchanging the origin. * Describe about to change the direction of the axes along withchange of origin. * Describe about invariants.	**Unit 01: Transformation of Coordinates 3 Hrs** Translation of coordinates Rotation of coordinates Combination of translation and rotation Invariants in orthogonal transformation Exercises
* Discuss about conic sections of different types. * Derive the standard equation of ellipse in detail. * State the different terminologies related to ellipse. * Discuss about sum of focal distances of a point. * State about polar equation of ellipse. * Write the definition of tangent and normal at a point on a curve and derive the equations of tangent and normal for ellipse and hyperbola. * Define hyperbola and derive standard equations of hyperbola. * Discuss about chord of contact. * Define pole and polar of a conic and state their properties. * Discuss about asymptotes of hyperbola. * Discuss about relations between the equations of hyperbola, its asymptotes and the conjugate hyperbola. * Derive polar equation of conic section with focus being pole.	**Unit 02: Conic Sections 10 Hrs** Introduction Ellipse Standard forms of ellipse and terminologies Sum of the focal distances of a point. Polar equation of the ellipse Tangent and normal (equation) Hyperbola Standard forms of hyperbola Equations of tangent and normal Chord of contact Pole and polar and their properties Asymptotes of hyperbola Relations between the equation of the hyperbola, itsasymptotes and the conjugate hyperbola Polar equation of conic section with focus being apole
* Discuss about general equation of second degree andthe conic represented by them. * Discuss about nature and centre of conic. * Derive equation of tangent and find condition of tangency. * Discuss about director circle of conic. * Derive equation of normal to the conic. * Derive equation of pole and polar of a conic.	**Unit 03: General Equation of the Second Degree 3 Hrs** General equation of second degree and the conicrepresented by them. Nature of conic Centre of conic Equation of tangent and condition of tangency Director circle

	Equation of normal to a conic Equation of pole and polar with respect to a conic
* Introduce coordinates in space in detail and revise some important formulae related to coordinates in	**Unit 04: Coordinates in Space and Plane 7 Hrs** 4.1 Introduction
space like distance formula, section formula and mid-point formula etc. * Find the angle between two straight lines. * Define direction cosines of a line and state relationbetween direction cosines of a line. * Define direction ratios and state relation betweendirection ratios. * Define plane in detail. * Derive equation of plane in normal and interceptforms. * Reduce the linear equation of plane to a normal form. * Derive equation of plane through three points. * Derive equation of plane through intersection of twoplanes. * Discuss about pair of planes and find angle between two planes represented by $ax^2 + by^2 + cz^2 + 2fyz + 2gzx + 2hxy = 0$	Distance formula, section formula and mid point formula Angle between the straight lines Direction cosines of a line and relation between direction cosines of a line. Direction ratios Projection Introduction of plane Equation of plane in normal and intercept form Reduction of linear equation of plane to a normalform Angle between two planes Plane through three points Plane through intersection of two planes Pair of planes and angle between two planes represented by $ax^2 + by^2 + cz^2 + 2fyz + 2gzx + 2hxy = 0$
* Discuss about introduction of straight lines in space. * Derive equation of straight line in symmetrical form. * Find length of perpendicular from a point to a line. * Transform the equation of line from general form to thesymmetrical form. * Find a relation for angle between a line and a plane. * Derive a condition for a line to lie in a plane. * Discuss about coplanar lines. * Discuss about shortest distance between lines.	**Unit 05: Straight Lines in Space 7 Hrs** Introduction of straight lines in space Equation of a line in symmetrical form Length of perpendicular from a point to a line Transformation of the equation of line from generalfrom to the symmetrical form Angle between a line and a plane Condition for a line to lie in a plane Co-planar lines The shortest distance Exercises
* Discuss about introduction of sphere. * Derive different equations of sphere. * Discuss about general equations of sphere. * Derive equation for sphere passing through four points. * Discuss about plane section of a sphere. * Derive equations of sphere in diameter form. * Discuss about intersection of two spheres. * Derive equation of tangent plane. * State condition of tangent with derivation.	**Unit 06: The Sphere 7 Hrs** Introduction Equation of a sphere General equation of sphere Sphere through four given points Plane section of sphere Equation of a sphere in diameter form Intersection of two spheres Equation of tangent plane Condition of tangency
* Define cone and cylinder in detail. * Derive the equation of cone with given vertex at origin. * Discuss about condition for the given equation of second degree to represent a cone. * Find angle between lines in which a plane cuts a cone. * Find the condition that the cone has three mutuallyperpendicular generators. * Discuss about tangent lines and tangent planes. * State and derive condition of tangency. * Discuss reciprocal, enveloping and right circular cones. * Derive equation of the cylinder through a given conic.	**Unit 07: Cone and Cylinder 8 Hrs** Definition Cone with given vertex at origin Condition for the given equations of second degree torepresent a cone Angle between lines in which a plane cuts a cone Condition that the cone has three mutuallyperpendicular generators Tangent lines and tangent planes Condition of tangency Reciprocal, enveloping and right circular cones Cylinder Equation of the cylinder through a given cone Enveloping and right circular cylinders

* Discuss about enveloping and right circular cylinders.	

4. Evaluation System:

Undergraduate Programs				
External Evaluation	**Marks**	**Internal Evaluation**	**Weightage**	**Marks**
End semester examination	60	Assignments	10%	
(Details are given in the separate table at the end)		Quizzes	10%	
		Attendance	10%	
		Presentation	10%	40
		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. A Textbook of 3d Geometry – Y. R. Sthapit and B. C. Bajracharya, Sukunda Pustak Bhawan
ii. Analytical Geometry (2D) – M. R. Joshi and Jeevan Kafle, Sukunda Pustak Bhawan
iii. Analytical Geometry – S. P. Koirala et. al., Pragya Pustak Bhawan, Tahachal, Kathmandu

FAR WESTERN UNIVERSITY

Faculty of Science and Technology

Course Title: Vector Analysis F.M.: 100
Course No.: MTH352 P.M.: 45%
Nature of Course: Theory Credit: 3
Level: B. Sc. Number of hours per week: 3
Year: Third, Semester: Fifth Teaching Hours: 45

1. Course Description:

This course of Mathematics is designed to gain the knowledge about product of three or four vectors, differentiation and integration of vectors, gradient, divergence and curl, line, surface and volume integrals, as well as integral transformation theorems and their skills are used in different fields of general and technical sciences. This course emphasizes both theoretical and applicable aspects of differentiation and integration of vector function, line surface and volume integrals etc.

2. Course Objectives:

The general objectives of the course are as follows:

- To enable the students to gain the knowledge about product of three or four vectors.
- To enable the students to gain the knowledge about differentiation and integration of vectors.
- To know about the gradient, divergence and curl.
- To enable the students to know about line, surface and volume integrals and integral transformation theorems.

3. Specific Objectives and Contents of Subject Matter:

Specific Objectives	Contents of Subject Matter in Detail
* Revise some important definitions, formula and product(scalar and vector) of two vectors in short. * Discuss about product of three vectors. * Discuss about scalar triple product in detail with geometrical interpretation. * Discuss about vector triple product in detail with geometrical interpretation. * Discuss about scalar and vector product of four vectors. * Define reciprocal system of vectors and state and prove their some properties and solve related exercises.	**Unit 01: Product of Three or Four Vectors 9 Hrs** Revision Product of three vectors Scalar triple product Vector triple product Product of four vectors Reciprocal system of vectors Exercise
* Discuss about vector function of a scalar variable * Discuss about limit, continuity and derivative of a vector function of scalar variable with geometrical interpretation. * Discuss about successive derivatives in brief. * Define constant vector and find derivative of constant vector function. * Discuss about important techniques of differentiation of vector function of scalar variable. * Discuss about derivative of a function of function. * Find the derivative of scalar and vector product of three vectors. * Discuss about partial derivative of vector function. * Discuss about vector integration in brief.	**Unit 02: Differentiation and Integration of Vectors 11 Hrs** Vector function of a scalar variable Limit of a vector function Continuity of a vector function Derivative of a vector function and geometrical interpretation Successive derivatives Constant vector and derivative of constant vector Techniques of differentiation of vector functions Derivative of a function of function Derivative of scalar and vector triple product Partial derivative of a vector function Vector integration

* Define scalar point functions and vector point functions with examples. * Discuss about vector differential operator. * Define gradient of a scalar function. * Define divergence of a vector function and define solenoidal. * Define curl of vector function and define irrotaional. * Discuss about level surface and directional derivatives. * Discuss about geometrical interpretations of the gradient of a scalar function. * Discuss about physical concepts of the divergence of a vector function. * Discuss about physical concept of curl of vector function. * State and prove some identities involving first order differential operator. * Discuss about use of vector differential operator for product functions. * Discuss about second order differential operator and related problems.	**Unit 03: Gradient, Divergence and Curl 8 Hrs** Point functions Gradient of scalar functions and G. I. Divergence and curl of vector function Level surface Directional derivatives Physical concepts of divergence and curl of vectorfunctions. Use of vector differential operator for product functions Second order differential operator
* Define smooth curve and simple closed curve. * Define line integral and discuss the line integral $\int_c F \cdot dr$ and some other expressions. * Discuss about line integral is the independent of path. * Define irrotational vector field. * Define surface integral in different form. * Discuss about applications of surface integrals. * Define volume integrals of vector function and solve some related problems.	**Unit 04: Line, Surface and Volume Integrals 8 Hrs** Line integrals Irrational vector field Surface integrals Volume integrals
* State and prove Green's theorem in the plane use it to find area. * State and prove Stoke's theorem. * Discuss about a special case of Stoke's theorem. * Discuss about some deductions from Stoke's theorem. * State and prove Gauss's divergence theorem. * Discuss about deductions from Gauss's theorem. * Discuss about expressions for grad ϕ, div $\vec{F}$ and curl $\vec{F}$ in terms of surface integral. * Solve some related problems.	**Unit 05: Integral Transformation Theorems 9 Hrs** Green's theorem in plane Area using Green's theorem Stoke's theorem and deduction Gauss's divergence theorem Expression for grad ϕ, div $\vec{F}$ and curl $\vec{F}$ in terms of surface integrals Green's theorem

4. Evaluation System:

Undergraduate Programs				
External Evaluation	**Marks**	**Internal Evaluation**	**Weightage**	**Marks**
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(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

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

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- Assignments
- Presentation by Students
- Term Paper writing
- Quizzes
- Guest Lecture

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5. Prescribed Books and References:

i. A Textbook of Vector Analysis – M. B. Singh and B. C. Bajracharya, Sukunda Pustak Bhawan
ii. Vector Analysis – Prof. Dr. Siddhi Prasad Koirala et. al., Cambridge Publication
iii. Vector Analysis – Lalji Prasad
iv. Vector Analysis – B. L. Baidya

FAR WESTERN UNIVERSITY
FACULTY OF SCIENCE AND TECHNOLOGY

Course Title: **Urban Environment** Credit: **3**

Course Code: **ENV 351** Number of hours per week: **3**

Nature of the Course: **Theory (Core Course)** Total hours: **45**

Year: **Third** Semester: **Fifth**

Objectives

Upon the completion of the course, the students should be able to

- Understand an overview of urban environment, urbanization, urban growth and pattern
- Understand the socio-cultural and environmental issues of urbanization and acquire knowledge on urban environmental planning
- Know the concept of sustainable cities, strategies for sustainable urbanization, and urban management initiatives
- Analyze the urban area from scientific perspective and conduct research on presentissues of urban environment

Objectives	**Units, Contents and Lecture Hours**
• Understand fundamental concepts related to urban environment and urbanization • Take insights on influencing factors and patterns of urban growth and urbanization in Nepal	**Unit I: Introduction to Urban Environment and Urbanization (6 Hrs)** Introduction to Urban environment; Concept and characteristics of urban areas; Trends, process and pattern of urbanization; Trend of urbanization in developed and developing countries; Influencing factors and patterns of urban growth and urbanization in Nepal.
• Understand various environmental issues in urban areas • Acquaint with economic and ecological components of urbanization	**Unit II: Urban Environnemental Issues (15 Hrs)** Concept of urban ecology; Economic and ecological components of urbanization; Socio-cultural and environmental impacts; Urban poverty, slum and squatters; Environmental sustainability and urban health; Socio-economic challenges in urban areas, urban food security; Urban infrastructures; Urban environmental issues: Sanitation, drainage, water supply and solid waste management, traffic congestion, air and noise pollution, urban land use change and patterns.

• To acquaint with concept of urban planning	**Unit III: Urban Planning (12 Hrs)** Principles of urban planning; planning process, methods and technique; Comprehensive planning; Green infrastructure; Concept of zoning and land pooling; Guided Land Development (GLD), Land Pooling and Nepalese experience; Role of environmental components in urban planning; Urban Planning in Nepal-Case Study
• Understand concept of sustainable urban development (SUD) • Identify fundamentals of climate resilient urban development	**Unit IV: Sustainable Urban Development (6 Hrs)** Concept on sustainable cities; Sustainable urbanization; Concept of inclusive urban development; Strategies for Sustainable Urban Development (SUD); Eco-cities, energy and water efficient cities; Smart cities; Climate resilient urban development
• Understand various national and international initiatives on sustainable urban development • Critically examine Sustainable Development Goal 11 on sustainable cities and communities	**Unit V: National and International Initiatives on Sustainable Urban Development (6 Hrs)** Policy and practice of sustainable urban development; Urban governance in Nepalese context; Urban planning, policies and institutions; Laws and policies related to urban issues; Development control of zoning regulations; SDG 11: Sustainable Cities and Communities

References

1. Adhikari, A.D. (1998). Urban and environmental planning in Nepal. IUCN, Kathmandu.
2. Cities and Bio-diversity Outlook. (2013.) Action and policy: a global assessment of the links between urbanization, biodiversity, and ecosystem services. Secretariat of the Convention on Biological Diversity.
3. Mitlin, Diana and Satterthwaite D. (1994). "Cities and Sustainable Development", background paper, Global Forum '94, Manchester.
4. Mostafavi, M. and Doherty, G. (2010). Ecological urbanism. Harvard University Graduate School of Design, Baden.
5. MoUD. (2015). National Urban Development Strategy (NUDS), 2015 (Final Draft). Ministry of Urban Development, Government of Nepal, Kathmandu.
6. National Planning Commission, 2015: Sustainable Development Goals, 2016-2030, National (Preliminary) Report. Government of Nepal, National Planning Commission, Kathmandu, Nepal

7. Price, Charles and Tsouros A., eds. (1996). Our Cities, Our Future: Policies and Action Plans for Health and Sustainable Development. Healthy Cities Project Office, Copenhagen.
8. Rodney R. (1994). White Urban Environmental Management: Environmental Change and Urban Design. John Wiley &Sons, Chichester.
9. Thapa, G.B. and Devkota, S.R. (1999). Managing solid wastes in metro Kathmandu. Asian Institute of Technology, Bangkok.
10. UN-HABITAT. (2011). Global report on human settlements - cities and climate change: policy directions. United Nations Human Settlements Programme.
11. Viessman, W. and Hammer, M.J. (1998). Water supply and pollution control. Adison-Wesley Publication, Boston.

FAR WESTERN UNIVERSITY
FACULTY OF SCIENCE AND TECHNOLOGY

Course Title: **Urban Environment PR**	Credit: **1**
Course Code: **ENV 351**	Number of hours per week: **3**
Nature of the Course: **Practical (Core Course)**	Total hours: **45**
Year: **Third**	Semester: **Fifth**

Objectives

Upon the completion of the course, students will get field based practical knowledge on several aspects of urban environment management. The students will also get insights on preparing field reports.

Practical

1. Field-based study to identify environmental issues and urban environmental planning (S*tudents will visit nearby urban areas/centres to identify all the major issues of the locality, rank them in order of importance and work on to assess the influence of the issues on urban environment planning. Each student has to prepare an individual report at the end of the study following the prescribed format of the university. Examples include solid waste management.*)
2. Discuss, design, and conduct field survey and review of local/national planning program and designs related to urban environmental quality (*Students will work in a group/team of 4-5 and conduct this field-based study under the supervision of a faculty. Each group/team will submit a group report following the prescribed format of the university.*)
3. Innovative solutions for your own urban living environment (*This follows an approach of 'Community Work'. Students will visit communities of their choice, interact with the local inhabitants, identify key issues of the locality and provide innovative solutions. Each student will work independently under the supervision of faculty/expert and prepare report following the prescribed format of the university.*)
4. Environmental Good Practices – a case study of any one municipality (or rural municipality if municipality is not feasible) of Nepal. (*Students will visit one municipality and assess good practices being undertaken by the municipality to improve the environmental quality. For example, many municipalities in Nepal have implemented 'Environmental Friendly Local Governance Program, EFLGP' under the auspices of Ministry of Federal Affairs and Local Development, MoFALD. If possible students will visit such municipalities and will carry out SWOT i.e. Strengths, Weaknesses, Opportunities and Threats analysis of the program.*)