Sant Gadge Baba Amravati University, Amravati

Faculty: Science and Technology

Programme: B.Sc.

Course: Environmental Science

POs:
At the time of graduation, Students would be able to

PO1.Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO2.Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

PO3. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings.

PO4. Effective Citizenship: Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO5. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

PO6. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

PO7. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

Course Specific Outcomes

Upon completion of the course (Environmental Science) successfully, students would be able to

1. Apply environment related technical skills for sustainability.
2. Develop the skills to identify Environmental problems.
3. Use the fundamentals of interdisciplinary subjects to solve environmental problems
4. Understand concept and components of environment, history and meaning and interdisciplinary nature of Environmental Science.
5. Identify sources, nature and effects of pollutants on global and local environment.
6. Perform procedure for qualitative and quantitative analysis of pollutants.
7. Assess the effects of pollutants and suggest the control and preventive measures for environment.
8. Apply the environmental conservation strategies.

<u>Employability Potential of the Course</u>

Environmental consultancy, recruitment in environmental ministries/boards/organizations, NEERI, CSIR labs, Wildlife Institute, Forest Institute, GBPNHIED, UNDP, CPCB and SPCB's. NGO's, Corporate Sector as well as there are lots of scopes abroad, can also apply in industries like in waste management plants, water management plants, quality control lab.

In Government Sector-

- Environmental Scientist in Research Institutes
- Regional / Sub Regional Officer in Pollution Control Boards
- Pollution Control Officer in Corporation / Council
- Scientific Officer in MPCB/CPCB
- Professor at Universities and Senior Colleges
- Lecturer at Junior Colleges
- Technician in Ground water quality Analysis

- Technician in Health laboratories.
- Biodiversity board
- Air water and Soil quality testing

In Corporate Sector-

- Pollution Control Officer.
- ETP Operator
- Industrial Safety Officer.
- Environment Manager.
- Designing and Operation on STP and ETP

Expert / Entrepreneur-

Environment Impact assessment.

- Environmental Consultant.
- Environment Auditor
- ISO 14000 Certification
- Green and Energy Auditor
- Sustainability Consultant
- Forest Carbon Specialist
- Environmental Risk Modeller
- Senior Catastrophe Risk Modeller

Environmental Journalism.

- Wildlife Filmmaker.
- Environmental Journalists.
- Environmental Photographer.

Others-

- 30% syllabus of Ecology and Environment in UPSC
- Data Scientist in Environmental Science
- Conservation Hydrologist
- Quality control officer in any industry
- Pharma industries and Waste and water sectors
- Sanitation and Swachh Bharat Mission {Work in the projects like UNDP, UNICEF, BMGF, Disaster Management projects, waste water, solid waste management, Environment education.
- Marine Scientist

Syllabus Prescribe for B.Sc. First Year UG Programme

Programme: B.Sc.

Semester 1

Code of the Course/Subject	Title of the Course/Subject	(Total Numbers of Periods)
EVSTH1/Environmental Science	Environmental Ecology (Environmental Science)	84

COs

After completion of this course successfully, students would be able to

1. Analyse biodiversity and bioindicator.
2. Understand fundamental Concept in Ecology.
3. Analyse characteristics of Ecology.
4. Understand fundamental Concepts in Population Ecology.
5. Understand fundamental Concepts in community Ecology.
6. Analyze productivity of ecosystem, ecological succession.

Unit	Content	Periods
Unit I	**a) Definition, scope, principles and environmental ethics.** **b) Introduction to Ecology-** Definition, principles and scope of ecology. Types of ecology **Ecological factors**- climatic, topographic and biotic. **c) Biogeochemical cycles**- Definition, types. Gaseous (carbon, oxygen, and nitrogen). Sedimentary (phosphorous and sulfur)	14
Unit II	**a) Population Ecology**- Definition, characteristic (natality, mortality, age structure, growth curve, dispersal, population size and density, biotic potential and life tables. **b) Inter-specific relationship** - Positive- Mutualism and Commensalism; Negative – Parasitism and Predation.	14
Unit III	**Community Ecology:** Definition, characteristics – species diversity, growth form, structure and dominance. **Characters used in community structures-** **1. Analytical**- a) Qualitative- frequency, abundance, density, basal area, dominanace. b) Quantitative – Physiognomic, phenology stratification abundance vitality, life form. **2. Synthetic**-i) presence and Constance, ii) fidelity iii) Dominance and other synthetic characters. **Methods for community study**- Quadrate.	14
Unit IV	**a) Ecosystem**- Definition, Types of Ecosystem, components and structure, food chain, food web, ecological pyramids, energy flow in ecosystem, energy flow model (Y-shaped). Ecological niche, Ecotone. **b) Ecosystems**: **Terrestrial**: forest, grassland, desert and cropland; **Aquatic:** marine, estuarine and fresh water.	14
Unit V	**a) Productivity of ecosystem**- Concept of productivity, types (primary, secondary), net productivity. **Methods of measurement of productivity**- Chlorophyll, O2, CO2 and radioactive.	14

	Biomass- concept, definition and study methods **b) Ecological succession** – Definition, causes, types. General process of succession. Hydro sere, Xerosere as a succession models.	
Unit VI	**a) Biodiversity –** Definition, levels of biodiversity. India as mega diversity nation. Biodiversity hot spots (Global, Indian). Causes of biodiversity loss. **b. Biomes** - Savannah, Taiga and Tundra with respect to their distribution, temperature, wind pattern, soil, precipitation, flora and fauna. **c) Bio-indicators** - climate, soil and pollution.	14
*SEM	Study of interlinking of local ecosystem with society Conservation and restoration of local ecosystem Study of sustainable practices for conservation of ecosystem Estimation of carbon sequestration of local area Observation and monitoring of biogeochemical cycles from different local habitats Study of abundance, density and frequency of different discipline from local community Observation and monitoring of different inter-specific interrelationship from different local habitats Biodiversity survey of the local area Observation and monitoring of successional stages from the nearby habitats.	
COs	Provide solutions to environmental problems using appropriate tools and techniques. Observed and monitor of conservation and management practices for environment restoration. Can work in consultancy services working on projects related to vegetational community structure & Ecosystem.	
**Activities	Visit to Ecosystem (Forest, Pond, River, Grassland, Cropland) Survey of local flora and fauna	06

Course Material/Learning Resources

Text Books:

1. Text Book of Ecology and Environment. G.D. Muratkar, Dr.V.A. Meshram D.L. Bhade, Mr.R.B. Barabde Dnyanpath Publication, Amravati.
2. Principles of Environmental Biology-P.K.G. Nair, Himalaya Publ.
3. Ecology and Environment- P.D. Sharma , Rastogi Publ.
4. Plant Ecology and Soil Science- R.S. Shukla, P.S. Chandel, S Chand& company.
6. Communities and Ecosystem- Witalkar.
7. Manual of Field Ecology- R. Mishra.
8. Concept of Ecology- E.J. Koromondy, Principal Hall.
9. Modern Concept of Ecology- H.D. Kumar.
10. Text book of Plant Ecology- R.S. Ambusth.
11. Elements of Ecology- Brijgopal and Bharadwaj.
12. Elements of Ecology- P.L. Kochar.
13. Environmental Biology- K.C. Agrawal.
14. A Text book of Ecology and Environment by P.C. Joshi and Namita Joshi, Himalaya
15. Environment & Ecology by- Vaishali Anand, Mc Graw Hill
16. Environmental Ecology and Natural Resources by Awdhutwar and Kute

17. Fundamental of Ecology and Environment by – Pranav Kumar

18. Environment and Ecology by – K. K. Agrawal

19. Environment, Ecology, Bio-diversity, Climate Change and Dister Management by – Ravi, Agrahari (Mc Graw Hill)

Reference Books:

1. Fundamentals of Ecology by E.P. Odum.

2. Fundamentals of Ecology- M.C. Dash, Tata McGraw Hill Pub.

3. Environmental Science - Van Cunninghnn, Tata McGraw Hill Pub.

4. Ecology by Weiver and Climents

Weblink to Equivalent MOOC on SWAYAM relevant:

1. **Ecology and Environment**
   By Prof. Abhijit P Deshpande, Prof. Ravi Krishna R | IIT Madras
   https://onlinecourses.nptel.ac.in/noc22_ge20/preview
2. **Environment Natural resources and Sustainable Development**
   By Prabhakar Rao Jandhyala | University of Hyderabad
   https://onlinecourses.swayam2.ac.in/aic19_ge05/preview
3. **Environment and Development**
   By Prof. NgamjahaoKipgen | IIT Guwahati
   https://onlinecourses.nptel.ac.in/noc22_hs126/preview
4. **Environmental & Resource Economics**
   By Prof. Sabuj Kumar Mandal | IIT Madras
   https://onlinecourses.nptel.ac.in/noc22_hs71/preview

Weblink to Equivalent Virtual Lab if relevant:

1. **https://vlab.amrita.edu/?sub=2&brch=294**
2. **https://ccnsb06-iiith.vlabs.ac.in/List%20of%20experiments.htt.**

Sant Gadge Baba Amravati University, Amravati

Syllabus Prescribed for B.Sc. First Year UG Programme

Programme: B.Sc.

Semester I

Code of the Course/Subject	Title of the Course/Subject (Laboratory/Practical)	(No. of Periods/Week)
EVS PR1/Environmental Science	Environmental Ecology (Environmental Science)	6/Week

COs

After completion of this course successfully, students would be able to

1. Apply systems concepts and methodologies to analyze and understand interactions between environmental and ecological processes.
2. Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work as interdisciplinary scholars and/or practitioners.
3. Analyse the transnational character of community and ways of addressing them, including interactions across local to global scales.

***List of Practical/Laboratory Experiments/Activities etc**

Sr. No.	Name of Experiment
A) Experiments on vegetational community structure.	
1.	Determination of minimum size of quadrate by Species Area-Curve method.
2.	Determination of minimum number of quadrate to be laid down in the field understudy.
3.	To study community characters–density, frequency, abundance by quadrate or line transact method.
4.	To study vegetation of given area by Physiognomic / BiologicalSpectrumMethod.
5.	To compare the biomass of ungrazed and grazed grassland.
6.	To determine Importance value Index(IVI)of vegetation.
B) Experiments on Ecosystems.	
1.	Measurement of Primary productivity in aquatic ecosystem by light and dark bottle method.
2.	To study abiotic components–pH, temperature, turbidity and light penetration in pond ecosystem.
3.	To study biotic components of pond ecosystem.
4.	To study biotic components of forest ecosystem.
5.	Qualitative and quantitative estimation of planktons in freshwater.
6.	To study the abiotic components of forest ecosystem.
7.	To study the ecological adaptation sin Flora and Fauna.
Spotting-Observation and comment on–	
1.	Mutualism-Lichens, Rhizobia, Mycorhizae.
2.	Commensalism-Lianas, Epiphytes.
3.	Parasitism-Cuscuta, Orobranchie, Loranthus.
4.	Predation-Nepenthes, Drosera and Utricularia.

DISTRIBUTIONOF PRACTICAL MARKS **Time : 4 hrs.**

Q.1	Any two Experiments on community structure	20
Q.2	Experiments on Ecosystem	10
Q.3	Spotting (any four)	08
Q.4	Tour Diary	03

Q.5	Practical record	04
Q.6	Viva-voce	05

TOTAL 50

B.Sc.I
Semester -I
GIC1: Ecosystem and Natural Resources

Course outcomes:

After completion of this course successfully, students would be able to

1. Gain in-depth knowledge about the concept of ecosystem and natural resources.
2. Explore the theoretical and practical aspects of sustainable management of natural resources and eco-friendly ways of living.
3. Develop professional knowledge in the areas of biodiversity conservation and natural resource management.
4. Critically assess different natural resource management projects, policies and planning at different levels.

Course content: (15 Hours)

- **Ecosystem and Biodiversity:** Concepts of Ecosystem, Biodiversity: Levels, Distribution and Uses, Loss of Biodiversity, Biodiversity Conservation
- **Land and water Resources:** Land and Soil, Water: Status, distribution and quality, Water: Competitive Uses
- **Energy & Mineral Resources:** Renewable and Non-renewable resources, Alternative Energy Resources, Mineral Resources, Usage Pattern and Issues
- **Agrobiodiversity: Status and issues,** Agrobiodiversity : Introduction and Importance, Loss of agrobiodiversity, Sustainable use of agrobiodiversity, Agrobiodiversity: Challenges and Opportunities

Syllabus Prescribed for B.Sc. First Year UG Programme

Programme: B.Sc. Environmental Science

Semester-II

Code of the Course/Subject	Title of the Course/Subject	(Total Numbers of Periods)
EVSTH2/Environmental Science	Physical Environment and Natural Recourses (Environmental Science)	84

COs

After completion of this course successfully, students would be able to

1. Understand the components of Environment.
2. Describe the concept of Natural Resources & its classification.
3. Evaluate characteristics of Environmental meteorology.
4. Demonstrate the concepts in Environmental Geosciences.
5. Understand the fundamentals in Marine Environment.

Unit	Content	Periods
Unit I	**Fundamentals of Environmental Science** –Concept of Earth System Science. Components of Environment: Atmosphere - Definition, structure and composition. Hydrosphere – Definition, distribution of water, hydrological cycle, and global water balance. Lithosphere - Definition, internal structure of earth. Rocks - types and their formation. Biosphere - Definition, boundaries of biosphere.	14
Unit II	**A. Natural Resources-** a) **Water Resources (Freshwater)** - types, availability, demand, utilization and conservation. **b) Forest resources** - Indian forest types, utilization and conservation. c) **Mineral resources –** types, availability, distribution, utilization and conservation. **B. Soil -** Definition, composition, formation, soil profile. Humus – significance and role.	14
Unit III	**Environmental meteorology - I** Solar radiation - Concept of insolation and heat budget. Temperature – Horizontal distribution, lapse rate - concept and types, temperature inversion - concept and types, Humidity -definition and types. Wind - origin and Earth's surface wind system (doldrums, trade wind belt, prevailing westerlies, and polar easterlies).	14
Unit IV	**Environmental Meteorology - II** **a. Clouds** - definition, formation and types. Precipitation- types (orographic, convectional, cyclonic), forms of precipitation (rain, drizzle, sleet, hail, snow). **b. Monsoon -** Meaning, origin, Indian monsoon (Bay of Bengal branch and Arabian Sea branch) and significance. El-Nino, La-Nina- concept and mechanism.	14
Unit V	**Environmental Geosciences: Fundamental concept of Environmental geology,** **a. Concept of plate tectonics**- major plates and their boundaries. **b. Geological hazards-** Earth quakes, Floods, Volcano's, Cyclones, landslides, desertification and Tsunami- (causes, distribution, types and effects).	14

Unit VI	**Marine Environment:** Introduction to Marine Environment- Zonation in the sea; physico-chemical properties, (temperature, light penetration, salinity, CO_2, O_2). Oceanic movements- waves, tides, oceanic currents (origin and types). Marine Resources – Food, medicinal, mineral, ornamental, petroleum deposits.	14
***SEM**	**Skill Enhancement Module:** Identification of rocks and minerals Water conservation practices (Rain / roof water Harvesting) Ground water recharging, Farm ponds and check dams) Water and soil analytical techniques Preparation of saplings for plantation Observation of local weather Weather equipment standardization and maintenance Identification of clouds	
COs	• Acquired the knowledge and skills needed for the water conservation and harvesting. • Analyse and determine soil and water quality using Environmental Analytical Techniques. • Use of different tools for the management of Environment, like metrological instrument and different methodologies.	
**Activities	• Visit to metrological station • Study of Landslide, Rock Fall, Flood affected area, deforested area	06

Course Material/Learning Resources

Text Books

1. Physical geography by Savendra Singh
2. 3. Climatology by Savendra Singh.
3. Physical Geology by P.K. Mukherji.
4. A Text book of Ecology and Environment by P.C. Joshi and Namita
Joshi, Himalaya.
5. Environmental Geography by Savendra Singh.
6. A Text Book of Marine Ecology by Balkrushnan Nair .
7. Environmental Biology by Verma and Agrawal.
8. Ecology and Environment By P.D. Sharma
9. Climatology: Atmosphere By- K. Siddharth (Kitab Mahal)
10. Climatology: An Atmosphere Science, By – Andrew-Hymen
11. Atmosphere weather and climate by – Richard Chorley
12. Understanding weather and Climate By – J. E. Burt
13. Global Physics Climatology By – ennis L. Hartmann

Reference Books

1. Climatology by S.K. Lal
2. Ecology by Weiver and Climents
3. Engineering and general Geology by Parbin Singh
4. Environmental Science, Danial Botkin and Edward Keller. John Wiley and Sons, New York
(1997).
5. Environmental Geology by K.S. Waldia.
6. Fundamentals of Ecology by E.P. Odum.

Weblink to Equivalent MOOC on SWAYAM relevant:

1. **Certificate course in Environmental Sustainability**
   Dr. M. Rajesh 2. Dr. Sindhu P Nair, 3. Dr. Jalajakumari VT, 4. Dr. P Unnikrishnan | IGNOU Regional Centre, Vatakara
   https://onlinecourses.swayam2.ac.in/nou22_ag16/preview
2. **Constitution of India and Environmental Governance: Administrative and Adjudicatory Process**
   By Prof. Sairam Bhat, Prof. M. K. Ramesh | National Law School of India University
   https://onlinecourses.nptel.ac.in/noc22_lw02/preview
3. **Environmental Chemistry**
   By Prof. Bhanu Prakash Vellanki | IIT Roorkee
   https://onlinecourses.nptel.ac.in/noc22_ce55/preview
4. **Environmental Modeling and Simulation**
   By Prof. Gargi Singh | IIT Roorkee
   https://onlinecourses.nptel.ac.in/noc22_ce77/preview

Weblink to Equivalent Virtual Lab if relevant:

1. **https://www.labster.com/simulations/spatial-ecology**
2. **https://opentextbc.ca/virtualscienceresources/chapter/environmental-science/ Sant Gadge Baba Amravati University, Amravati**

Syllabus Prescribed for B.Sc. First Year UG Programme
Programme: B.Sc.
Semester II

Code of the Course/Subject	Title of the Course/Subject (Laboratory/Practical)	(No. of Periods/Week)
EVSPH2/Environmental Science	Concept of Environmental Science (Environmental Science)	6/Week

COs

After completion of this course successfully, students would be able to

1. Determine the quality of water and evaluate degree of pollution .
2. Evaluate quality of Soil and its properties.
3. Demonstrate experiments on meteorology.
4. Handle, standardize and maintain the basic instruments such as pH meter, conductivity meter and meteorological equipments.
5. Identify types of rocks and minerals.

List of practical/Laboratory Experiments/Activities etc

Sr. No.	Name of Experiments
A) Experiments on water analysis.	
1.	Measurement of pH.
2.	Measurement of electrical conductivity.
3.	Determination of total Hardness.
4.	Determination of dissolved Oxygen.
5.	Determination of alkalinity.
6.	Determination of free CO_2
7.	Determination of turbidity.
B) Experiments on Soil and rocks and minerals.	
1.	Determination of soil temperature.
2.	Determination of soil moisture.
3.	Determination of soil bulk density.
4.	Determination of soil texture.
5.	Determination of soil electrical conductivity.
6.	Determination of soil pH.
7.	Determination of soil acidity
8.	Determination of soil organic content.
9.	Determination of soil calcium carbonate.
10.	To study the properties of rocks and minerals (Streak, lusture, texture, hardness, color etc.).
C) Experiments on meteorology.	
1.	Measurement of humidity and relative humidity.
2.	Measurement of light intensity.
3.	Monitoring wind speed and direction.
4.	Measurement of rain fall.
5.	Observation of clouds.
D) Spotting.	
1.	Rocks and minerals.
2.	Observations and comments on meteorological instruments.

3.	Economically important plants of forest origin (medicinal, timber Yielding, fiber yielding, resinous and other).

DISTRIBUTION OF PRACTICAL MARKS **Time : 4 hrs.**

Q.1	Experiment on water analysis	10
Q.2	Experiment on soil analysis	10
Q.3	Experiment on meteorology	08
Q.4	Spotting (any four)	08
Q.5	Tour Diary	04
Q.6	Practical record	05
Q.7	Viva-voce	05

	TOTAL	**50**

B.Sc.I
Semester -II
GIC2: Earth System Science

Course outcomes:

After completion of this course successfully, students would be able to

1. Understand the origin of the universe and solar system.
2. Analyse the geodynamic elements of earth.
3. Classify and analyse the Volcanoes- types, products and their distribution.
4. Gain Knowledge on the eustasy and Land-air-sea interaction.
5. Gain Knowledge on the geochemical cycle, Biosphere.

Course content:

- Introduction to various branches of Earth Sciences, General characteristics and origin of the Universe, Solar System and its planets, Earth in the solar system - origin, age of the earth.
- Earth magnetic field, Formation of core, mantle, crust, hydrosphere, atmosphere and biosphere, Concept of plate tectonics, sea-floor spreading and continental drift.
- Geodynamic elements of Earth- Mid Oceanic Ridges, trenches, transform faults and island arcs, Origin of oceans, continents, mountains and rift valleys, Earthquake and earthquake belts.
- Volcanoes- types, products and their distribution, Oceanic current system and effect of Coriolis force
- Concepts of eustasy and Land-air-sea interaction, Wave erosion and beach processes, Atmospheric circulation, Weather and climatic changes, Earth's heat budget, Soils- processes of formation, soil profile and soil types
- Introduction to geochronological methods and their application in geological studies, Introduction to geomorphology of the Indian subcontinent, Introduction to geology of the Indian subcontinent – tectonic history
- Mass conservation of elements and energy changes in the geochemical cycle, Biosphere, Geochemical behavior of major elements

Scheme of Teaching, Learning & Examination leading to the Degree in Bachelor of Science in the Programme Environmental Science
(Three years- Six Semester Degree Programme- C.B.C.S.)
(B.Sc. Part I) Semester I

Sr.	Subject	Subject code	Teaching & Learning Scheme							Duration of Exam Hours	Examination & Evaluation Scheme						
			Teaching Periods Per Week				Credits				Theory		Practical		Total Marks	Minimum Passing	
			L	T	P	Total	T/T	Practical	Total		Theory+ MCQ External	Skill Enhancement Module	Internal	External		Marks	Grade
1	DSC I Environment & Ecology	EVS (1S)	6	-	-	6	4.5	-	4.5	03	80	20	-	-	100	40	P
2	Lab	EVS 1S PR	-	-	6	6	-	2.25	2.25	03	-	-	25	25	50	25	P
3	Total		6	-	6	6	4.5	2.25	6.75	06	80	20	25	25	150	65	P

L: Lecture, T: Tutorial, P: Practical

Student may complete their Internship/ Field Work/ Work experience from Second to Fifth semester of Bachelor of Science in the Programme, according to their convenience; @ denotes Non-Examination credits.

Note: Internship/ Apprenticeship/ Field Work Experience (during vacations of semester II to V This will carry 5 credits for learning of 150 hours. Its credits and grades will be reflected in final semester VI credit grade report.

Scheme of Teaching, Learning & Examination leading to the Degree in Bachelor of Science in the Programme Environmental Science
(Three years- Six Semester Degree Programme- C.B.C.S.)
(B.Sc. Part I) Semester II

Sr.	Subject	Subject code	Teaching & Learning Scheme							Duration of Exam Hours	Examination & Evaluation Scheme						
			Teaching Periods Per Week				Credits				Theory		Practical		Total Marks	Minimum Passing	
			L	T	P	Total	T/T	Practical	Total		Theory+ MCQ External	Skill Enhancement Module	Internal	External		Marks	Grade
1	DSC -2 Physical Environment & Natural Resources	EVS (2S)	6	-	-	6	4.5	-	4.5	03	80	20	-	-	100	40	P
2	Lab	EVS 2S PR	-	-	6	6	-	2.25	2.25	03	-	-	25	25	50	25	P
3	Total		6	-	6	6	4.5	2.25	6.75	06	80	20	25	25	150	65	P

L: Lecture, T: Tutorial, P: Practical

Student may complete their Internship/ Field Work/ Work experience from Second to Fifth semester of Bachelor of Science in the Programme, according to their convenience; @ denotes Non-Examination credits.

Note: Internship/ Apprenticeship/ Field Work Experience (during vacations of semester II to V This will carry 5 credits for learning of 150 hours. Its credits and grades will be reflected in final semester VI credit grade report.