



**UNIVERSITY OF SARGODHA  
OFFICE OF THE REGISTRAR  
(ACAD BRANCH)**

**NOTIFICATION**

On the recommendations of Academic Council made in its 21<sup>st</sup> (2/2024) meeting held on 07.06.2024, the Syndicate in its 67<sup>th</sup> (3/2024) meeting held on 12.07.2024 approved the curriculum of BS in Forestry for implementation w.e.f. Fall 2024 (Annex-'A').

**(WAQAR AHMAD)**  
Additional Registrar (General)

No. SU/Acad/24/885

Dated: 14.11.2024

**Distribution:**

- Chairman, Department of Forestry
- Controller of Examinations
- Director Academics

**C.C:**

- Dean, Faculty of Agriculture
- Principal College of Agriculture
- Director, QEC
- Additional Registrar (Affiliation & Registration)
- Secretary to the Vice-Chancellor
- PA to Registrar
- Notification File

**Scheme Of Studies for the Degree of  
BS FORESTRY  
(Four Years)**



**Implementation w.e.f. Fall Semester, 2024**

**DEPARTMENT OF FORESTRY  
COLLEGE OF AGRICULTURE  
UNIVERSITY OF SARGODHA  
2024**

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*Verified*  
*Received*  
*08-11-2024*

*[Signature]*  
Chairman  
Department of Forestry  
University of Sargodha

## 1. Title of Degree Program: BS Forestry

## 2. Program Learning Objectives:

The Program Learning Objectives of BS Forestry is to educate and train the students in Forestry sector on modern lines with ample practical knowledge, a standard identical to accredited international standards. It encompasses a comprehensive set of goals designed to equip students with the knowledge, skills, and competencies necessary to fulfill the specific requirements in the field successfully. By the end of this program, students are expected to demonstrate a profound understanding of forestry and allied disciplines, including rangelands, wildlife and watershed. Students will be able to understand the types of forests and principles of their management, silvicultural system based on the ecological setup and vegetation types. They will understand the constraints in natural resource management which will enable them to devise strategies for their scientific management based on ground realities. They should be adept at conducting scientific research, employing innovative techniques, and applying sustainable practices to address multidimensional challenges in the field of forestry. Furthermore, graduates should exhibit effective communication and collaboration skills, enabling them to work seamlessly within multidisciplinary teams and engage with diverse stakeholders in the agricultural sector, especially in forestry. Overall, the program aims to produce graduates who are well-prepared to contribute significantly for sustainable forestry practices and their contribution to mitigate climate change and environmental stability.

## 3. Scope and Career Prospects:

This degree program has been designed to train forestry professionals for all stakeholders i.e. provincial forest departments (Government Sector), Non-Governmental Organization (NGO's), and private forest owners. The graduates of BS Forestry will be eligible and able to join following sectors for employment:

- Federal Government Departments and Divisions
  - Ministry of Climate Change and Environmental Coordination
  - Capital Development Authority
  - Pakistan Zoological Survey
- Provincial Government Departments (Punjab, KPK, GB, Baluchistan etc)
  - Forestry Field Wing (territorial)
  - Forestry Research Wing
  - Wildlife, Zoo and Safari's
- Non-Governmental Organization (NGOs)
  - International
  - National
- Private enterprises

## 4. Program Structure:

<b>Duration</b>	Minimum 4-Years (8-Semesters), Maximum 6-Years (12-Semesters)
<b>Admission Requirements:</b>	At least 45% marks in SSC/Matric & HSSC/F.Sc. (Part-I / II) Pre-Medical / Pre-Engineering or Equivalent.
<b>Degree Completion Requirements:</b>	144 credit hours
<b>Seats allocated for admission</b>	60

## 1. General Education (Gen Ed) Requirements: (Mandatory/Core Courses):

The minimum requirement for Gen Ed is 30 credits hours and will be offered in first four semesters only.

Sr. No.	Semester	Course Code	Course Title	Credit Hours	Prerequisite
1.	2	URCG-5112	Fables, Wisdom Literature, And Epic	2(2-0)	Nil
2.	4	URCG-5115	The Science of Global Challenges	3(2-1)	Nil
3.	2	URCG-5116	Science of Society-I	2(2-0)	Nil
4.	1	URCG-5118	Functional English	3(3-0)	Nil
5.	3	URCG-5119	Expository Writing	3(3-0)	Nil
6.	2	URCG-5120	Exploring Quantitative Skills	3(3-0)	Nil
7.	3	URCG-5121	Tools for Quantitative Reasoning	3(3-0)	Nil
8.	1	URCG-5105 URCG-5126	Islamic Studies (OR) Religious Education/Ethics	2(2-0)	Nil
9.	3	URCG-5122	Ideology and Constitution of Pakistan	2(2-0)	Nil
10.	1	URCG-5123	Applications of Information and Communication Technologies (ICT)	3(2-1)	Nil
11.	4	URCG-5124	Entrepreneurship	2(2-0)	Nil
12.	4	URCG-5125	Civics and Community Engagement	2(2-0)	Nil
13.	2, 4, 6, 7	URCG-5111	Translation of the Holy Quran	NC	Nil
14.	2	URCG-5127	Seerat of the Holy Prophet (SAW)	1(1-0)	Nil
<b>GE Courses Credit Hours Total</b>				<b>31</b>	

## 2. Major Courses:

Sr. No.	Course Code	Course Title	Credit Hours	Prerequisite
1.	FRST-5701	Introduction to Forestry and Watershed Management	2(1-1)	Nil
2.	FRST-5702	Introduction to Range and Wildlife Management	2(1-1)	Nil
3.	FRST-5703	Forest Economics	2(2-0)	FRST-5701
4.	FRST-5704	Fundamentals of Agroforestry	3(2-1)	FRST-5701
5.	FRST-5705	Sustainable Land Management	3(3-0)	SAES-5801
6.	FRST-5706	Introductory Forest Ecology	2(2-0)	FRST-5701

  
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7.	FRST-5707	Forest Entomology	3(2-1)	FRST-5702
8.	FRST-5708	Forest Pathology	3(2-1)	FRST-5701 & FRST-5704
9.	FRST-5709	Field Tours	2(0-2)	FRST-5701 & FRST-5702
10.	FRST-5710	Basic Plant Physiology and Morphology	3(2-1)	FRST-5701
11.	FRST-5711	Essentials of Rangeland Management	3(2-1)	FRST-5702
12.	FRST-5712	Forest Genetics	3(3-0)	FRST-5701
13.	FRST-5713	Forestry Extension	3(3-0)	FRST-5706
14.	FRST-6714	Forest Survey and Levelling	3(2-1)	FRST-5701 & FRST-5705
15.	FRST-6715	Landscaping and Urban Forestry	3(2-1)	FRST-5701
16.	FRST-6716	Basic Silviculture	3(3-0)	FRST-5701
17.	FRST-6717	Forest Hydrology	3(2-1)	FRST-5701
18.	FRST-6718	Utilization of Forest Produce	3(3-0)	FRST-5703
19.	FRST-6719	Biodiversity and Environment	3(2-1)	FRST-5706
20.	FRST-6720	Agroforestry Systems	2(2-0)	FRST-5704
21.	FRST-6721	Wood Science	3(2-1)	BOTN-5102
22.	FRST-6722	Forest Accounting and Office Management	2(2-0)	Nil
23.	FRST-6723	Applied Silviculture	3(2-1)	FRST-6716
24.	FRST-6724	Environmental Forestry	3(3-0)	FRST-5706
25.	FRST-6725	Wildlife Conservation	3(2-1)	FRST-5702
26.	FRST-6726	Forest Measurements	3(2-1)	FRST-5701
27.	FRST-6727	Forest, Range and Wildlife: Policies and Laws	3(3-0)	FRST-5701
28.	FRST-6728	Remote Sensing and GIS in Forestry	3(2-1)	GEOG-5101
29.	FRST-6729	Research Methods and Scientific Writing	3(2-1)	FRST-6723
30.	FRST-6730	Sustainable Forest Management	3(3-0)	FRST-5705
31.	FRST-6731	Forest Working Plan	4(2-2)	FRST-6719

  
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32.	FRST-6732	Forest Engineering	3(2-1)	FRST-6714
33.	FRST-6733	Range Vegetation-Livestock Interactions	3(3-0)	FRST-5711
<b>Major Courses Credit Hours Total</b>			<b>93</b>	



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### 3. Interdisciplinary/Allied courses: minimum 12 credit hours:

*Interdisciplinary/Allied courses will be offered after 4th semester*

1.	ZOOL-6141/ MATH-5128	Introduction to Biology-I (for Pre-Engineering students) / Mathematics (for Pre-Medical students)	3(3-0)	Nil
2.	GEOG-5101	Fundamentals of Geography	3(3-0)	Nil
3.	SAES-5801	Introduction to Soil Science-I	2(1-1)	Nil
4.	BOTN-5102	Plant Systematics, Anatomy and Development/ Embryology	4(3-1)	Nil
5.	AGRO-5901	Basic Agriculture	2(1-1)	Nil
<b>Interdisciplinary Courses Credit Hours Total</b>			14(11-3)	

### 4. Field experience/internship: Minimum 03 credit hours:

*Lasting 6-8 weeks and ideally scheduled after/during summer breaks after 4<sup>th</sup> semester.*

1.	FRST-6734	Field experience / Internship	3(0-3)	FRST-6729
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### 5. Capstone project: Minimum 03 credit hours:

*This project, after the sixth semester, requires faculty supervision and evaluation following department guidelines*

1.	FRST-6735	Capstone project	3(0-3)	FRST-6729
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**Semester Wise Courses  
BS Forestry (Four Years)**

**Semester-I**


Category	Course Code	Course Title	Credit Hours	Pre-Requisite
GE-1	URCG-5118 ✓	Functional English	3(3-0)	Nil
GE-2	URCG-5105 ✓ URCG-5126 ✓	Islamic Studies (OR) Religious Education/Ethics	2(2-0)	Nil
GE-3	URCG-5123 ✓	Applications of Information and Communication Technologies (ICT)	3(2-1)	Nil
IDC-1	ZOOL-6141/ MATH-5128	Introduction to Biology-I (for Pre- Engineering students)/ Mathematics (for Pre-Medical students)	3(3-0)/ 3(3-0)	Nil
IDC-2	GEOG-5101	Fundamentals of Geography	3(3-0)	Nil
IDC-3	SAES-5801	Introduction to Soil Science-I	2(1-1)	Nil
Major-1	FRST-5701	Introduction to Forestry and Watershed Management	2(1-1)	Nil
Major-2	FRST-5702	Introduction to Range and Wildlife Management	2(1-1)	Nil
<b>Total Credit Hours</b>			<b>20 (16-4)</b> ✓	

**Semester-1 Total Credit Hours:20**

**Semester-II**

GE-4	URCG-5112 ✓	Fables, Wisdom Literature, and Epic	2(2-0)	Nil
GE-5	URCG-5116 ✓	Science of Society-I	2(2-0)	Nil
GE-6	URCG-5120 ✓	Exploring Quantitative Skills	3(3-0)	Nil
GE-7	URCG-5127 ✓	Seerat of the Holy Prophet (SAW)	1(1-0)	Nil
GE-14	URCG-5111	Translation of Holy Quran – I	NC	Nil
IDC-4	BOTN-5102	Plant Systematics, Anatomy and Development/ Embryology	4(3-1)	Nil
Major-3	FRST-5703	Forest Economics	2(2-0)	FRST-5701
Major-4	FRST-5704	Fundamentals of Agroforestry	3(2-1)	FRST-5701
Major-5	FRST-5705	Sustainable Land Management	3(3-0)	SAES-5801
<b>Total Credit Hours</b>			<b>20 (18-2)</b> ✓	

**Semester-II Total Credit Hours: 20**

  
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### Semester-III

Category	Course Code	Course Title	Credit Hours	Pre-Requisite
GE-8	URCG-5119 ✓	Expository Writing	3(3-0)	Nil
GE-9	URCG-5121 ✓	Tools for Quantitative Reasoning	3(3-0)	Nil
GE-10	URCG-5122 ✓	Ideology and Constitution of Pakistan	2(2-0)	Nil
IDC-5	AGRO-5901	Basic Agriculture	2(1-1)	Nil
Major-6	FRST-5706	Introductory Forest Ecology	2(2-0)	FRST-5701
Major-7	FRST-5707	Forest Entomology	3(2-1)	FRST-5702
Major-8	FRST-5708	Forest Pathology	3(2-1)	FRST-5701 & FRST-5704
Major-9	FRST-5709	Field Tours	2(0-2)	FRST-5701 & FRST-5702
<b>Total Credit Hours</b>			<b>20 (15-5) ✓</b>	

**Semester-III Total Credit Hours: 20**

### Semester-IV

Category	Course Code	Course Title	Credit Hours	Pre-Requisite
GE-11	URCG-5115	The Science of Global Challenges	3(2-1)	Nil
GE-12	URCG-5124 ✓	Entrepreneurship	2(2-0)	Nil
GE-13	URCG-5125 ✓	Civics and Community Engagement	2(2-0)	Nil
GE-14	URCG-5111	Translation of Holy Quran – II	NC	Nil
Major-10	FRST-5710	Basic Plant Physiology and Morphology	3(2-1)	FRST-5701
Major-11	FRST-5711	Essentials of Rangeland Management	3(2-1)	FRST-5702
Major-12	FRST-5712	Forest Genetics	3(3-0)	FRST-5701
Major-13	FRST-5713	Forestry Extension	3(3-0)	FRST-5706
<b>Total Credit Hours</b>			<b>19 (16-3) ✓</b>	

**Semester-IV Total Credit Hours: 19**

  
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**Semester-V**

Major-14	FRST-6714	Forest Survey and Levelling	3(2-1)	FRST-5701& FRST-5705
Major-15	FRST-6715	Landscaping and Urban Forestry	3(2-1)	FRST-5701
Major-16	FRST-6716	Basic Silviculture	3(3-0)	FRST-5701
Major-17	FRST-6717	Forest Hydrology	3(2-1)	FRST-5701
Major-18	FRST-6718	Utilization of Forest Produce	3(3-0)	FRST-5703
Major-19	FRST-6719	Biodiversity and Environment	3(2-1)	FRST-5706
Major-20	FRST-6720	Agroforestry Systems	2(2-0)	FRST-5704
<b>Semester Total Credit Hours</b>			<b>20(16-4)</b>	

**Semester-V Total Credit Hours: 20****Semester-VI**

GE-14	URCG-5111	Translation of Holy Quran – III	NC	Nil
Major-21	FRST-6721	Wood Science	3(2-1)	BOTN-5102
Major-22	FRST-6722	Forest Accounting and Office Management	2(2-0)	Nil
Major-23	FRST-6723	Applied Silviculture	3(2-1)	FRST-6703
Major-24	FRST-6724	Environmental Forestry	3(3-0)	FRST-5706
Major-25	FRST-6725	Wildlife Conservation	3(2-1)	FRST-5702
Major-26	FRST-6726	Forest Measurements	3(2-1)	FRST-5701
Major-27	FRST-6727	Forest, Range and Wildlife: Policies and Laws	3(3-0)	FRST-5701
<b>Semester Total Credit Hours</b>			<b>20(16-4)</b>	

**Semester-VI Total Credit Hours: 20****Semester-VII**

GE-14	URCG-5111	Translation of Holy Quran – IV	NC	Nil
Major-28	FRST-6728	Remote Sensing and GIS in Forestry	3(2-1)	GEOG-5101
Major-29	FRST-6729	Research Methods and Scientific Writing	3(2-1)	FRST-6714
Major-30	FRST-6730	Sustainable Forest Management	3(3-0)	FRST-5705
Major-31	FRST-6731	Forest Working Plan	4(2-2)	FRST-6719
Major-32	FRST-6732	Forest Engineering	3(2-1)	FRST-6714
Major-33	FRST-6733	Range Vegetation-Livestock Interactions	3(3-0)	FRST-5711
<b>Semester Total Credit Hours</b>			<b>19(14-5)</b>	



**Semester-VII Total Credit Hours: 19**

**Semester-VIII**

Compulsory	FRST-6734	Capstone Project	3(0-3)	FRST-6723
Compulsory	FRST-6325	Field Experience / Internship	3(0-3)	FRST-6723
<b>Semester Total Credit Hours</b>			<b>6(0-6)</b>	

**Semester-VIII Total Credit Hours: 06**

**Note:** The scheme of studies of BS Forestry has been prepared in accordance with the requirement/s of National Agriculture Education Accreditation Council (NAEAC), Higher Education Commission of Pakistan.

  
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## SEMESTER-I

### URCG-5118

### Functional English

3(3-0)

The course aims at providing understanding of a writer's goal of writing (i.e. clear, organized and effective content and to use that understanding and awareness for academic reading and writing. The objectives of the course are to make the students acquire and master the grammatical academic writingskills. The course would enable the students to develop argumentative writing techniques. The studentswould be able to logically add specific details on the topics such as facts, examples and statistical or numerical values. The course will also provide insight to convey the knowledge and ideas in an objective and persuasive manner. Furthermore, the course will also enhance the students' understanding of ethical considerations in writing academic assignments and topics including citation, plagiarism, formatting and referencing the sources as well as the technical aspects involved in referencing.

#### **Contents**

1. Developing Analytical Skills
2. Transitional devices (word, phrase and expressions)
3. Development of ideas in writing
4. Reading Comprehension
5. Precis Writing
6. Developing argument
7. Sentence structure: Accuracy, variation, appropriateness, and conciseness
8. Appropriate use of active and passive voice
9. Organization and Structure of a Paragraph
10. Organization and structure of Essay
11. Types of Essays

#### **Recommended Texts**

1. Bailey, S. (2011). *Academic writing: A handbook for international students* (3rd ed.). New York:Routledge.
2. Eastwood, J. (2011). *A Basic English grammar*. Oxford: Oxford University Press.
3. Swales, J. M., & Feak, C. B. (2012). *Academic writing for graduate students: Essential tasks andskills* (3<sup>rd</sup> ed.). Ann Arbor: The University of Michigan Press.
4. Swan, M. (2018). *Practical English usage* (8<sup>th</sup> ed.). Oxford: Oxford University Press.

#### **Suggested Readings**

1. Biber, D., Johansson, S., Leech, G., Conrad, S., Finegan, E., & Quirk, R. (1999). *Longmangrammar of spoken and written English*. Harlow Essex: MIT Press.
2. Cresswell, G. (2004). *Writing for academic success*. London: SAGE.
3. Johnson-Sheehan, R. (2019). *Writing today*. Don Mills: Pearson.
4. Silvia, P. J. (2019). *How to write a lot: A practical guide to productive academic writing*. Washington: American Psychological Association
5. Thomson, A. J., & Martinet, A. V. (1986). *A Practical English Grammar*. Oxford: OxfordUniversity Press

*Introductory compulsory foundation course*

Islamic Studies engages in the study of Islam as a textual tradition inscribed in the fundamental sources of Islam: Qur'aan and Hadith, history and particular cultural contexts. The area seeks to provide an introduction to and a specialization in Islam through a large variety of expressions (literary, poetic, social, and political) and through a variety of methods (literary criticism, hermeneutics, history, sociology, and anthropology). It offers opportunities to get fully introductory foundational basis of Islam in fields that include Qur'aanic studies, Hadith and Seerah of Prophet Muhammad (PBUH), Islamic philosophy, and Islamic law, culture and theology through the textual study of Qur'aan and Sunnah.

- To make students understand the relevance and pragmatic significance of Islam in their lives.
- To make learners comprehend the true spirit of Islam with reference to modern world.
- To generate a sense of Islamic principles as a code of living that guarantee the effective solutions to the current challenges of being.
- To provide Basic information about Islamic Studies
- To enhance understanding of the students regarding Islamic Civilization
- To improve Students skill to perform prayers and other worships
- To enhance the skill of the students for understanding the issues related to faith and religious life.

*Contents*

1. Introduction to Qur'aanic Studies	تعارف قرآن مجید
1) Basic Concepts of Qur'aan	قرآن مجید کا بنیادی تعارف
2) History of the compilation of Qur'aan	تاریخ جمع و تدوین قرآن مجید
3) Uloom-ul-Qur'aan	علوم القرآن

مطالعہ قرآن (تعارف قرآن مجید، منتخب آیات کا ترجمہ و تفسیر: سورۃ البقرہ آیات 1-5، 284-286؛ سورۃ الحجرات آیات 1-18؛ سورۃ الفرقان آیات 63-77؛ سورۃ المؤمنون آیات 1-11؛ سورۃ الاحزاب آیات 6، 21، 32-33، 40، 56-59؛ سورۃ الانعام آیات 151-153؛ سورۃ الصف آیات 1-14؛ الحشر آیات 18-20؛ آل عمران آیات 190-192؛ النحل آیات 12-14؛ التین آیت 20، حم السجدہ آیت 53

2. Introduction to Hadith	تعارف حدیث
1) Legal Status of Hadith	حدیث کی قانونی حیثیت
2) History of the compilation of Hadith	تاریخ جمع و تدوین حدیث
3) Classifications of Hadith	حدیث کی اقسام

- 1- انماں، برکت پر مفسر ہے۔ 2- بہترین انسان قرآن کا ماب۔ 3- تاب، سنت برات سے پہلے کا ذریعہ تیس۔ 4- اور کان۔ 5- اور کان۔ 6- اور قیامت کی نشانیاں، 6- بچوں کو نماز کی تلقین۔ 7- دین کا گہرا فہم اللہ کی خاص منیت ہے۔ 8- حصول علم، سادہ قرآن اور عمل کی اہمیت و فضیلت۔ 9- روزِ نشوونما کے لئے۔ 10- حقوق اللہ کے ساتھ ساتھ حقوق العباد کا لحاظ رکھنا بھی لازم ہے۔ 11- حسن خلق کی عظمت اور بخشش و بدگوئی کی مذمت۔ 12- دنیا و آخرت کی جلالی کی شان پر چیزیں۔ 13- ہلاک گردینے والی سات چیزیں، 14- بے عمل مسلمان کا ہمت ناک انجام۔ 15- ہر شخص کو ان سے اور ہر شخص مسئلہ

### 3. Sirah of the Prophet (PBUH)

سیرت النبی ﷺ

1. Significance of Seerah Studies      مطالعہ سیرت کی ضرورت و اہمیت  
2. Prophetic principles of Character building      تعمیر سیرت و نفسیت کا نبوی منہاج

اقامت دین کا نبوی طریق کار، اقامت دین بعدِ خلافت راشدہ، بیضاں مدینہ، خطبہ حجۃ الوداع، اخلاقی تعلیمات، تشکیل اجتماعیت اور اسوہ حسنہ، قرآن مجید میں سیرت سے دو عالم کا بیان، غزوات نبوی ﷺ کے مقاصد و حکمتیں

### 4. Islamic Culture & Civilization

اسلامی تہذیب و تمدن

- 1) Basic Concepts of Islamic Civilization      اسلامی تہذیب کا مفہوم  
2) Historical evaluation of Islamic Civilization      اسلامی تہذیب کا تاریخی ارتقاء  
3) Salient feature of Islamic Civilization      اسلامی تہذیب کی نمایاں خصوصیات  
4) Islamic Civilization and Contemporary Issues      اسلامی تہذیب و تمدن اور معاصر مسائل

اسلامی تہذیب کے عوامل و عناصر، اسلامی تہذیب کے علمی، معاشرتی اور باہمی اثرات، تہذیبوں کے تصادم کے نظریے کا تنقیدی جائزہ، تہذیبی تصادم کے اثرات و نتائج، طبی، حیاتیاتی اور معاشرتی علوم میں مسلمانوں کا کردار، نامور مسلمان سائنسدان

Pre-Requisite: Nil

### Recommended Books

- 1) Hameed ullah Muhammad, —Emergence of Islam, IRI, Islamabad  
2) Hameed ullah Muhammad, —Muslim Conduct of State  
3) Hameed ullah Muhammad, —Introduction to Islam  
4) Ahmad Hasan, —Principles of Islamic Jurisprudence, Islamic Research Institute, International Islamic University, Islamabad (1993)  
5) Dr Muhammad Zia-ul-Haq, —Introduction to Al Sharia Al Islamia, Allama Iqbal Open University, Islamabad (2001)  
6) Dr. Muhammad Shahbaz Manj, Teleemat-e- Islam

1. Meaning and Scope of Ethics.
2. Relation of Ethics with:
  - (a) Religion
  - (b) Science
  - (c) Law
3. Historical Development of Morality:(a). Instinctive Moral Life.  
(b). Customary Morality.(c). Reflective Morality.
4. Moral Theories:
  - (a). Hedonism (Mill)
  - (b). Intuitionism (Butler)
  - (c). Kant's Moral Theory.
5. Moral Ethics and Society.
  - (a). Freedom and Responsibility.(b). Tolerance
  - (c). Justice
  - (d). Punishment (Theories of Punishment)
6. Moral Teachings of Major Religions:a). Judaism  
b). Christianityc). Islam
7. Professional Ethics:
  - a). Medical Ethics
  - b). Ethics of Students
  - c). Ethics of Teachersd). Business Ethics

**Reference Books:**

1. William Lille. An Introduction to Ethics., London Methuen & Co. latest edition.
2. Titus, H.H. Ethics for Today. New York: American Book, latest edition.
3. Hill, Thomas. Ethics in Theory and Practice. N.Y. Thomas Y. Crowel, latest edition
4. Ameer Ali, S. The Ethics of Islam. Culcutta: Noor Library Publishers, latest edition
5. Donaldson, D.M. Studies in Muslim Ethics. London: latest edition. 6. Sayeed, S.M.A.(Tr.)Ta'aruf-e-Akhlaqiat. Karachi: BCC&T, Karachi University of

The course introduces students to information and communication technologies and their application in the workplace. Objectives include basic understanding of computer software, hardware, and associated technologies. How computers can be used in the workplace, how communications systems can help boost productivity, and how the Internet technologies can influence the workplace. Students will get basic understanding of computer software, hardware, and associated technologies. They will also learn how computers are used in the workplace, how communications systems can help to boost productivity, and how the Internet technologies can influence the workplace.

***Contents***

1. Introduction, Overview of Information Technology.
2. Hardware: Computer Systems & Components, Storage Devices.
3. Software: Operating Systems, Programming and Application Software.
4. Databases and Information Systems Networks.
5. File Processing Versus Database Management Systems.
6. Data Communication and Networks.
7. Physical Transmission Media & Wireless Transmission Media.
8. Applications of smart phone and usage.
9. The Internet, Browsers and Search Engines.
10. Websites and their types.
11. Email Collaborative Computing and Social Networking.
12. E-Commerce.
13. IT Security and other issues.
14. Cyber Laws and Ethics of using Social media.
15. Use of Microsoft Office tools (Word, Power Point, Excel) or other similar tools depending on the operating system.
16. Other IT tools/software specific to field of study of the students if any.

***Recommended Text***

1. Discovering Computers 2022: Digital Technology, Data and Devices by Misty E. Vermaat, Susan L. Sebok; 17<sup>th</sup> edition.

***Suggested Readings***

1. Computing Essentials 2021 by Timothy J. O'Leary and Linda I. O'Leary, McGraw Hill Higher Education; 26<sup>th</sup> edition.
2. Computers: Understanding Technology by Fuller, Floyd; Larson, Brian: edition 2018.

This subject aims to yield students with a sense of practical relevance of biology to everyday life. This will make students comprehend life by understanding some of the molecular processes that occur in and around cells, to make students cognizant of biologic phenomenon (nature, body, etc.) on an evolutionary, ecological, behavioral, physiologic, tissue, cellular, and molecular level. In this subject students will examine how life is organized into hierarchical levels; how living organisms use and produce energy; how life grows, develops, and reproduces; how life responds to the environment to maintain internal stability; and how life evolves and adapts to the environment. Moreover, it will also enable them to investigate the biological molecules, homeostasis in vertebrates, and the influence of hormones on coordination and control systems of animal body. Upon completion of this subject students will be having an enhanced knowledge and appreciation of the basics of growth and development plans of animals and can develop cogent and critical arguments based on the course material.

### **Contents**

1. Introduction: Nature and scope of biology, Branches of biology, Relationship between biology and psychology
2. Biological molecules: Carbohydrates, Proteins, Fats, Nucleic acids, Water
3. The cell: Structure and function of cell, Cell organelles, Different types of cells
4. Homeostasis: Osmoregulation, Structure and functions of Nephron, Thermoregulation
5. Coordination and control: Structure and physiology of Neuron, Introduction to central and peripheral nervous system, Hormones
6. Basics of growth and development: Embryonic and post embryonic development

### **Recommended Texts**

1. Michael, J. and Lenardo. (2013). *Immune Homeostatis: Methods and protocol*. Humama press.
2. Campbell, M. and Christopher J. P. (2016). *Organismal homeostatis*. Momentum press.

### **Suggested Readings**

1. Lisa A. U., Michael L. C., Steven A. W., Peter V. M., Jane B. R. and Neil A. C. (2016). *Campbell biology*. 11<sup>th</sup> Pearson
2. Cambell, N. A. Mitchell, I. G. and Reece, J. B. (2009). *Biology: Concepts and connections*. 6<sup>th</sup> edition San Francisco: Addison Wesley, Longman
3. Anna A. S., Richard B. P. (2019). *An Introduction to Conservation Biology* 2nd Edition. Sinauer Associates is an imprint of Oxford University Press

To prepare the students, not majoring in mathematics, with the essential tools of algebra to apply the concepts and the techniques in their respective disciplines. Mathematics, as a study of patterns, both practical and abstract, involves analytical thought, logical reasoning, problem solving skills, and precise communication. Because of its power and versatility, mathematics has often been called the "Queen of the Sciences." There is no field of scientific inquiry that does not express itself through the language of mathematics. An undergraduate degree in mathematics provides an excellent foundation for students who are interested in pursuing an advanced degree in mathematics or in a related specialized profession. Mathematics can also provide an excellent foundation for students considering professional degrees in such allied fields such as Law, Business Administration, or Medicine. The kinds of analytical and logical thinking skills that one develops while studying mathematics are precisely the skills that recruiters look for in potential employees. Jobs involving significant mathematical background also consistently rank near the top of the list in annual career surveys.

### **Contents**

1. Real Numbers
2. Relations and Functions
3. Inequalities
4. Quadratic Functions and Complex Numbers
5. Linear Equations and Quadratic Equations: Formation of Linear equation
6. Solving Linear equation involving one variable
7. Solution of Quadratic equation by factorization method
8. Solution of quadratic equation by square completion methods
9. Solution of quadratic equation by quadratic formula
10. Application of quadratic equation
11. Sequence and Series
12. Types of Sequences; A. P, A. M., G. P., H. P
13. Trigonometric Functions, Trigonometric Applications
14. Graph of Functions and Modelling
15. Limits and Continuity
16. Derivatives, Integration
17. Probability and Binomial Theorem.

### **Recommended Texts**

1. Gantert, A. X. (2009). *Algebra 2 and trigonometry*. New York: AMCOS School Publication INC.
2. Kaufmann, J. E. (1994). *College algebra and trigonometry* (3<sup>th</sup> ed.). Boston: PWS-Kent Pub. Co.

### **Suggested Readings**

1. Swokowski, E. W. (1993). *Fundamentals of algebra and trigonometry* (8<sup>th</sup> ed.). Boston: PWS-Kent Pub. Co.
2. Nauman, K. (2019). *Basic mathematics-I: algebra and trigonometry* (2<sup>nd</sup> ed.). Lahore: Al-Hassan Pub.
3. Anton, H. (1999). *Calculus: A new horizon* (6<sup>th</sup> ed.). New York: John Wiley.
4. Stewart, J. (2012). *Calculus* (7<sup>th</sup> ed.). Belmont: Brooks/Cole.

This course is graduate-level course to expose students with the founding principles of Geography and geographical knowledge. A systematic descriptive introduction to the diverse elements of landscape including geomorphic, climatic, and biotic elements, human settlement and land-use patterns; cartographic approaches to the analysis of selected processes of landscape change. This course provides an opportunity for understanding part of the complex physical and biological environment in which human beings live. The nature and processes of geo-system and its constituent parts: atmosphere, lithosphere, hydrosphere and biosphere; structure and composition of the atmosphere: atmospheric circulation, weather and climate, energy transmission, spatial variation of energy inputs and energy budget; structure and composition of the earth: tectonics and related processes; hydrological cycle and its components: precipitation, evapotranspiration, groundwater, surface water and the oceans; vegetation zones of the world: world soils, ecosystems, biomes, energy and matter flows.

### ***Contents***

#### ***Theory***

1. Introduction, Definitions, scope and branches of Geography
2. Roots of the discipline and basic geographic concepts
3. Themes and traditions of Geography
4. Tools of Geography, The Universe, Galaxies and solar system
5. The Earth as a planet, Celestial positions, its shape and size
6. Rotation, revolution and related phenomena
7. Spheres of the earth, Lithosphere, Atmosphere, Hydrosphere
8. Biosphere
9. Man-environment interaction
10. Population
11. Major Economic activities
12. Settlements
13. Pollution

#### ***Practical (Lab. Work)***

1. Comprehension of atlases
2. Map reading skills, location of places
3. Features and relevant work related to topics of the theoretical section.

#### ***Recommended Texts***

1. Arbogast, A. F. (2007). Discovering physical geography. London: John Wiley and Sons.
2. Christopherson, R. W. (2009). Geo systems: an introduction to physical geography. New Jersey: Pearson Prentice Hall.

#### ***Suggested Readings***

1. De Blij, H. J and Muller, P. O. (1996). Physical geography of the global environment. London: John Wiley and Sons.
2. Strahler, A. (2013). Introduction to physical geography. New Jersey: John Wiley & Sons.

This is an introductory course designed to introduce the concept and significance of soil science for agriculture students at undergraduate level. It provides information to the students about soil science and its branches as well as their environmental significance. This course also delivers knowledge to the students about weathering of rocks and minerals as well as their classification. This course gives information to the students about physical properties of soil and their significance in agriculture. This subject also improves the awareness of the students about impact of agricultural and industrial wastes on our environment. In addition, this course also improves the skills of the students how to collect soil and water samples for physico-chemical analysis. Laboratory exercise will be designed to develop student competency for analysis of irrigation water and soil samples. Ability to highlight and support the importance of both water and soil quality analysis for judicious-use of resources.

### **Contents**

#### *Theory*

1. Introduction to Soil and environment: definition of earth, geology and soil science; disciplines of soil science; lithosphere, hydrosphere and biosphere
2. Weathering of rocks and minerals: definition. Agents and classification
3. Parent materials: definition and types
4. Soil formation: definitions, processes and factors
5. Soil profile: definition and description
6. Soil, water and air pollution: sources and types

#### *Practical*

1. Methods of soil sampling and handling
2. Preparation of saturated soil paste
3. Determination of soil water contents
4. Analysis of irrigation water, report writing and interpretation.
5. Textural analysis of soil

### **Recommended Texts**

1. Bashir, E. & R. Bantel. (2001). *Soil Science*. Islamabad, National Book Foundation.
2. Brady, N.C. & R.R. Weil. (2007). *The Nature and Properties of Soils* (14<sup>th</sup> ed.). Upper Saddle River, NJ, USA, Pearson Education.

### **Suggested Readings**

1. Brady, N.C. & R.R. Weil. (2009). *Elements of the Nature and Properties of Soils* (3<sup>rd</sup> Ed.). Upper Saddle River, NJ, USA, Pearson Education.
2. Hillel, D. (2008). *Soil in the Environment*: Burlington, MA, USA. Crucible of Terrestrial Life. Elsevier Inc.
3. Das, D.K. (2011). *Introductory Soil Science* (3<sup>rd</sup> ed.). New Delhi-110002, India.

**Introduction**

Forests and Watersheds are lifeline of natural system and regulate many global cycles. The understanding of forest resources in relation to watersheds is crucial for agriculture students. Watershed management is closely related to forest management as the selection and implementation of different forestry practices are essential component of it. Students will learn the different biological and engineering approaches to control and regulate the water flow and to reduce the sedimentation of the streams and lakes fed by this water.

**Course Learning Objectives**

1. To acquaint the students with basic knowledge of Forestry
2. To teach students principles of watershed management
3. To impart knowledge about forest resources in Pakistan
4. To teach skills helpful in field practices.

**Contents***Theory*

1. Introduction to forest and watershed management
2. Forest resources of Pakistan and their importance
3. Constraints and problems in natural resource management
4. Forestry practices (Agroforestry, social forestry etc.), Principles of sustainable forest management
5. Principles of Watershed Management
6. Hydrological cycle
7. Problems and potentials of various watersheds.

*Practical*

1. Identification of important forest tree species
2. Visits to various forest types and watershed areas.
3. Watershed measurements (instruments, area, drainage, flow etc.).

**Recommended Texts**

1. Franzel, S.; Scherr, S.J. (2001). *Trees on the Farm*. CAB International.
2. Quraishi, M.A.A. (2002). *Watershed Management in Pakistan*. Department of Forestry. UAF.

**Suggested Readings**

1. Sheikh, M.I. (1999). *Forests and Forestry in Pakistan*. A-One Publishers, Urdu Bazar, Lahore.
2. Quraishi, M.A.A. and Siddiqui, M.T. (2002). *Practical manual of watershed management*. Department of Forestry. UAF.
3. Quraishi, M. A. A. (1999). *Basics of Forestry and Allied Sciences*. Urdu Bazar, Lahore, A-One Publishers.

**Introduction**

This course will introduce the students with the knowledge of rangelands and their importance as major land use in Pakistan. Students will be able know the characteristics of rangelands of the country and complexities associated with management of rangelands. The course describes the range ecosystem, its components and types of range vegetation in different ecological zones of the country with brief discussion of the botany of range grasses, shrubs and trees, range plant ecology, range animal behavior, rangeland stocking rate and selection of grazing system. There is a comprehensive discussion on principles of scientific management of all the components of range ecosystem and its relation with wildlife.

**Course Learning Objectives**

1. To introduce the students with the rangeland resources and associated wildlife of Pakistan
2. To make the students identify major range vegetation types and wildlife species of the country
3. To provide information about the problems of rangelands and their scientific management

**Contents***Theory*

1. Introduction and importance of Rangelands
2. Basic terminology of range management and wildlife management
3. Components of Rangelands
4. Constraints and problems of rangelands.
5. Rangeland Resources of Pakistan; ecological zones and vegetation types.
6. Range improvement techniques.
7. Introduction to protected areas (National Park, Game Reserve and Wildlife Sanctuary).
8. National Parks of Pakistan.

*Practical*

1. Identification of important Grasses and Plant species of a rangeland.
2. Visits to various Rangeland types and Plantations.
3. Quantitative analysis of range vegetation.
4. Identification of important wildlife species

**Recommended Texts**

1. Holechek, J. (1989). *Range Management, Principles and Practices*. Newberry. Prentice Hall, Inc. USA.
2. Quraishi, M. A. A., G.S. Khan and Yaqoob, M. S. (1993). *Range Management in Pakistan*, University of Agriculture, Faisalabad.

**Suggested Readings**

1. Mohammad, N. (1989). *Rangeland Management in Pakistan*. Published by ICIMOD & NARC, Islamabad.
2. Quraishi, M.A.A., Ishaque, M. (1995). *Practical Manual of Range Management*. University of Agriculture, Faisalabad.

The course will enable students to explore human experiences, cultivate an appreciation of the past, enrich their capacity to participate in the life of their times, and enable an engagement with other cultures and civilizations, both ancient and modern. But independently of any specific application, the study of these subjects teaches understanding and delight in the highest achievements of humanity. The three components of the course, including fables, wisdom literature and epic, will enable the learners to explore and understand the classic tradition in literature. Development of personal virtue, a deep Sufi ethic and an unwavering concern for the permanent over the fleeting and the ephemeral are some of the key themes explored in the contents that will develop an intimate connection between literature and life.

**Contents**

1. Fables  
The Fables of Bidpai  
The Lion and the Bull  
The Ring-dove  
The Owls and the Crows  
Selected poem from Bang-i-Dara
2. Gulistan-e- Sa'di  
Ten hikāyāt from John T. Platts, *The Gulistan*
3. Epic  
THE SHĀHNĀMA OF FIRDAUSI

**Recommended Texts**

1. John T. P. (1876). *The Gulistan; or, Rose Garden of Shaikh Muslihu'd- Dīn Sa'dī of Shīrāz*. London: Wm. II. Allen.
2. Chishti, Y.S. (1991). *Sharaḥ-i bāng-i darā*. Lāhaur: Maktaba-i ta'mīr-i insāniyat

**Suggested Readings**

1. Thackston, W. (2000). *A Millennium of Classical Persian Poetry*. Maryland: Ibex Publishers.
2. Wood, R. (2013). *Kalila and Dimna: Fables of Conflict and Intrigue*. United Kingdom: Medina Publishing, Limited.

This course will introduce students with the subject matter of social science, its scope, nature and ways of looking at social phenomenon. It will make the participants acquaintance with the foundations of modern society, state, law, knowledge and selfhood. While retaining a focus on Pakistani state and society, students will encounter theoretical concepts and methods from numerous social science disciplines, including sociology, politics, economics anthropology and psychology and make them learn to think theoretically by drawing on examples and case studies from our own social context. Students will be introduced to the works of prominent social theorists from both western and non-western contexts. Instruction will include the use of written texts, audio-visual aids and field visits.

### **Learning Outcomes:**

The course has following outcomes:

- Introduce student with the nature of human social behavior and foundations of human group life
- Analyze the reciprocal relationship between individuals and society.
- Make student aware with the nature of societies existing in modern world
- Make students familiar with the philosophy of knowledge of social sciences
- Introduce students with the works of prominent theories explain human group behavior
- Help students to understand the foundations of society including culture, socialization, politics and economy
- Introduce students with various dimensions of social inequalities with reference to gender, race, ethnicity and religion
- Make them aware about the understanding of various themes pertains to social science in local context
- Help them recognize the difference between objective identification of empirical facts, and subjective formulation of opinionated arguments

### **Course Outlines:**

#### **1. Introduction to Social Sciences**

- Social world, Human Social behavior, Foundations of society
- Evolution of Social sciences
- Philosophy of Science
- Scope and nature of social sciences
- Modernity and social sciences
- Branches of social science: Sociology, Anthropology, Political Science, Economics

#### **Society and Community, Historical evolution of Society**

- Types of Societies
- Foraging society, Horticultural society, Pastoralist society
- Agrarian societies, Industrial society, Postindustrial society

#### **2. Philosophy of Knowledge in social Science and social inquiry**

- Understanding social phenomenon
- Alternative ways of knowing
- Science as a source to explore social reality
- Objectivity, Value-Free research
- Positivism vs Interpretivism
- Qualitative vs Quantitative

#### **3. Culture and Society**

- Idea of Culture, Assumptions of Culture

- Types, Components, Civilization and culture
  - Individual and culture. Cultural Ethnocentrism, Cultural Relativism
  - Outlook of Pakistani culture
  - Global Flows of culture, Homogeneity, Heterogeneity
- 4. Social Stratification and Social inequality**
- Dimensions of inequality, Social class
  - Gender, Race, Religion, Ethnicity, Caste
  - Patterns of social stratification in Pakistan
  - Class, caste system in agrarian society
  - Ascription vs Achievement, Meritocracy
  - Global stratification in modern world, Global patterns of inequality
- 5. Personality, Self and Socialization**
- Concept of self, Personality
  - Nature vs Nurture, Biological vs Social
  - Development of Personality
  - Socialization as a process, Agents of socialization
  - Socialization and self/group identity
- 6. Gender and Power**
- Understanding Gender
  - Social construction of Patriarchy
  - Feminism in Historical context, Gender Debates
  - Gender and Development
  - Gender issues in Pakistani society, Women Participation in politics, economy and education
  - Toward a gender sensitive society, Gender mainstreaming
- Pakistan: State, Society, Economy and Polity**
- Colonialism, colonial legacy, National identity
  - Transformation in Pakistani society: Traditionalism vs Modernism
  - Economy, Informality of Economy, Modern economy and Pakistan
  - Political Economy, Sociology of Economy

**Recommended Textbooks and Reading Materials:**

1. Giddens, A. (2018). Sociology (11<sup>th</sup> ed.). UK: Polity Press.
2. Henslin, J. M. (2018). Essentials of Sociology: A Down-to-Earth Approach. (18<sup>th</sup> Edition) Pearson Publisher.
3. Macionis, J. J. (2016). Sociology (16<sup>th</sup> ed.). New Jersey: Prentice-Hall.
4. Qadeer, M. (2006) Pakistan - Social and Cultural Transformation in a Muslim Nation.
5. Smelser, N.J. and Swedburg, R., The Handbook of Economic Sociology, Chapter 1 'Introducing Economic Sociology', Princeton University Press, Princeton.
6. Systems of Stratification | Boundless Sociology (no date). Available at: <https://courses.lumenlearning.com/boundless-sociology/chapter/systems-of-stratification/>
7. Jalal, A. (ed.) (1995) 'The colonial legacy in India and Pakistan', in Democracy and Authoritarianism in South Asia: A Comparative and Historical Perspective. Cambridge: Cambridge University Press (Contemporary South Asia)
8. Zaidi, S. A. (2015) Issues in Pakistan's Economy: A Political Economy Perspective. Oxford University Press. Chapter 26
9. Akhtar, A. S. (2017) The Politics of Common Sense: State, Society and Culture in Pakistan. Cambridge: Cambridge University Press.
10. Smelser, N.J. and Swedburg, R., The Handbook of Economic Sociology, Chapter 1 'Introducing Economic Sociology', Princeton University Press, Princeton.

Since ancient times, numbers, quantification, statistics and mathematics has played a central role in scientific and technological development. In the 21st century, Quantitative Reasoning (QR) skills are essential for life as they help to better understand socio-economic, political, health, education, and many other issues, an individual now faces in daily life. The skills acquired by taking this course will help the students to apply QR methods in their daily life and professional activities. This course will also change student's attitude about statistics and mathematics. It will not only polish their QR skills, but also enhance their abilities to apply these skills.

### **Contents**

1. Introduction to quantitative reasoning
2. Overview of contributions of Mathematicians and Statisticians especially Muslim scholars.
3. Types of standard numbers
4. Proportions, rates, ratio and percentages
5. Odds and odds ratio
6. Scale of measurements
7. Number sequence and series
8. Unit analysis as a problem-solving tool
9. Data handling (small and large)
10. Data errors, absolute and relative and their applications
11. Descriptive statistics
12. Rules of counting: multiplication rule, factorial, permutation and combination
13. Probability and its application in real life
14. A graphical perspective through Venn Diagram
15. Financial indicator analysis, and money management (profit, loss, simple and compound interest)
16. Practical scenarios involving algebraic expressions: linear and quadratic

### **Recommended Texts**

1. Akar, G. K., Zembat, İ. Ö., Arslan, S., & Thompson, P. W. (2023). *Quantitative Reasoning in Mathematics and Science Education*. 1<sup>st</sup> Ed., Springer, USA.
2. Peck, R., Olsen, C., & Devore, J. L. (2015). *Introduction to statistics and data analysis*. 5<sup>th</sup> Ed., Brooks Cole, USA.
3. Devlin, K. J. (2012). *Introduction to mathematical thinking*. Palo Alto, CA: Keith Devlin.

### **Suggested Readings**

1. Triola, M. F., Goodman, W. M., Law, R., & Labute, G. (2006). *Elementary statistics*. Reading, MA: Pearson/Addison-Wesley.
2. Blitzer, R., & White, J. (2005). *Thinking mathematically*. Pearson Prentice Hall.

## مطالعہ سیرت النبی صلی اللہ علیہ وسلم Seerat of the Holy Prophet

Course Code

URCG-5127

Title	Description
Semester	
Nature of Course	
No. of C.Hrs.	1(1-0)
Total Teaching weeks	18
Objectives of the Course	<p>۱۔ طلباء کو مطالعہ سیرت علیہ السلام کی ضرورت و اہمیت سے آگاہ کرنا</p> <p>۲۔ فقیر شخصیت میں مطالعہ سیرت علیہ السلام کے کردار کو واضح کرنا</p> <p>۳۔ بھٹ نبوی کے موقع پر اقوام عالم کی عمومی صورت حال سے آگاہ کرنا</p> <p>۴۔ رسول اکرم صلی اللہ علیہ وسلم کی اور مدنی زندگی کا اس طرح مطالعہ کروانا کہ طلباء ان واقعات سے نتائج کا استفادہ کر سکیں</p> <p>۵۔ طلباء کو عہد نبوی کی معاشرت، سیاست، معیشت سے آگاہ کرنا</p>

## Course Description

S.No.	Title	Description
1	حضور صلی اللہ علیہ وسلم کے ابتدائی حالات زندگی	۱۔ حضور صلی اللہ علیہ وسلم کا خاندانی حسب و نسب ۲۔ پیدائش اور ابتدائی تربیت ۳۔ لڑکپن اور جوانی کے حالات زندگی
2	بھٹ نبوی کے وقت دنیا کے حالات (ا)	۱۔ بھٹ نبوی کے وقت اہم تہذیبیں ۲۔ عرب، مصر، حبشہ، ہندوستان، ساسانی
3	بھٹ نبوی	۱۔ کی عہد میں دعوت اسلام
4	بھٹ نبوی	۱۔ مدنی عہد میں دعوت اسلام
5	خصائص النبی	آپ ﷺ کا بیٹا ہر امن
6	خصائص النبی	بھیت استاد و معلم
7	خصائص النبی	بھیت تاجر
8	خصائص النبی	بھیت سربراہ و سیاست
9	خصائص النبی	ذاتی محاسن اور جائزہ اثرات

نمبر شمار	نام مؤلف	نام کتاب
10		خصائص النبی
11		اسوہ حسنہ اور عصر حاضر
12		اسوہ حسنہ اور عصر حاضر
13		اسوہ حسنہ اور عصر حاضر
15		اسوہ حسنہ اور عصر حاضر
16		اسوہ حسنہ اور عصر حاضر

#### نصابی کتب


نمبر شمار	نام مؤلف	نام کتاب
1	ابن ہشام	السیرۃ النبویہ
2	مولانا شبلی نعمانی، سعید سلیمان ندوی	سیرۃ النبی صلی اللہ علیہ وسلم
3	قاضی محمد سلیمان سلیمان منصور پوری	رحمۃ اللعالمین
4	مولانا سعید احمد الحسن علی ندوی	نبی رحمت صلی اللہ علیہ وسلم
5	ڈاکٹر حسین مظہر صدیقی	محمد نبوی کا نظام حکومت
6	ڈاکٹر خالد علوی	السان کامل

#### حوالہ جاتی کتب

نمبر شمار	نام مؤلف	نام کتاب
1	سید ابراہیم علی سورودی	سیرت سرور عالم صلی اللہ علیہ وسلم
2	مولانا صفی الرحمن سہارنوی	الرحیق المختوم
3	پیر محمد کرم شاہ، اذہر ہی	ضیاء النبی صلی اللہ علیہ وسلم
4	ڈاکٹر اکرم الضیاء، انصاری	السیرۃ النبویۃ الصحیحۃ
5	مولانا حمید الرحمن، دانا پوری	اصح السیر

محمد

Topic	Details
Semester/Level	In some disciplines 1 <sup>st</sup> semester and in some disciplines 2 <sup>nd</sup> Semester/ADP Program 1 <sup>st</sup> Year
Objectives	<ul style="list-style-type: none"> <li>To familiarize the students to keys and fundamentals of recitation of the holy Quran.</li> <li>To develop the skill of the students of recitation the last revelation.</li> <li>Students will learn the basic Arabic grammar in a practical way.</li> <li>To develop an eagerness among the students to explore the last divine Book.</li> </ul>
Course Contents:	<ul style="list-style-type: none"> <li>تیسواں پارہ - ناظرہ مع تجوید</li> <li>بنیادی عربی گرامر</li> <li>اسم اور اسکے متعلقات : اسم فاعل، مفعول، تفضیل، مبالغہ</li> <li>فعل اور اسکی اقسام : ماضی، مضارع، امر، نہی</li> <li>حرف اور اسکی اقسام : حروف علت، حروف جارہ، مشبہ بالفعل</li> </ul>
Memorization:	تیسویں پارے کی آخری بیس سورتیں (حفظ مع ترجمہ)

  
 Chairman  
 Department of Islamic Studies  
 University of Gujrat

## **BOTN-5102 Plant Systematics, Anatomy and Development/Embryology 4(3-1)**

Plant systematics is a science that includes and encompasses traditional taxonomy; however, its primary goal is to reconstruct the evolutionary history of plant life. It divides plants into taxonomic groups, using morphological, anatomical, embryological, chromosomal and chemical data. However, the science differs from straight taxonomy in that it expects the plants to evolve, and documents that evolution. Determining phylogeny -the evolutionary history of a particular group; is the primary goal of systematics. Anatomical characters are conserved and stable and thus can be used as a “Taxonomic Character” for Plant Systematics of Plant Taxonomy. Anatomical characters of all the plant parts can be used such as the characters of stem, root, leaves, bark, stomata, trichomes, internal parts etc. The study systematics gives the order and relationships among the organism. This order and relationship arise from evolutionary processes. As a living thing, all of a plant's parts are made up of cells and this course will lead towards the developmental processes that how they took place.

### ***Contents***

#### ***Theory***

1. Plant Systematic: Introduction to Plant Systematic: aims, objectives and importance. Classification: Brief history of various systems of classification, Brief introduction to nomenclature, importance of Latin names and binomial system,
2. Morphology: A detailed account of various morphological characters root, stem, leaf, inflorescence, flower, placentation and fruit types, Diagnostic characters, economic importance and distribution pattern of the families
3. Anatomy: Cell wall: structure and chemical composition, Concept, structure and function of various tissues, Meristem, Vascular cambium, Structure and development of root, stem and leaf, Primary and secondary growth of dicot stem, periderm, Characteristics of wood and annual rings.
4. Development/Embryology: Early development of plant body: *Capsella bursa-pastoris*, Structure and development of Anther and ovule, Endosperm formation, Parthenocarpy, Poly-embryony

#### ***Practical (Lab work)***

1. Study of stomata and epidermis, Tissues of primary body of plant, Study of xylem 3-dimensional plane of wood, T. S of angiosperm stem and leaf, Anatomy of germinating seeds, Study of pollens
2. Identification of families given in syllabus with the help of keys, Technical description of common flowering plants belonging to families, Field trips shall be undertaken to study and collect local plants, Students shall submit 40 fully identified herbarium specimens.

### ***Recommended Text***

Clive A., Stace, C. A. & Crawley, M. J. (2015). Alien plants. New York: Harper Collins Publishers.

### ***Suggested Readings***

1. Hather, J. G. (2016). Archaeological parenchyma. London: Routledge Publishers.
2. Steeves, T. A. & Sawhney, V. K. (2017). Essentials of Developmental Plant Anatomy. Oxford: Oxford University Press.
3. Spichiger, R. E. (2019). Systematic Botany of Flowering Plants: A New Phylogenetic Approach of the Angiosperms of the Temperate and Tropical Regions. Florida: CRC Press.

**Introduction**

This course deals with the understanding of forest resource valuation and economic incentives for long term natural resource adequacy. It focuses on fundamental principles of economics and their application for resolving the general issues related to forest resource conservation and utilization, generally encountered in the developing countries, like Pakistan. The students will be able to understand the importance of economic aspects not only for wood products but also for non-wood forest products, extracted from the forests. Students will also be able to take decisions regarding the fixing the rotation of forest crop and its harvesting time. They will be able to estimate the value of forest products keeping in view the global market standards and trends in the contemporary world.

**Course Learning Objectives**

1. To introduce the students with the economic aspects of forest resources
2. To develop the skills and expertise to evaluate the forest products in the context of current market scenario.

**Contents**

- 1 Principles of economics and its application in forest resources.
- 2 Grading of goods: inferior and normal, Discounting and Compounding. Present worth of annuity, methods of depreciation: straight-line method, declining balance method.
- 3 Total and marginal value.
- 4 Demand and supply chain. Elasticity of demand and supply.
- 5 Determination of economic rotation age.
- 6 Introduction to Location theory: Marketing transportation and other considerations.
- 7 Forest valuation: valuation of Forest products and services.

**Recommended Texts**

1. Field, B. C. (2001). *Natural resource economics; an introduction*. McGraw-Hill.
2. Kahn, J. R. (1998). *The Economic approaches to environmental and natural resources*. (2<sup>nd</sup> ed.). South-Western, Thomson.

**Suggested Readings**

1. Klemperer, K. D. (2003). *Forest resource economics and finance*. USA: Blacksburg.
2. Chapman, H. H. (2010). *Forest valuation*. Kessinger Publishing. USA.
3. Bullard, S. H., & Straka, T. J. (2011). *Basic concepts in forest valuation and investment analysis*. Clemson University.

**Introduction**

The primary objective of this course is to equip students with a comprehensive understanding of agroforestry's significance both globally and nationally. Students will gain insights into the fundamental principles of agroforestry and its pivotal role in environmental amelioration through the integration of farm trees. The course will address the urgent need for agroforestry in the context of a growing global population, and provide practical knowledge on profitable tree-crop combinations for farmers. Ultimately, this course aims to enhance students' ability to articulate the benefits of agroforestry and apply this knowledge to improve agricultural practices and environmental sustainability.

**Course Learning Objectives**

1. Describe the significance of agroforestry in global and national context
2. Discuss the different types of agroforestry systems
3. Explain the role of farm trees in environmental amelioration
4. Propose the profitable tree-crop combinations to farmers

**Contents***Theory*

1. Introduction to agroforestry: history, basic agroforestry terminology, basic components
2. Basic principles of Agroforestry
3. Scope and classification
4. Significance of agroforestry in Pakistan
5. Tree- crop interaction and nitrogen fixing trees in agroforestry
6. Agroforestry for carbon sequestration, climate change mitigation and adaptation
7. Agroforestry and environment: soil fertility, soil stabilization, water yield and quality, soil pollution, biodiversity conservation, aesthetics and cultural services and food security
8. Economic analysis of agroforestry systems: markets and marketing of agroforestry products

*Practical*

1. Layout of: compact plantation, linear plantation and inter planting/Alley cropping on farmlands.
2. Scientific and common names of trees for diverse purposes in Agroforestry.
3. Interview with agroforestry farmers.
4. Visit to various agroforestry systems.

**Recommended Texts**

1. Alavalapati, J. and D. E. Mercer. 2005. Valuing Agroforestry Systems. Springer.
2. FAO. 2020. 2019-Forestry Sector Review: Pakistan FAO Islamabad. Nuberg, I. and R.R.G. Brendan. 2009. Agro-forestry for Natural Resource Management. CSIRO.
3. Siddiqui, M. T. and M. F. Nawaz. 2017. Text Book of Applied Forestry. University of Agriculture Faisalabad. available online at the link: <http://onlinebooks.uaf.edu.pk/BookDetails.aspx?BookId=17>

**Suggested Readings**

1. Shibu, J. and M.G. Andrew. 2008. Towards Agroforestry Design. Springer.
2. Batish, D.R. 2007. Ecological basis of Agro-forestry. CRC.

**Introduction**

Sustainable land management (SLM) is a knowledge-based procedure that helps integrate land, water, biodiversity, and environmental management (including input and output externalities) to meet rising food and fiber demands while sustaining ecosystem services and livelihoods. SLM is necessary to meet the requirements of a growing population. Improper land management can lead to land degradation and a significant reduction in the productive and service functions.

**Course Learning Objectives**

1. Preserving and enhancing the productive capabilities of cropland, forestland, and grazing land (such as upland areas, down-slope areas, flatlands, and bottomlands)
2. Sustaining productive forest areas and potentially commercial and noncommercial forest reserves
3. Foster an enabling environment for sustainable growth.
4. Promote agricultural and forest productivity.
5. Encourage nonfarm economic growth.
6. Improve social well-being, manage and mitigate risk, and reduce vulnerability.
7. Enhance sustainability of natural resource management.

**Contents**

Concept of sustainability and sustainable development

Sustainable development goals of UN

Land management and sustainable land management

International agreements related to sustainable land management

Sustainable agriculture and soil conservation

Drought and desertification

Sustainable forest management

Sustainable water management

Land degradation neutrality

**Recommended Texts**

1. Ashraf, M.I. (2020). Sustainable Land Management. SLMP-II and Ministry of Climate Change, Government of Pakistan. Islamabad
2. Hurni, H. (1997). Concepts of sustainable land management. ITC journal, 210-215.

**Suggested Readings**

1. Hurni, H. (2000). Assessing sustainable land management (SLM). Agriculture, ecosystems & environment, 81(2), 83-92.
2. Haregeweyn, N., Tsunekawa, A., Tsubo, M., Fenta, A. A., Ebabu, K., Vanmaercke, M., ... & Poesen, J. (2023). Progress and challenges in sustainable land management initiatives: A global review. Science of The Total Environment, 858, 160027.

## **SEMESTER-III**

**URCG- 5119**

**Expository Writing**

**3 (3-0)**

This course prepares undergraduates to become successful writers and readers of English. The course helps students develop their fundamental language skills with a focus on writing so that they can gain the confidence to communicate in oral and written English outside the classroom. The course is divided into five units and takes a Project-based Learning approach. Unit themes target the development of 21<sup>st</sup> century skills and focus on self-reflection and active community engagement. The course completion will enable the students to develop communication skills as reflective and self-directed learners. They will be able to intellectually engage with different stages of writing process, and develop analytical and problem-solving skills to address various community-specific challenges.

### ***Contents***

1. Self-Reflection
  - a. Introduction to the basics of the writing process
  - b. Introduction to the steps of essay writing
  - c. Prewriting activities: Brainstorming, listing, clustering and freewriting
  - d. Practicing Outlining of the essay
2. Personalized Learning
  - a. Learning Process, Learning Styles, Goal Setting and Learning Plan
3. Oral Presentation
  - a. Structure and Significance, Content Selection and Slide Presentation, Peer Review
4. Critical Reading Skills
  - a. Introducing Authentic Reading (Dawn and non-specialist academic books/texts)
  - b. Reading Strategies and Practice: Skimming, scanning, SQW3R, Annotating, Detailed reading and note-taking, Standard Test Practice: TOEFL and IELTS, Model Review Reports and Annotated Bibliographies
5. Community Engagement
  - a. Student-led brainstorming on local versus global issues, Identifying research problems
  - b. Drafting research questions, Drafting interview/survey questions for community research (in English or L1)
  - c. Engaging students in Critical reading, Presenting interview/ survey information, Field work
  - d. Writing Community Engagement Project
6. Letter to the Editor
  - a. Types of letters, Format and purpose of letter to the editor, Steps in writing letter-to-editor

### ***Recommended Texts***

1. Bailey, S. (2011). *Academic writing: A handbook for international students* (3rd ed.). New York: Routledge.
2. Swales, J. M., & Feak, C. B. (2012). *Academic writing for graduate students: Essential tasks and skills* (3<sup>rd</sup> ed.). Ann Arbor: The University of Michigan Press.

### ***Suggested Readings***

1. Cresswell, G. (2004). *Writing for academic success*. London: SAGE.
2. Johnson-Sheehan, R. (2019). *Writing today*. Don Mills: Pearson.
- Silvia, P. J. (2019). *How to write a lot: A practical guide to productive academic writing*. Washington: American Psychological Association.

This course is based on quantitative reasoning 1 course. It will enhance the quantitative reasoning skills learned in quantitative reasoning 1 course. Students will be introduced to more tools necessary for quantitative reasoning skills to live in the fast paced 21st century. Students will be introduced to importance of statistical and mathematical skills in different professional settings, social and natural sciences. These quantitative reasoning skills will help students to better participate in national and international issues like political and health issues. This course will prepare the students to apply quantitative reasoning tools more efficiently in their professional and daily life activities. This course will help them to better understand the information in form of numeric, graphs, tables, and functions.

### **Contents**

1. Types of data and its graphical representation ( Histogram, Stem and Leaf display, Box Plot, Scatter diagram, Histogram, Bar chart, etc)
2. Solving practical problems using linear and exponential models
3. Population growth models
4. Analytical approach to solve simultaneous equations
5. Inequalities and their application
6. Comparing quantities using analytical tools
7. Logical reasoning and their application in modern age
8. Logical reasoning and decision making
9. Data tendencies via measure of location
10. Variability and Measure of dispersion
11. Measuring relationships via Regression analysis and correlation
12. Statistical inference: sampling techniques, estimation techniques and hypothesis testing for decision and policy making

### **Recommended Texts**

1. Akar, G. K., Zembat, İ. Ö., Arslan, S., & Thompson, P. W. (2023). *Quantitative Reasoning in Mathematics and Science Education*. 1<sup>st</sup> Ed., Springer, USA.
2. Sharma, A. K. (2005). *Text book of elementary statistics*. Discovery Publishing House.
3. Blitzer, R. (2014). *Precalculus*, 5<sup>th</sup> Ed.. Pearson Education, Limited. New York

### **Suggested Readings**

1. Gupta, S. C., & Kapoor, V. K. (2020). *Fundamentals of mathematical statistics*. 12<sup>th</sup> Ed, Sultan Chand & Sons.
2. Aufmann, R. N., Lockwood, J., Nation, R. D., & Clegg, D. K. (2007). *Mathematical thinking and quantitative reasoning*. Cengage Learning
3. Blitzer, R., & White, J. (2005). *Thinking mathematically*. Pearson Prentice Hall.

**Course Description:**

This course focuses on ideological background of Pakistan. The course is designed to give a comprehensive insight about the constitutional developments of Pakistan. Starting from the Government of India Act, 1935 till to date, all important events leading to constitutional developments in Pakistan will be the focus of course. Failure of the constitutional machinery and leading constitutional cases on the subject. Moreover, students will study the process of governance, national development, issues arising in the modern age and posing challenges to Pakistan. It will also cover the entire Constitution of Pakistan 1973. However, emphasis would be on the fundamental rights, the nature of federalism under the constitution, distribution of powers, the rights and various remedies, the supremacy of parliament and the independence of judiciary

**Outline:**

- **Ideology of Pakistan**  
Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-e-Azam Muhammad Ali Jinnah.  
Two Nation Theory and Factors leading to Muslim separatism.
- **Constitutional Developments**  
Salient Feature of the Government of India Act 1935  
Salient Feature of Indian Independence Act 1947  
Objectives Resolution  
Salient Feature of the 1956 Constitution  
Developments leading to the abrogation of Constitution of 1956  
Salient features of the 1962 Constitution  
Causes of failure of the Constitution of 1962  
Comparative study of significant features of the Constitution of 1956, 1962 and 1973
- **Fundamental rights**
- **Principles of policy**
- **Federation of Pakistan**  
President  
Parliament  
The Federal Government
- **Provinces**  
Governors  
Provincial Assemblies  
The Provincial Government
- **The Judiciary**  
Supreme Court  
High Courts  
Federal Shariat Courts  
Supreme Judicial Council  
Administrative Courts and tribunals
- **Islamic Provisions in Constitution**
- **Significant Amendments of Constitution of Pakistan 1973**

**Recommended Books:**

1. Constitutional and Political History of Pakistan by Hamid Khan
2. Mahmood, Shaukat and Shaukat, Nadeem. Constitution of the Islamic Republic of Pakistan, 3rd re edn. Lahore: Legal Research Centre, 1996.
3. Munir, Muhammad. Constitution of the Islamic Republic of Pakistan: Being a

4. Commentary on the Constitution of Pakistan, 1973. Lahore. Law Pub., 1975.
4. Rizvi, Syed Shabbar Raza. Constitutional Law of Pakistan: Text, Case Law and Analytical Commentary. 2nd re edn. Lahore: Vanguard, 2005.
5. The Text of the Constitution of the Islamic Republic of Pakistan, 1973 (as amended).
6. Fundamental Laws of Pakistan by A.K. Brohi



Incharge Principal  
University Law College  
University of Sargodha

Topic	Details
Semester/Level	In some discipline 3 <sup>rd</sup> semester and in some discipline 4 <sup>th</sup> Semester/ ADP Program 2 <sup>nd</sup> Year
Objectives	<ul style="list-style-type: none"> <li>▪ Students will come to know about the real nature, significance and relevance of the Islamic beliefs in light of the text of the Holy Quran.</li> <li>▪ Students will seek knowledge of translation and transliteration of the Holy Book Quran.</li> <li>▪ To familiarize the students with the concept of Ibādah (Its significance, scope and relevance) and its types in Islam.</li> <li>▪ Students will learn literal and idiomatic way of translation of the Holy Book.</li> <li>▪ Students will learn about the polytheism and its incompatibility in Islam highlighted by the Holy Quran.</li> <li>▪ To highlight the significance of learning through using all human faculties provided by the almighty Allah and familiarize the students about condemnation of ignorance mentioned in the Quranic text.</li> <li>▪ To develop Awareness among the students about rights and duties of different circles of society in the light of Holy Quran.</li> <li>▪ To introduce the students to Quranic Arabic grammar in practical manner.</li> </ul>
Course Contents:	<p>ایمانیات اور عبادات ○</p> <p>اللہ پر ایمان، فرشتوں پر ایمان، رسولوں پر ایمان، آسمانی کتابوں پر ایمان</p> <p>یوم آخرت پر ایمان، تقدیر پر ایمان</p> <p>نماز، روزہ، زکوٰۃ، حج، جہاد</p> <p>معاشرے کے حقوق ○</p> <ul style="list-style-type: none"> <li>• خاندان کی تکوین</li> <li>• حق مہر</li> <li>• رضاعت و حمل</li> <li>• اولاد کو قتل کرنے کے ممانعت</li> <li>• شوہر کی نافرمانی</li> <li>• طلاق</li> <li>• بیوہ کی عدت کے احکام</li> <li>• نکاح کا پیغام بھیجنا</li> <li>• عورت کی وراثت (اس کے شوہر کی طرف سے)</li> <li>• والدین کے حقوق</li> <li>• بیویوں اور اولاد کے بیچ عداوت</li> <li>• خاندان کے حقوق ○</li> <li>• مہمان کی عزت</li> <li>• اجازت طلب کرنے کے اصول</li> <li>• مجلس کے آداب</li> <li>• تعاون اور بھائی چارہ</li> <li>• گروہ بندی</li> <li>• محبت</li> <li>• لوگوں کے درمیان صلح</li> <li>• عفو و درگزر، غصہ پر قابو اور معاف کرنا</li> <li>• شعوب و قبائل</li> <li>• لوگوں کے بیچ اختلافات</li> <li>• حمایت و نگہبانی</li> </ul>
Grammar:	<ul style="list-style-type: none"> <li>• قرآنی عربی گرامر کے اصول اور انکے اطلاقات (متن قرآنی پر اطلاق سے توضیحات)</li> </ul>
Details of	<ul style="list-style-type: none"> <li>▪ منتخب آیات مع ترجمہ و تجوید</li> </ul>



The main aim of this course is to provide the basic knowledge and background about Pakistan's Agriculture. Basic Agriculture is a graduate-level course which gives the students a basic knowledge of agriculture/ It will enable the students to understand the basic terminologies of agriculture, its different branches, allied disciplines, salient features of Pakistan's agriculture including climate, land resources etc. as well as the problems of Pakistan agriculture. Basic knowledge about agricultural inputs such as seed, fertilizer, irrigation etc. will be communicated. Crop growth related problems like weeds, insect pests will be elaborated. The students will be able to understand the conventional and international system of land measurement. The knowledge of post-harvest technology is also shared with the students.

### **Contents**

#### **Theory**

1. Agriculture, history, importance, branches and allied sciences.
2. Salient features of Pakistan's agriculture.
3. Climate, land and water resources.
4. Tillage: objectives and types.
5. Seed: types and quality.
6. Crop nutrients, manures and fertilizers, sources and methods of application.
7. Irrigation: systems, types and management.
8. Harvesting, processing, storage and marketing of farm produce.

#### **Practical**

1. Land measuring units.
2. Demonstration of hand tools and tillage implements.
3. Identification of meteorological instruments.
4. Identification of crop plants, weeds and seeds.
5. Identification of organic and inorganic fertilizers.
6. Calculation of nutrient-cum-fertilizer unit value.
7. Demonstration of various irrigation methods.
8. Field visits.

#### **Recommended Texts**

1. Bashir, E. and Bantel, R. (2001), *Soil Science*, Islamabad, National Book Foundation.
2. Brady, N.C. and Weil, R.R. (2013). *Elements of the Nature and Properties of Soils*, 3rd Ed. Upper Saddle River, NJ, USA, Pearson Education.

#### **Suggested Readings**

1. Hillel, D. (2008). *Soil in the Environment: Crucible of Terrestrial Life*. Burlington, MA, USA, Elsevier Inc.
2. Safdar, M.E., Javaid, M.M., Tanveer, A., Ali, H.H. and Kamran, M. (2019). *Innovation in Agronomic Concepts*. Higher Education Commission, Islamabad.
3. Das, D.K. (2011). *Introductory Soil Science* (3<sup>rd</sup> ed.). New Delhi-110002, India, Kalyani Publ.

**Introduction**

A forest is an ecological system (or biotic community) dominated by trees. Ecology is the study of ecological systems and the mutual interactions between organisms and the environment. The primary objective of forest ecology is to understand what controls the patterns of distribution and abundance of different organisms in forests of the world. The relevance of forest ecology to understanding biodiversity lies in the observations that forests dominate the natural landscape over much of the world and that forests harbor a large proportion of the world's species. Moreover, because forests are valuable to humans for the products and services that they provide – especially wood – many forest ecosystems are extensively manipulated and modified by human societies, often disrupting the natural ecological patterns.

**Course Learning Objectives**

1. Have comprehensive knowledge about forest ecology and silviculture
2. Know about ecological establishment of various multipurpose trees
3. Understand the application of different silvicultural operations
4. Get basic know how about various silvicultural systems being practiced in different forest types of Pakistan

**Contents**

1. Introduction to Forest Ecology, Definition, importance, need, scope and application of Forest Ecology.
2. Ecological Factors and their significance Soil, Water, temperature, light, atmospheric, topographic and biotic factors.
3. World eco-regions.
4. Distribution, significance and Management of Forest types of Pakistan.
5. Development of Forest Vegetation
6. Dynamics of forest formation, colonization, migration, ecesis, aggregation and competition. Plant succession causes, phases and kinds of succession. Climax, pre-climax, subclimax
7. Vegetation Structure
8. Ecosystem, Classification of plant communities, formation, association, associates, consociation, horizontal and vertical zonation of vegetation.
9. Application of Forest ecology/Modern concepts
10. Application of Forest Ecology in Watershed, Range Management, Geology and Soil Science etc, climate change, biodiversity, global warming

**Recommended Texts**

1. Begon, M.; C.R. Townsend, J.L. Harper. (2006.) *Ecology. From individuals to ecosystems. (4th ed.)*
2. Smith, R.; R.M. Smith. (2000.) *Ecology and Field Biology. (6th ed.)*

**Suggested Readings**

1. Odum, E. P. (1977.) *The emergence of ecology as a new integrative discipline.*
2. Syed Sadruddin H. *Pakistan Manual of Plant Ecology*

## Introduction

The basic objective of this course 'Forest Entomology' is to provide the concepts regarding forest ecosystem entomology. Students will learn about the basic concepts of forest ecosystem, its functioning and important components and factors affecting forest ecosystems. Moreover, this course teaches students about the biology, ecology, damage potential and control practices recommend against some basic major insect pests of forest trees and forest nursery management strategies. Students will be able to understand basic steps and plans for proper integrated pest management of forest nurseries.

## Course Learning Objectives

1. Recognize and classify various forest insects and their life cycles
2. Describe the ecological roles of insects in forest ecosystems
3. Evaluate the types and extent of damage caused by forest insects to trees and forested landscapes
4. Develop and apply integrated pest management (IPM) strategies for controlling forest insect populations, including biological, chemical, and cultural control methods.

## Contents

### Theory

- 1 Importance of entomology in rangeland and forest ecosystems
- 2 Major insect/pests of grasses and forest/woody trees
- 3 Lawn insects, their identification, distribution
- 4 Host plants, biology, nature of damage
- 5 Estimation of losses and management
- 6 Pests of wood and their control
- 7 Biocontrol of pests and integrated pest management

### Practical

- 1 Survey and collection
- 2 Preservation and identification of insect pests of range and forest trees
- 3 Study of nature of damage and demonstration of control measure
- 4 Field visits to pest hotspots in forests (optional/as per occurrence)

## Recommended Texts

1. Barbose, P. & Wagner, M.B. (1989). *Introduction to Forest and Shade Tree Insects*. London, UK: Academic Press.
2. Dajoz, R. (2000). *Insects and Forests*. UK: Intercept Ltd.

## Suggested Readings

1. Hashmi, A. A. (1994). *Insect Pest Management, Horticultural and Forest Crops* (Vol. 2). Islamabad: Pakistan Agricultural Research Council, Islamabad.
2. Jha, K. (2003). *Forest Entomology*. India: Ashish Publishing House.
3. Knight, F.B. & Heeiknen, H.J. (1980). *Principles of Forest Entomology*. New York: McGraw Hill, Book Co.

**Introduction**

To understand diseases, student must learn the essentials about fungi, bacteria, viruses, and higher plants that cause disease. There must be information of names of pathogens, specialized terminology of mycology and pathology also. The student must realize that most forest disease problems result from a complex interaction of pathogen, tree, and environment. Usually control must be attained by such practices as selecting the proper tree for each site and regulating density rather than by the use of fungicides or other direct controls. This explains why ecology plays such a vital role in forest pathology and is always stressed. The course will cover in detail identification and etiology of forest disease. Taxonomy of forest diseases will also be discussed. Forest decline diseases including shisham decline, citrus decline, guava decline and mango decline will also be covered. Role of molecular biology and biotechnology to manage forest diseases will also be discussed in detail in this course.

**Course Learning Objectives**

1. Understand the basic concept of range and forest disease problems
2. Categorize the different types of important forest diseases
3. Know about the forest disease distribution according to pathogen types
4. Formulate the management approaches for forest diseases

**Contents***Theory*

1. Introduction and importance of pathology for forests
2. Identification and etiology of forest disease. Taxonomy of forest diseases.
3. Disease causing agents i.e., organisms in forests
4. Prevention strategy for forest disease (casual organisms)
5. Use of biotechnology in management of forest disease.

*Practical*

1. Identification, collection of diseased specimens from forest trees. Isolation and purification of fungi from diseased specimen. Preparation of slides. Field visits and study tour.

**Recommended Texts**

1. Sharma, M. (2018). *Basic Plant Pathology*. India, CBS Publishers & Distributors.
2. Bhutta, A.R. (2010). *Text book of Introductory Seed Pathology*. Islamabad, HEC.
3. Manion, P.D. (1991). *Tree Disease Concepts* (2<sup>nd</sup> ed.). USA, Prentice Hall.

**Suggested Readings**

1. Matteo, G., & Paolo, G. (2018). *Forest Pathology and Plant Health*. Switzerland, MPDI.
2. Sharma, R.C., & Sharma, G.N. (2006). *Challenging Problems in Horticultural and Forest Pathology*. India, Indus Publishing Company.
3. Sharma, V.K. (2004). *Trees and Protection of Environment*. India, Deep and Deep Publication.

**Introduction**

Study tour of Pakistan Forest Types will be arranged to impart practical knowledge about various forest types found in Punjab and other province; How these forests are managed, their layout, mode of irrigation, different silvicultural operations carried out in these forests at different stages, various silvicultural systems being followed and felling operation used in these forests will be practically demonstrated to the students.

**Course Learning Objectives**

1. Describe the Forest Types of Pakistan
2. Discuss about various trees species, herbs, shrubs and trees found in different forest types and rangelands, management of forests and rangelands

*Orientation tour (s) for practical observation of following forest types*

1. Irrigated plantations
2. Tropical thorn forests
3. Linear plantations
4. Sub-tropical broad leaved evergreen scrub forests
5. Sub-tropical chirpine forests
6. Himalayan moist temperate forests
7. Himalayan dry temperate forests
8. Sub-alpine forests

## SEMESTER-IV

URCG-5115

The Science of Global Challenges

3 (2-1)

Around ourselves is largely owed to the advancement in scientific knowledge that has enabled us to harness Nature's resources in a multitude of ways. This progress however has come at a great cost, including a threat to our own existence. Through this course, we will discuss some of the core challenges mankind is facing, the scientific reasoning behind all these challenges and the actions that must be taken to create a future free of these problems. The three main areas we will focus on include Climate Change, The Energy Crisis and the survival of humanity in the wake of deadly viruses and infectious diseases. Towards the end the students will get to see the complex relationship between Science, Technology and our Society and some future directions that promise a safer future for all of us.

### *Contents*

**Climate Change** i.e., Global Warming, Natural and Anthropogenic Activities and their impact; **Energy** i.e., Renewable and non-renewable energy resources; **Water Security** i.e., water scarcity and waste water treatment; **Land Degradation** i.e., salinity, water logging, deforestation, land erosion; **Food Security** and roll of Biotechnology in food production; **Global Health Pandemics** i.e., Infectious diseases, vaccine, development of drug discovery for newly explored diseases

### *Practical*

- 1: Preparation of standard solution and their standardizations
- 2: Soil and Water Analysis

### *Recommended Text*

Usman, M. (2022). *Science of Global Challenges*. Ilmi Kitab Khana, Lahore

### *Suggested Readings*

1. Thieman, W.J. & Palladino, M.A. (2014). Introduction to biotechnology. Edinburgh Gate UK: Pearson Education Limited.
2. Daugherty, E. (2012). Biotechnology: Science for the New Millennium, 1st Edition, Revised, USA: Paradigm Publication.
3. Karaduman, I. C. (Ed.) (2014) Global Challenges for the world. Obroonnosc. Zeszytl Naukowe. Turkey

This course addresses the unique entrepreneurial experience of conceiving, evaluating, creating, managing, and potentially selling a business idea. The goal is to provide a solid background with practical application of important concepts applicable to the entrepreneurial environment. Entrepreneurial discussions regarding the key business areas of finance, accounting, marketing and management include the creative aspects of entrepreneurship. The course relies on classroom discussion, participation, the creation of a feasibility plan, and building a business plan to develop a comprehensive strategy for launching and managing a new venture.

### Course Learning Objectives

1. To enhance the 'entrepreneurial intentions' of the students by improving their natural willingness to start a business.
2. To understand the process of entrepreneurship and learn the ways to manage it by working individually in the class and in the form of groups outside the class to conduct field assignments.
3. To educate the students about the practical underpinnings of the entrepreneurship with the aid of practical assignments and idea pitching.

### Contents

1. **Background:** What is an Organization, Organizational Resources, Management Functions, Kinds of Managers, Mintzberg's Managerial Roles.
2. **Forms of Business Ownership:** The Sole proprietorship, Partnership, Joint Stock Company
3. **Entrepreneurship:** The World of the Entrepreneur, what is an entrepreneur? The Benefits of Entrepreneurship, The Potential Drawbacks of Entrepreneurship, Behind the Boom: Feeding the Entrepreneurial Fire.
4. **The Challenges of Entrepreneurship:** The Cultural Diversity in Entrepreneurship, The Power of "Small" Business, Putting Failure into Perspective, The Ten Deadly Mistakes of Entrepreneurship, How to Avoid the Pitfalls, Idea Discussions & Selection of student Projects, Islamic Ethics of Entrepreneurship.
5. **Inside the Entrepreneurial Mind:** From Ideas to Reality: Creativity, Innovation, and Entrepreneurship, Creativity – Essential to Survival, Creative Thinking, Barriers to Creativity, How to Enhance Creativity, The Creative Process, Techniques for Improving the Creative Process, Protecting Your Ideas, Idea Discussions & Selection of student Projects.
6. **Products and technology, identification opportunities**
7. **Designing a Competitive Business Model and Building a Solid Strategic Plan:** Building a strategic plan, Building a Competitive Advantage, The Strategic Management Process, Formulate strategic options and select the appropriate strategies, Discussion about execution of Students' Project.
8. **Conducting a Feasibility Analysis and Crafting a Winning Business Plan:** Conducting a Feasibility Analysis, Industry and market feasibility, Porter's five forces model, Financial feasibility analysis. Why Develop a Business Plan, The Elements of a Business Plan, What Lenders and Investors Look for in a Business Plan, Making the Business Plan Presentation.
9. **Building a Powerful Marketing Plan:** Building a Guerrilla Marketing Plan, Pinpointing the Target Market, Determining Customer Needs and Wants Through Market Research. Plotting a Guerrilla Marketing Strategy: How to Build a Competitive Edge, Feed Back & Suggestions on Student Project, Islamic Ethics for Entrepreneurial Marketing
10. **E-Commerce and the Entrepreneur:** Factors to Consider before Launching into E-Commerce, Ten Myths of E-Commerce, Strategies for E-Success, Designing a Killer Web

Site, Tracking Web Results, Ensuring Web Privacy and Security, Feed Back & Suggestions on Student Project.

11. **Pricing Strategies:** Three Potent Forces: Image, Competition, and Value, Pricing Strategies and Tactics, Pricing Strategies and Methods for Retailers, The Impact of Credit on Pricing
12. **Attracting Venture Capitalist:** Projected Financial Statements, Basic Financial Statements, Ratio Analysis, Interpreting Business Ratios, Breakeven Analysis, Feed Back & Suggestions on Student Project,
13. **Idea Pitching:** Formal presentation, 5-minutes pitch, funding negotiation and launching.

***Recommended Texts:***

1. Scarborough, N. M. (2011). *Essentials of entrepreneurship and small business management*. Publishing as Prentice Hall, One Lake Street, Upper Saddle River, New Jersey 07458..

***Suggested Readings:***

1. Burstiner, I. (1989). *Small business handbook*. Prentice Hall Press.

**Course Description:**

The Civics and Community Engagement course is designed to provide students with an understanding of the importance of civic participation, culture and cultural diversity, basic foundations of citizenship, group identities and the role of individuals in creating positive change within their communities. The course aims at developing students' knowledge, skills and attitudes necessary for active and responsible citizenship.

**Learning outcomes**

After completing this course, students will be able to

- Understand the concepts of civic engagement, community development, and social responsibility.
- Understand rights and responsibilities of citizenship
- Understand cultural diversity in local and global context
- Analyze the significance of civic participation in promoting social justice, equity, and democracy.
- Examine the historical and contemporary examples of successful civic and community engagement initiatives.
- Identify and assess community needs, assets, and challenges to develop effective strategies for community improvement.
- Explore the ethical implications and dilemmas associated with civic and community engagement.
- Develop practical skills for effective community organizing, advocacy, and leadership.
- Foster intercultural competence and respect for diversity in community engagement efforts.
- Collaborate with community organizations, stakeholders, and fellow students to design and implement community-based projects.
- Reflect on personal growth and learning through self-assessment and critical analysis of community engagement experiences.

**Contents****Introduction to Civics & Community Engagement**

- Overview of the course: Civics & Community Engagement
- Definition and importance of civics
- Key concepts in civics: citizenship, democracy, governance, and the rule of law
- Rights and responsibilities of citizens

**Citizenship and Community Engagement**

- Introduction to Active Citizenship: Overview of the Ideas, Concepts, Philosophy and Skills
- Approaches and Methodology for Active Citizenship

**Identity, Culture, and Social Harmony**

- Concept and Development of Identity, Group identities
- Components of Culture, Cultural pluralism, Multiculturalism, Cultural Ethnocentrism, Cultural relativism, Understanding cultural diversity, Globalization and Culture, Social Harmony,
- Religious Diversity (Understanding and affirmation of similarities & differences)
- Understanding Socio-Political Polarization
- Minorities, Social Inclusion, Affirmative actions

**Multi-cultural society and inter-cultural dialogue**

- Inter-cultural dialogue (bridging the differences, promoting harmony)

- Promoting intergroup contact/ Dialogue
- Significance of diversity and its impact
- Importance and domains of Inter-cultural dialogue
- Active Citizen: Locally Active, Globally Connected
  - Importance of active citizenship at national and global level
  - Understanding community
  - Identification of resources (human, natural and others)
  - Utilization of resources for development (community participation)
  - Strategic planning, for development (community linkages and mobilization)
- Human rights, constitutionalism and citizens' responsibilities
  - Introduction to Human Rights
  - Human rights in constitution of Pakistan
  - Public duties and responsibilities
  - Constitutionalism and democratic process
- Social Institutions, Social Groups, Formal Organizations and Bureaucracy
  - Types of Groups, Group identities, Organizations
  - Bureaucracy, Weber's model of Bureaucracy
  - Role of political parties, interest groups, and non-governmental organizations
- Civic Engagement Strategies
  - Grassroots organizing and community mobilization
  - Advocacy and lobbying for policy change
  - Volunteerism and service-learning opportunities
- Social issues/Problems of Pakistan
  - Overview of major social issues of Pakistani society
- Social Action Project

***Recommended Text:***

1. Kennedy, J. K., & Brunold, A. (2016). Regional context and Citizenship education in Asia and Europe. New York: Routledge, Falmer.
2. Henslin, James M. (2018). Essentials of Sociology: A Down to Earth Approach (13<sup>th</sup> ed.). New York: Pearson Education
3. Macionis, J. J., & Gerber, M.L. (2020). Sociology. New York: Pearson Education

***Suggested Readings:***

1. Glencoe McGraw-Hill. (n.d.). Civics Today: Citizenship, Economics, and Youth.
2. Magleby, D. B., Light, P. C., & Nemacheck, C. L. (2020). Government by the People (16th ed.). Pearson.
3. Sirianni, C., & Friedland, L. (2005). The Civic Renewal Movement: Community-Building and Democracy in the United States. Kettering Foundation Press.
4. Bloemraad, I. (2006). Becoming a Citizen: Incorporating Immigrants and Refugees in the United States and Canada. University of California Press.
5. Kuyek, J. (2007). Community Organizing: Theory and Practice. Fernwood Publishing.
6. DeKieffer, D. E. (2010). The Citizen's Guide to Lobbying Congress. TheCapitol.Net.
7. Rybacki, K. C., & Rybacki, D. J. (2021). Advocacy and Opposition: An Introduction to Argumentation (8th ed.). Routledge.
8. Kretzmann, J. P., & McKnight, J. L. (1993). Building Communities from the Inside Out: A Path Towards Finding and Mobilizing a Community's Assets. ACTA Publications.
9. Patterson, T. E. (2005). Engaging the Public: How Government and the Media Can Reinvent American Democracy. Oxford University Press.

Semester level	In some discipline 5 <sup>th</sup> Semester and in some discipline 6 <sup>th</sup> Semester, BS (5 <sup>th</sup> Semester make)
Objectives	<ul style="list-style-type: none"> <li>To introduce ethics and highlight its importance, need and relevance for individual and collective life.</li> <li>To illuminate the students with the Quranic norms of Morality i.e. truthfulness, patience, gratitude, modesty, forgiving, hospitality etc.</li> <li>To familiarize the students with immoral values like falsify, arrogance, immodesty, extravagance, backbiting etc.</li> <li>To inculcate ethical and moral values in our youth.</li> <li>To develop a balanced dynamic and wholesome personality.</li> <li>To introduce the students to Quranic Arabic grammar in practical manner.</li> </ul>
Course Contents:	<p>○ اخلاق (تعارف، ضرورت و اہمیت، اقسام، معنویت)</p> <p>اخلاق حسنہ :</p> <ul style="list-style-type: none"> <li>برائی کو نیکی سے مٹانا</li> <li>نیکی کے کاموں میں مسابقت</li> <li>لوگوں کے درمیان صلح</li> <li>عدل و انصاف</li> <li>سچائی</li> <li>ایثار</li> <li>سلیم قلب</li> <li>مہمان نوازی</li> <li>لغویات سے اعراض</li> <li>عاجزی و انکساری</li> <li>نگاہ اور آواز کو پست رکھنا</li> <li>چال میں میانہ روی</li> <li>شرمگاہوں کی حفاظت</li> <li>صبر</li> <li>شکر</li> <li>امور میں میانہ روی</li> </ul> <p>اخلاق سنیہ :</p> <ul style="list-style-type: none"> <li>ظلم اور زیادتی</li> <li>غرور و تکبر</li> <li>نفسانی خواہشات کی پیروی</li> <li>بدگمانی</li> <li>جھوٹ</li> <li>چغلی اور تہمت</li> <li>تمسخر اور شیخی خوری</li> <li>لہو و لعب</li> <li>برے ناموں سے پکارنا</li> <li>احسان جتانا اور تکلیف دینا</li> <li>فضول خرچی اور حد سے بڑھنا</li> <li>حسد اور تنگ دل</li> <li>بے پردگی</li> </ul>
Grammar:	<ul style="list-style-type: none"> <li>قرآنی عربی گرامر کے اصول اور انکے اطلاقات (متن قرآنی پر اطلاق سے توضیحات)</li> </ul>
Details of Chapters and	<ul style="list-style-type: none"> <li>منتخب آیات مع ترجمہ و تجوید</li> <li>البقرہ (۱۱۲، ۲۳۵، ۸۳، ۱۸۲، ۱۶۲، ۱۵۲، ۱۶۲، ۵۲، ۱۵۳، ۱۶۶، ۲۵۰، ۱۲۵)</li> </ul>



**Introduction**

This subject will provide a broad understanding of functional tree biology. Modern forest science, ecology and management relies on tools and models based on functional parameters of trees, e.g., forest growth modeling, estimating water use by forests, assessing risks by environmental extremes, quantifying carbon sequestration by forests.

**Course Learning Objectives**

1. Identify and describe the main parts of plants
2. Explain the basic functions of each plant part
3. Describe the stages of plant growth and development
4. Understand the processes of photosynthesis, nutrients uptake and water transport in plants.

**Contents***Theory*

1. Fundamental processes of tree life and primary production - photosynthesis, respiration, nutrition
2. Water relations and water use of trees
3. Primary and secondary metabolism of trees
4. Principles of tree-environment interactions (ecophysiology)
5. Strategies used by trees to withstand adverse environmental conditions (stress physiology)
6. The structure of trees in relation to associated functional aspects (growth, wood formation, water and nutrient uptake, environmental interactions)
7. Overview of methods to measure the life functions of trees

*Practical*

1. Measurement of Photosynthesis, Stomata conductance, Leaf water potential, Transpiration Ascent of sap,
2. Study of Anatomy of leaves, stems and root.

**Recommended Texts**

1. Sinha, S., S. Manisha and S. Ranjana. 2005. A text book of Environmental Studies. AITBS Publishers. India
2. Robert, M. D. 1999. Plant Physiology. Van Nostrand Reinhold Company. Melbourne Australia.

**Suggested Readings**

1. Dutta, A.C. 2006. A Class Book of Botany. 20<sup>th</sup> Edition. Satribari Road, Gauhati, Assam India

**Introduction**

The main objective of this course is to introduce the students with the basic concepts of rangelands, its importance and management. This course is important in the context of cultural and socioeconomic aspects of Pakistan as it is directly related to the livestock industry of the country, which over the years has emerged as the largest sub-sector in agriculture. It is a source of foreign exchange earnings and contributes about 3.1 percent in total exports. More than 8 million rural families are engaged in livestock production and deriving more than 35-40 percent of their income from this sector. Range lands play a crucial role for strengthening this sector.

**Course Learning Objectives**

1. To identify the range vegetation types, their preservation and quantitative analysis.
2. To use various instruments used for range vegetation analysis
3. Learn about the important features of rangelands of the country and their management requirement according to their ecological needs.

**Contents***Theory*

- 1 Introduction and importance of Rangeland and Range resources of Pakistan
- 2 Principles of range management; proper stocking, distribution and season of grazing
- 3 Grazing effects on plant morphology and physiology.
- 4 Range vegetation analysis.
- 5 Basic terminology and Concepts; Animal Unit, Animal Unit Month, Range Frequency, etc.
- 6 Estimation of carrying capacity, range condition, range trend and range utilization.
- 7 Grazing Systems of the world, integrated range land management.
- 8 Range Improvement Techniques: Importance of range improvement. Artificial reseeding. Site selection. Seeding methods. Calculation of seed rate for artificial reseeding.

*Practical*

- 1 Introduction to use of instruments for range vegetation analysis.
- 2 Identification of range plants.
- 3 Germination tests.
- 4 Estimation of carrying capacity, cover, frequency, density, range condition and range utilization.
- 5 Visit to selected range areas and compilation of reports.

**Recommended Texts**

1. Holechek, J. L., Pieper, R. & Herbal, C. H. (2011). *Range management principles and practices*. New Jersey: Prentice Hall.
2. Quraishi, M. A. A., Khan, G. S. and Yaqoob, M. S. (1993). *Range management in Pakistan*. Faisalabad: University of Agriculture.

**Suggested Readings**

1. Vallentine, J. F. (2000). *Grazing management*. Academic Press. Elsevier Science & Technology Books.
2. Mohammad, N. (1989). *Rangeland management in Pakistan*. Islamabad: NARC. ICIMOD.

**Introduction**

This course is designed to introduce students to the fundamental concepts of forest genetics and its vital role in forestry. Students will explore the principles behind species selection and the application of quantitative genetics for forest improvement. The course will cover a range of traditional and innovative tree breeding strategies, equipping students with the knowledge needed to understand how genetic principles can enhance forest productivity and sustainability. By the end of the course, students will gain a deeper appreciation of how forest genetics contributes to the health and efficiency of forest ecosystems.

**Course Learning Objectives**

1. Discuss the concept of forest genetics and biotechnology
2. Educate the principles underlying choice of species, role of quantitative genetics in forest improvement.
3. Explain conventional and non-conventional tree breeding strategies
4. Highlight the role of forest genetics in forest productivity

**Contents**

Chromosome cytology, Cell biology, Cell structure and functions, DNA structure and function, RNA structure and function, Genes Mutation, Chromosome theory, Hereditary material, Mutations, Chromosomal aberrations, DNA structure and functions, Mendelian genetics, Modern genetics, Molecular evolution, Genetic engineering, Population genetics; Hardy-Weinberg Law, Qualitative genetics, Quantitative genetics, Tree biology and sexual structure, Genetic manipulation of tree species.

**Recommended Texts**

1. Abdullah, S.N.A., H. Chai-Ling and C. Wagstaff. 2017. Crop Improvement Springer International Publishing, Switzerland.
2. Finkeldey, R. and H.H. Hattermer. 2007. Tropical Forest Genetics, Springer-Verlag Berlin Heidelberg, Germany.

**Suggested Readings**

1. Parthiban K. T., N. Krishnakumar, and P.S. Devanand. 2020. Tree Breeding and Improvement Theory and Technology. Scientific Publishers India.
2. Ramawat, K.G., J.M. Mérillon and M.R. Ahuja. 2014. Tree Biotechnology CRC Press Taylor and Francis, USA.
3. Shelbourne, C. J. A. and M. Carson. 2019. Tree Breeding and Genetics in New Zealand. Springer Nature Switzerland

**Introduction**

This course is designed to provide students with a comprehensive understanding of how forestry practices and knowledge are effectively communicated to landowners, communities, and stakeholders. Students will explore the principles and methods of forestry extension, focusing on strategies to disseminate information, promote sustainable forest management, and support forest-related decision-making. By integrating practical communication skills with a deep understanding of forestry issues, this course aims to prepare students to play a crucial role in advancing forestry practices and fostering community engagement.

**Course Learning Objectives**

1. Demonstrate an understanding on the concept and significance of forestry extension in increasing forest cover.
2. Describe objectives of forestry extension.
3. Explain methods and tools used for forest extension.
4. Analyze forest policy and forestry extension Programs in Pakistan

**Contents***Theory*

1. Forestry Extension: importance, role in increasing forest productivity, philosophy/principles
2. of extension education
3. Objectives of forestry extension Means and tools of forestry extension.
4. ICTs in forestry extension
5. Planning forest extension programs
6. Extension teaching methods: individual, group and mass contact methods;
7. The adoption and diffusion of agricultural innovations;
8. Forest policy and forestry extension Programs in Pakistan
9. Evaluation and monitoring of Forestry extension Programs

**Recommended Text**

1. Collingwood, G.H. 2017. Farm-Forestry Extension: Early Development, and Status in 1923 (Classic Reprint). Fb and C. Limited.
2. Fernandaz, C.C., Sudhagar, R.J., Balasubramaniam, P. and Sekar, I. 2021. A Textbook on Forestry Extension. Agrobios
3. Jha, L.K. and P.S. Sarma. 2008. A Manual of Forestry Extension Education: APH Publishing

**Suggested Readings**

1. Pete, B., K. Boston and D. L. Grebner. 2017. Forest Management and Planning. 2nd Ed . Academic Press. Elsevier International.

## SEMESTER V

FRST-6714

Forest Surveying and Levelling

3(2-1)

### **Introduction**

This course is designed to equip students with essential skills and knowledge for conducting accurate forest surveys and levelling operations. Students will learn about various techniques and tools used to measure and map forest landscapes, assess forest resources, and plan for sustainable management. By combining theoretical understanding with practical applications, this course aims to prepare students to perform precise forest surveys, interpret data effectively, and contribute to informed decision-making in forest management and conservation.

### **Course Learning objectives**

1. Impart basic knowledge to the forestry students of surveying and civil engineering related work i.e., building and road construction.
2. Describe the fundamental principles of forest surveying and levelling, including measurement techniques and data interpretation.
3. Demonstrate proficiency in using various surveying instruments and tools

### **Contents**

#### *Theory*

1. Principles and classification of survey.
2. Scales and their classification.
3. Triangulation Survey: Use of survey instruments. Adjustment of chain/measuring tape. Selection of base line and formation of best and well-conditioned triangles in the field. Offsetting and its classification. Area calculation through triangulation. Use of GPS and its application for area calculation. Data recording in Field Book and plotting of survey.
4. Traverse Survey: Use of Prismatic and Surveyor's compasses for taking Reduced and Whole circle bearings for an open and closed traverse. Calculation of angles from bearings. Magnetic declination and Dip. Effect of local attraction on bearings. Plotting of Traverse and distribution of closing error.
5. Plane Table Survey: Instruments and their use. Various methods of Plane Tabling. Methods of locating contour lines in the field through direct and indirect methods. Plotting of contours on ground and on sheet. Leveling: Bench marks and their classification, Leveling instruments: dumpy level. Automatic Level, Theodolite, Leveling staff and its reading.
6. Methods of leveling: simple, compound, flying and reciprocal leveling. Level book and its recording. Profile and Cross-section leveling and their plotting for a forest road.
7. Areas and Volumes: Calculation of areas and volume by various methods.
8. Use of Minor Instruments: Use of Abney level, hand level, tangent clinometers, spirit level, proportional compass, and planimeter,

#### *Practical*

Practice in: Chain Survey. Compass survey. Plane table survey. Longitudinal and cross sections of road. Survey drawings: At least four survey drawings of the above exercises will be prepared by each student of which one will be in ink and colour. Practical exercises in road alignment.

***Recommended Text***

1. Barry, F., S. J. Kavanagh and G. Bird. 2000. Surveying: Principles and Applications.
2. Paul, A. Z. 1997. Surveying Principles for Civil Engineers.

***Suggested Readings***

1. Kanetkar. 1956. Surveying and leveling, Part I & II A.V. Griber, Prakashan, Pona-2, India.
2. The Punjab Govt. (1955). Rasul Manual for subordinate Engineers, Surveying Part. I Sub-Engineers, Govt. Printing Press, Punjab.

**Introduction**

The basic objective of this undergraduate course is to give the concept of raising single tree and tree populations in the concrete urbanized setting for the amelioration of urban climates. This course will enable the students to understand the need and importance of planting trees in the congested and crowded urban environment and to know the critical role trees play in the urban infrastructure infested with carbon emission from traffic and industrial exhausts. Students will learn the urban planning strategy, designing options, selection of tree species to be planted and their silvicultural and management requirements. Moreover, the course will provide comprehensive learning opportunities on benefits of urban forestry ranging from the beautification of the landscape, regulation of the ecosystem processes, physical and mental health of burgeoning urban population to the improvement of socio-economic value of property and provision of cultural services to the urban community.

**Course Learning Objectives**

1. Understand the importance of urban forestry
2. Guide the students about urban forestry benefits
3. Help the local community and foresters in promoting urban forestry
4. Guide the farmers to select suitable tree-crop combinations in peri-urban for productivity enhancement and environmental amelioration.

**Contents***Theory*

1. Introduction to landscaping, history of landscaping, concept and principles of landscaping
2. Aesthetic component of landscape design, forestry aesthetics, soft and hard landscaping
3. Introduction to urban forestry, definitions, basic concepts and objectives
4. Urban forestry practices, need and importance of urban forests in Pakistan
5. Compatibility of trees with urban ecosystem, quantification of urban forestry services
6. Ecological and environmental considerations, energy conservation by urban forests
7. Distinctive features of urban and peri-urban forests, constraints and challenges to urban forestry
8. Various types of urban forests, classification of urban forestry trees of Pakistan
9. Principles of urban forestry and landscape designing (factors affecting establishment and management of urban forests)

*Practical*

1. Designing a comprehensive landscape design by hand using basic principle
2. Learn beginners' skills of using designing software for landscaping
3. Make a plan for establishment of urban plantations
4. Preparing plan for selected areas; Planting methods, cultural operations, tending operations and protection measures for urban forestry trees
5. Afforestation techniques for urban and peri urban areas; Integration of Miyawaki forest establishment techniques
6. Visit to various urban forest parks and Miawaki forests, Visit to various urban afforestation projects.

### **Recommended Texts**

1. Pearlmutter, D., C. Calfapietra, R. Samson, L. O'Brien, O.S Krajter, S., G, Sanesi, and A. R. Alonso del. 2017. *The Urban Forest: Cultivating Green Infrastructure for People and the Environment*, Springer International.
2. Siddiqui, M.T. and M.F. Nawaz. 2017. *Text Book of Applied Forestry*. University of Agriculture Faisalabad. available online at the link: <http://onlinebooks.uaf.edu.pk/BookDetails.aspx?BookId=17>
3. Milner, H. E. (2016). *The art and practice of landscape gardening*. Cambridge University Press.

### **Suggested Readings**

1. Root, R. R., & Kelley, C. F. (2016). *Design in landscape gardening*. Ulan Press. USA.
2. Grebner, D.L., P. Bettinger, J.P. Siry, and K. Boston. 2021. *Introduction to Forestry and Natural Resources*. Academic Press International. USA.
3. Hussain S. S. 2020. *Pakistan Manual of Plant Ecology*. National Book Foundation, Islamabad.
4. Pancel, L. and M. Kohl. 2018. *Tropical Forestry Handbook*. Springer International.

**Introduction**

This is the core subject for graduate level forestry students. The course is particularly designed for developing the understanding of young foresters with the basic terminology and concepts of growing, protecting and harvesting of forest resources of Pakistan. Silviculture deals with development and growth of forests and trees. The knowledge of silviculture enables the students to understand the specific natural factors that act upon the individual trees and the whole forest stand. The course teaches the students the basic knowledge of forestry operations leading to the production of sound future forest managers of the country as per prevailing situation and resources.

**Course Learning Objectives**

1. Manage the species-specific forest crops according to their ecological and Silvicultural requirements.
2. Decide which silvicultural system is best suited to which species under given environmental conditions for its better production and management on sustainable basis.

**Contents**

- 1 Silviculture, role of silviculture in forest resource management.
- 2 Tree morphology including development, types and concepts related to roots, stem, crown.
- 3 Concept of forest, classification, major divisions of the world's forest. Forest types of Pakistan
- 4 Crop morphology, forest composition, stand structure and tree classification, pure, mixed stands, even, and un-even aged forest stands their characters and development, advantages and disadvantages.
- 5 Tree reproduction: flowering habit of trees, maturity in trees, seed periodicity, factors influencing periodicity, flower initiation and cone development in conifers, flowering in deciduous trees, induced seeding.
- 6 Forest site: soil formation, soil profile, site quality and its evaluation. Stand density and Stocking: methods for determining stand density.

**Recommended Texts**

1. Sheikh, M. I. (1999). *Forests and forestry in Pakistan*. Urdu Bazar, Lahore: A-One Publishers.
2. Champion, H. G., Seth, S. K. & Khattak, G. M. (1965). *Forest types of Pakistan*. Peshawar: Pakistan Forest Institute.

**Suggested Readings**

1. Champion, H. G., Seth, S. K. & Khattak, G. M. (1965). *Manual of silviculture for Pakistan*. Peshawar: Pakistan Forest Institute.
2. Daniel, T. W., Helms, J. A. & Baker, F. S. (1979). *Principles of silviculture* (2<sup>nd</sup> ed.). New York: McGraw-Hill Book Company.

## Introduction

Watershed management is closely related to forest management as the selection and implementation of different forestry practices play a crucial role in it. Students will learn the different biological and engineering approaches to control and regulate the water flow and to reduce the sedimentation of the streams and lakes fed by this water. Study of this course will clarify the close relationship between soil and water conservation and practical possibilities of vegetation management for better water yield.

## Course Learning Objectives

1. Develop the understanding of watershed areas of the country
2. Importance of managing the watershed area to achieve the regular flow of good quality water in maximum quantity on sustainable basis.
3. Understand the concept of soil and water conservation, regulation of stream flow regime, flood control, reduction of siltation and sedimentation in rivers and reservoirs
4. Ground water recharge for successful management of our irrigation system.

## Contents

### *Theory*

- 1 Introduction to Watershed Management, importance, need, scope and application
- 2 The Hydrological Cycle
- 3 Precipitation, its types and measurement. Snow, Influence of Vegetation on Precipitation
- 4 Run-off and its components, types, measurement and factors affecting runoff
- 5 Infiltration, percolation and other forms of soil moisture
- 6 Evapo-transpiration, measurement, meteorological factors effecting the evapo-transpiration
- 7 Erosion and sedimentation, types of erosion, factors effecting erosion
- 8 Soil Conservation in Watershed Management, managing watershed range and crop lands
- 9 Biological and structural soil conservation measures
- 10 Modern concepts in Watershed Management; participatory & integrated watershed Management Watershed planning and management for sustainable livelihood

### *Practical*

- 1 Calculation of mean precipitation in a watershed by different methods
- 2 Determination of features of watershed: Drainage density, mean elevation, area, drop per kilometer and mean slope

## Recommended Texts

1. Tennyson, L. C. (1986). *Principles of watershed management*. FAO PAK/78/036 Field Document No.9. Peshawar: Pakistan Forest Institute,
2. Sech, T. V. (2002). *Principles of water resources*. John Wiley & Sons.

## Suggested Readings

1. Shah, B. H. & Heusch, B. (1991). *Design of soil conservation works in watershed areas*. Peshawar: Pakistan Forest Institute.
2. Raeder-Roitzsch, J. E. (1968). *Watershed management: abstract of lectures*. Peshawar: Pakistan Forest Institute

**Introduction**

This course is designed to introduce the students with the numerous forest products, including wood, and describes the uses of forests for sustainable forest resource management based on multiple uses of forests. Over 1.6 billion people depend on forests for food or fuel, and some 70 million people worldwide - including many Indigenous communities - call forests home. Forests provide us with oxygen, shelter, jobs, water, nourishment and fuel. With so many people dependents on forests, the fate of our forests may determine our own fate as well. Timber extraction is an important operation in forestry, which includes transporting and storage of wood. The course introduces the students with different methods of extraction, equipments and transportation of timber particularly those used in different forest areas of Pakistan.

**Course Learning Objectives**

1. Understand the basic concept of developing cottage industry based on sericulture and apiculture.
2. A detailed and comprehensive knowledge of medicinal plants, their cultivation, collection and preservation.
3. Use of forest resources sustainably at local as well as at commercial level.

**Contents**

1. Felling and conversion: Different methods of felling and conversion of timber
2. Types and description of different implements used. Seasons for felling. Hand and mechanical sawing
3. Extraction and transportation methods of timber used in Pakistan
4. Various types of equipment used for extraction of timber
5. Storage of logs and timber, lay out and types of timber depots, maintenance of depot record
6. Methods of stacking with advantages and disadvantages, Sale and disposal of forest produce.
7. Introductory sericulture and piculture
8. Mushroom, Resins and Gums; their utilization and economic aspects
9. *Medicinal* plants of Pakistan; their importance and scope
10. Cultivation, Collection and Conservation of medicinal plants

**Recommended Texts**

1. Ganga, G. (2003). *Comprehensive Sericulture. (Vol. II). silkworm rearing and silk reeling.* New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd.
2. Negi, SS. 2001. *Forest Products and Utilization.* IBD Publisher New Delhi. India.

**Suggested Readings**

1. Gill, M. A. (2006). *Guidelines for cultivation, collection, conservation and propagation of medicinal herbs.* Gland, Switzerland: WHO, IUCN & WWF
2. Zaman, M. B. & Khan, M. S. (1972). *Hundred drug plants of West Pakistan.* Islamabad: Printing Corporation of Pakistan.

**Introduction**

This course is to get the students acquainted with the concept and importance of biodiversity and its conservation. In this course students will learn the skills and techniques to conserve biodiversity and to mitigate the impact of global warming and climate change. Students will be well equipped with the knowledge of biodiversity which will ultimately play key role for conservation of biodiversity and natural resources in future. The course will largely be helpful to understand the complex interactions at species, population and community level and phenomenon of interdependence of different components of the ecosystem

**Course Learning Objectives**

1. Define and explain key concepts related to biodiversity.
2. Describe the structure and function of various ecosystems.
3. Identify and analyze the effects of human activities on biodiversity and ecosystems.

**Contents***Theory*

- 1 Definition of biodiversity and its scope.
- 2 Factors affecting biodiversity of flora and fauna (human population, industrialization and unsustainable land uses).
- 3 Biodiversity status of flora and fauna in various zones/regions. Threatened and endangered mammals, birds, and plant species in Pakistan.
- 4 Biodiversity rich areas and hotspots.
- 5 Conservation and management strategy for biodiversity in Pakistan.
- 6 Ecosystem based adaptation
- 7 The concept of climate change and its harmful effects on Biodiversity.
- 8 International treaties and conventions on biodiversity and climate change.

*Practical*

- 1 Field visit to different sites to assess the status of biodiversity
- 2 Field visit to biodiversity conservation projects
- 3 Learning various methods to reduce global warming

**Recommended Texts**

1. Siddiqui, K. M. (1997). *Forestry and environment*. Peshawar: Pakistan Forest Institute.

**Suggested Readings**

1. Government of NWFP. IUCN. (1996). *Sarhad provincial conservation strategy*. IUCN.

**Introduction**

This course is designed to give the basic knowledge of agroforestry and agroforestry systems being practiced in Pakistan. Agroforestry is a land use and its management system in which trees or shrubs are grown around or among crops or pastures depending on the suitability of the site, locality factors and environmental conditions. This intentional combination of agriculture / pastures and forestry has a variety of benefits, including increased biodiversity and productivity and reduced erosion and other environmental hazards. This course is especially important in Pakistan's perspective where forest resources are meager and meeting demands for wood and wood products is a big challenge.

**Course Learning Objectives**

1. Identify and describe various agroforestry practices
2. Examine how agroforestry systems contribute to ecosystem services
3. Select the suitable tree species to be grown on the farmlands of irrigated and rain-fed areas of the country
4. Provide the basic guideline to the farmers to maximize their income by judicious combination of different components under limited resources in hand.

**Contents***Theory*

- 1 Definition of a system, farming system and agroforestry system
- 2 Importance, need, objectives and potential of Agroforestry systems
- 3 Agroforestry Systems and classification by Major components (agrisilvicultural, silvipastoral, agrosilvopastoral and other systems),
- 4 Temporal and spatial character, function and application, and spread and management
- 5 Current agroforestry systems in Pakistan in view of establishment, cultural and harvest techniques i.e., Rotation Systems, Permanent Tree and Field Crop Systems, Tree-pasture Systems and Minor Forest Products systems, Tree and Aquatic, Tree and Forage, miscellaneous forest products such as medicinal plants, Kitchen Gardens (Home Gardens)
- 6 Agroforestry Systems in Latin American, African and Asian Countries
- 7 Designing Agroforestry Systems (Land capability classifications and their application to design of agroforestry)

*Contents (Practical)*

- 1 Visits to various Agroforestry Systems in Pakistan
- 2 Practice to design an Agroforestry system

**Recommended Texts**

1. Dwivedi, A. P. (1992). *Agroforestry, principles and practices*. New Delhi: Oxford and IBH Publishing Company.
2. Jha, L. K. (2009). *Advances in agroforestry*. New Delhi: APH Publishing Corporation.

**Suggested Readings**

1. Jose, S., & Gordon, A. M. (Eds.). (2008). *Toward agroforestry design: an ecological approach* (Vol. 4). Springer Science & Business Media.
2. Vergara, N.T. and MacDicken, K. G. (1990). *Agroforestry: classification and management*. New York: John Wiley and Sons.

## **SEMESTER VI**

**FRST-6721**

**Wood Science**

**3(2-1)**

### **Introduction**

This course provides an opportunity to the students to pursue professional careers in science and technology of wood as natural resource and to make themselves aware about the problems related to wood as basic material to manufacture various useful products. The main focus of the study is to synthesize multi-disciplinary knowledge in the biological and physical science of wood and its industrial application. This course aims to educate and train the students in forest products research. Graduates will demonstrate a firm understanding of wood formation, wood identification, physical properties, mechanical properties, chemical characteristics and properties, wood degradation and deterioration, and composite materials. Graduates will be able to compare and contrast a variety of complex contemporary issues of wood, including demand, use, and impact of use on society and the environment, applications of wood and wood-based materials, choosing and specifying appropriate wood-based products, policy regulation, environmental and other societal issues, professional ethics, and health, safety, and security issues.

### **Course Learning Objectives**

1. Identify anatomical characteristics of wood
2. know chemical composition of wood
3. Defects of wood and their causes
4. Formation of composite wood products & wood seasoning
5. Wood based industries especially pulp & paper manufacturing

### ***Contents***

#### ***Theory***

- 1 Wood structure, formation, anatomical properties, anisotropic structure of soft and hardwoods.
- 2 Wood defects, kinds and classification, cause of natural and drying defects during seasoning
- 3 Wood properties and their types.
- 4 Wood seasoning, preservation their types and application methods.
- 5 Sawmilling and wood working, types, operation, maintenance, design and layout of sawmills.
- 6 Pulp and paper, composite wood products
- 7 Uses of woods and decorative uses of Pakistani timbers.
- 8 Utilization of wood waste and integration of forest industries

#### ***Practical***

- 1 Studying gross features of wood and determination of its physical properties; Testing of timber for different mechanical properties
- 2 Demonstration of stacking techniques and measurement of seasoning defects; Demonstration of various methods of wood preservation
- 3 Measurement of round and sawn timber; Calculation of recovery of converted timber

4 Manufacturing, testing and evaluation of plywood, particleboard, MDF, etc.

***Recommended Texts***

1. Bower, L. J. (2003). *Forest products and wood science; an introduction*. (4<sup>th</sup> ed.). USA: Wiley-Blackwell
2. Negi, SS. (2001). *Forest Products and Utilization*. IBD Publisher New Delhi. India.

***Suggested Readings***

1. Kollmann, F. F. P. & Wilfred A. C. J. (1968). *Principles of wood science and technology* (Vol. 1-2). Berlin, W. Germany: Springer-verlag.
2. Walker, J. C. F. (1993). *Primary wood processing; principles and practices*. New York: Chapman and Hall.



- فضل (١٣، ٢، ٢٤)
- العنكبوت (٣١، ٦٣، ٢٠)
- الروم (٢٠)
- الاسراء (٤٠، ٤٩)
- الرعد (٢)
- السجدة (١٠، ٣، ٢٢)
- يونس (٨٨، ١٠١، ٢٣، ٢٣، ٥، ٢٢)
- يوسف (١٣، ٩٣)
- الفرقان (٥٣، ٦٢)
- لقمان (١٦، ٢٩)
- طه (٥٣، ١١٣)
- النحل (٨، ٨، ١١٥، ٦٨، ٦٨، ٤٩، ٣٩، ٦١، ١١، ٤٥)
- النمل (١٨، ١٤، ١٦، ٨٢، ٦٠، ٨٨، ٦٣، ٦٣)
- السجده (٢٤)
- الحديد (٦)
- هود (٦، ٣٣)
- يسين (٣١، ٣٤)
- الروم (٣٦، ٢٣، ١٩، ٥٠، ٣٩، ٣٩)
- فصلت (٣٩، ٣٩)
- الحج (٤٣، ٢٢، ٦٥، ٦١)
- الحجر (٢٢، ١٩)
- الانبياء (٣٤، ٣٠، ٣١)
- الزاريات (٣٤)
- الزلزله (١)
- القصص (٨٢، ٨١، ٨٠، ٤٩، ٤٦)
- النور (٣٣، ٣٥، ٣٠، ٢٢، ٢٢، ٣٤)
- الجمع (٥، ١١، ١٠، ٦٢، ١١)
- القمر (٤)
- الواقع (٦٩)
- الفاطر (١٣، ٢٠)
- الملك (١٩)
- الصف (١٠)
- الجن (١٣)
- الشورى (٢٨)
- الزخرف (١١)
- الفيل (١)

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## Introduction

This is a specialized course for graduate level students of forestry to get them acquainted with the special nature of forest accounts. The knowledge of forest accounts allows countries to integrate environmental data with other standard economic accounting information and hence better understand the links between forests and the social and economic beneficiaries that rely on and affect those resources. This is a tool that enables countries to make more informed decisions regarding the use of forest resources and to design and monitor policies that can help to achieve multidimensional planning and development on sustainable basis. The course is based on the concept of understanding the approaches to cater the ever-increasing demands of forest products by burgeoning population with balanced flow of capital. The course describes the detailed procedures and methodologies of maintaining the records of forest products especially trees logged for timber production, regeneration, extraction, transportation and complexities involved while measuring for selling and purchasing of wood at site as well as at forest depots.

## Course Learning Objectives

1. Acquire comprehensive knowledge about fundamentals rules of Forests accounting in Pakistan.
2. Understand leave procedure rules for the employees of Forestry department in Pakistan.
3. Know about the Government service rules and regulations for the employees of Forestry department in Pakistan.
4. Get basic knowledge about the Government office systems regarding obligations and rights of various forest executive officers.

## Contents

### *Theory*

- 1 Introduction; maintenance of office records, register of books and maps, dispatch and receipt register, fire reports, drafting, forms of official communications, letters, semi-official letter etc
- 2 Cash Accounts: Classification of revenue and expenditure, forest/cash advance, preparation of pay bills, voucher, TA bills and their disbursements, introduction of financial power and limits, instructions regarding the preparation and maintenance of Range Accounts/cash book, compilation of monthly accounts, Audit and AP of operation.
- 3 Timber Accounts: Timber Forms 5 to 17. Function of Depot Officer. Preparation of launching lists. Mooswaras and transport/transit pass and challans. Sales depot, sorting and stacking of timber and lots etc. Hammer-marking of sold timber. Rules for supply of firewood to forest officials and maintenance of forest depot record.
- 4 Forestry Works: Preparation of cost estimates for forestry and civil works, maintenance and disbursement of muster rolls, maintenance of measurement books, and submission of completion report.

- 5 Service Rule: Govt. Servants Eff. and Dis. Rules, 1973. PEDDA Act 2006 revised up to 2017
- 6 Inquiry procedure. Government Servants Conduct Rules, 1964.
- 7 Revised Leave Rules, 1981.
- 8 Delegation of financial powers, ACR

***Recommended Texts***

1. Ajmal, M. S. & Omer, R. M. (1996). *Forest accounts and procedures*. Lahore, Pakistan: Danishkada Publishers.
2. Hamid, A. (1990). *Accounting rules and procedure of government of Pakistan*. Govt. of Pakistan: Finance Division.

***Suggested Readings***

1. Govt. of Pakistan. (1964). *civil service conduct rules*.
2. Govt. of Pakistan. (1973). *Government servants (efficiency and discipline) rules*.

**Introduction**

This is another core subject for graduate level forestry students. The course aims at improving the basic understanding and concepts into an applied approach as far as growth, protection and harvesting of forest resources of Pakistan is concerned. The course also includes the practical aspects to enhance the skill in learning and implementation of advanced silvicultural techniques as per requirement of the country's forest resources. The course introduces the students with all forestry operations starting right from seed collection and preparation of planting materials to final harvesting, conversion and stacking of wood logs. Detailed discussion on the selection of suitable silvicultural systems for particular tree species according to the ecological conditions of the site of implementation is given in this course. Students will also learn how to establish a commercial forest nursery with all required technical knowledge involved. This course is especially important for the Graduate level students to understand the advanced and applied concepts of forests and forest management to become professional foresters having sound theoretical and practical knowledge of forestry.

**Course Learning Objectives**

1. Have comprehensive knowledge about forest ecology and silviculture
2. Know about ecological establishment of various multipurpose trees
3. Understand the application of different silvicultural operations
4. Get basic know how about various silvicultural systems being practiced in different
5. forest types of Pakistan

**Contents***Theory*

- 1 Regeneration: Definition, importance and types
- 2 Silvicultural systems and their applications
- 3 Cultural and tending operations including choice of species, local and exotic species, evaluation of site for planting, site preparation, sowing and planting methods, spacing, irrigation, cultural operation, protection.
- 4 Seeds: seed collection and extraction, seed testing, storage, pre-sowing treatments.
- 5 Nursery establishment: Objectives, types of nurseries, selection of site, layout, area preparation, growth medium/soil preparation, soil and seed treatments, manuring and fertilization
- 6 Afforestation of special sites; arid and semi-arid areas, water logged and saline areas, canal side, highways/road sides, sand dunes, land slips, denuded hill slopes and ravine lands.
- 7 Silviculture of forest tree species

*Practical*

- 1 Identification of tree species
- 2 Nursery raising techniques (Seed bed preparation, soil preparation, nursery layout, etc.)
- 3 Different planting methods
- 4 Field visits for demonstration of cultural and tending operations in natural forests

***Recommended Texts***

1. Sheikh, M. I. (1999). *Forests and forestry in Pakistan*. Urdu Bazar, Lahore: A-One Publishers.
2. Champion, H. G., Seth, S. K. & Khattak, G. M. (1965). *Manual of silviculture for Pakistan*. Peshawar: Pakistan Forest Institute.

***Suggested Readings***

1. Daniel, T. W., Helms, J. A. & Baker, F. S. (1979). *Principles of silviculture* (2<sup>nd</sup> ed.). New York: McGraw-Hill Book Company.
2. Dvorak, J. & Novak, L. (1994). *Soil conservation and silviculture*. Elsevier Science.

**Introduction**

Forests are a stabilizing force for the climate. They regulate ecosystems, protect biodiversity, play an integral part in the carbon cycle, support livelihoods, and supply goods and services that can drive sustainable growth. Role of Forests in climate change is two-fold; they act as both a cause and a solution for greenhouse gas emissions. Around 25% of global emissions come from the land sector, the second largest source of greenhouse gas emissions after the energy sector. About half of these (5-10 GtCO<sub>2</sub>e annually) comes from deforestation and forest degradation. Forests are also one of the most important solutions to addressing the effects of climate change. Approximately 2.6 billion tons of carbon dioxide, one-third of the CO<sub>2</sub> released from burning fossil fuels, is absorbed by forests every year. Estimates show that nearly two billion hectares of degraded land across the world. This offers opportunity for restoration. Increasing and maintaining forests is therefore an essential solution to climate change. Halting the loss and degradation of forest ecosystems and promoting their restoration have the potential to contribute over one-third of the total climate change mitigation that scientists say is required by 2030 to meet the objectives of the Paris Agreement. This course will make aware the students about the issue of climate and equip them with practical solutions. The course will largely be helpful to understand the complex interactions at species, population and community level and phenomenon of interdependence of different components of the ecosystem.

**Course Learning Objectives**

1. Define environmental forestry and its core principles
2. Describe the structure and function of forest ecosystems
3. Examine various forest management techniques and their impacts on ecological health
4. Analyze the environmental and social impacts of forest management decisions

**Contents**

1. Concept of climate system & weather
2. General overview of climate change
3. Causes of climate change
4. Global Energy Balance and Greenhouse Effect
5. Influence of climate on species distribution
6. Climate change mitigation
7. Carbon sequestration
8. Global Agreements related to Climate and Forestry
9. Carbon Trading Concept
10. Carbon Accounting schemes e.g. REDD+
11. Introduction to Carbon Accounting
12. Political responses to climate change all over the world
13. Global agreements and conventions related to climate and forestry

**Recommended Texts**

1. Ashraf, M.I. (2019). *Climate Change and Role of Forests: A Community Guide*. Ministry of Climate Change, Government of Pakistan

2. Siddiqui, K. M. (1997). *Forestry and environment*. Peshawar: Pakistan Forest Institute.

### **Suggested Readings**

1. Freer-Smith, P. H., Broadmeadow, M. S., & Lynch, J. M. (Eds.). (2007). *Forestry and climate change*. CABI.
2. Government of NWFP. IUCN. (1996). *Sarhad provincial conservation strategy*. IUCN.

**Introduction**

Wildlife helps in maintaining the ecological balance of nature. Pakistan is blessed with the diverse source of wildlife; study of its biology and other ecological parameters is a key to keep this balance not only for aesthetic nature of the environment but also for the stability of the natural ecosystem on long term basis. Injudicious exploitation of wildlife causes irreparable damage to the proper functioning of different components of the ecosystem. Killing of carnivores leads to an increase in the number of herbivores which in turn affect the forest vegetation, thus due to lack of food in the forest they come out from the forest to agricultural lands and destroy the crop.

**Course Learning Objectives**

1. Acquaint the students with the knowledge and skills needed for the conservation of wildlife and allied resources.
2. Learn about the important wildlife species and threats to wildlife population in the country and ways and means to protect them in their native habitats.

**Contents***Theory*

- 1 Wildlife: Definition and values, ecosystem concept, characteristics and management requirements for different eco-systems in Pakistan.
- 2 Population Dynamics of Wildlife
- 3 Wildlife Health: Wildlife handling, diseases, parasites and preventative management actions.
- 4 Principles of Wildlife Management.
- 5 The Wildlife of Pakistan, its distribution, status and importance.
- 6 Wildlife Laws and Regulations.
- 7 Protected areas: Wildlife Sanctuaries, National Parks. Game Reserves and Community Controlled Hunting Areas.
- 8 Study of endangered species as listed in CITES, IUCN Red Data Book and species listed as threatened under provincial legislation.
- 9 Preparation of wildlife Management plans: Purpose, structure, contents and reviews/approval procedures.
- 10 International treaties and conventions on biodiversity, illegal trade of wildlife.

*Practical*

- 1 Identification of important Wildlife species on the basis of specific taxonomic characteristics
- 2 Preparation and submission of Wildlife Management Plans and Models
- 3 Wildlife survey techniques (identification, counting from various direct and indirect signs)
- 4 Visit to a protected area to review its management and preparation of case studies

**Recommended Texts**

Sinclair, A. R. E., Fryxell, J. M. & Graeme, C. (2009). *Wildlife ecology, conservation and management*. Wiley Blackwell.

1. Fulbright, T. E. (2007). *Wildlife science*. UK: CRC Press.

***Suggested Readings***

1. Bailey, J. A. (1984). *Principles of wildlife management*. USA: John Wiley & Sons. Inc.
2. Roberts. T. J. (1991). *The birds of Pakistan* (Vol. 1-2). Oxford University Press.
3. Roberts. T. J. (1977). *Mammals of Pakistan*. Oxford University Press.

### **Introduction**

Forest mensuration plays an important role in the practice of forest management. Forest research requires information about the density of forests, diversity, spatial distribution of trees within stands, the size distribution of trees within stands and the expected growth of trees and stands. Demand for more and better information from forests has driven the development and application of new instrumentation and measurement methods. Making measurement in forest such as the form, age, height, structure, height, growth, volume and yield of the single tree or the whole crop is necessary for preparing management plan. So this course covers all the practical aspect of forest inventories. The students shall be able to apply themselves more practical than the theoretically. The students will be able to estimate the forest quantitatively and qualitatively.

### **Course Learning Objectives**

1. Define forest mensuration and its significance in forest management.
2. Develop proficiency in various forest measurement techniques
3. Utilize statistical methods to analyze forest measurement data.
4. Accurately calculate forest metrics, including tree volume, biomass, basal area, and stand density.

### **Contents**

#### *Theory*

Scope of forest measurements in management and planning

- 1 Individual tree measurements i.e., diameter, height, crown and form study etc.
- 2 Volume Measurements, standing tree volume, felled tree volume i.e., bark, swan out turn volume, stacking/volume of fire wood and charcoal volume.
- 3 Introduction of volume tables and yield tables and its preparation
- 4 Forest inventory and Sampling and concept of carbon stock.

#### *Practical*

- 1 Assessing Diameter/Height, volume and biomass of the tree/forest.
- 2 Increment calculations (Single tree/stands)
- 3 Data compilation, analysis and plotting (Construction of Height-Diameter-Age curve, Data processing of fixed area plots, Data processing of Horizontal Point Sampling)

### **Recommended Texts**

1. Kershaw Jr, J. A., Ducey, M. J., Beers, T. W., & Husch, B. (2016). *Forest mensuration*. John Wiley & Sons.
2. Abbas, S. H. (1996). *Elements of forest mensuration*. Faisalabad: Punjab Forestry Research Institute.

### **Suggested Readings**

1. Avery, T. E., & Burkhart, H. E. (2015). *Forest measurements*. Waveland Press.

**Introduction**

The key objective of this course is to develop an understanding of forest policy and forest laws and to educate the student about developing the policy according to the basic need of the current period and to implement these policies to achieve the goals/objectives and to manage the resources on sustainable basis and protect the resources from over exploitation. Forest policy consists of the laws and rules and regulations, which guide the protection and management of country's forests. Forest policies help maintain healthy forest ecosystems, which are essential for working towards a sustainable future and improving our quality of life. It is a negotiated agreement between government and stakeholders on the orientations and principles of actions they adopt, in harmony with national socioeconomic and environmental policies, to guide and determine decisions on the sustainable use and conservation of forest and tree resources for the benefit of society. The student will be able understanding the current objective of the forest management according the policy and challenges in the management and learn how to overcome the illegal activities according to the law.

**Course Learning Objectives**

1. Get knowledge about Forests Policy and Laws.
2. Get information about history of Forest Laws in Indo-Pakistan.
3. Know about the role of Forest, Range, Wildlife Policies and Laws and their mutual
4. Relationships
5. Understand the impact of forest policies on economic advancement of the natural resources

**Contents**

- 1 Forest Policy: Definition of Policy. Principles of policy formulation, requirements of a sound national forest policy, inter-relationship of national forest policy with other relevant policies. Linkages of forest policy with economic development, national character and modern technology. History of National Forest Policy since 1894 to to-date. Comparison of the national forest policy of Pakistan with other countries.
- 2 Forest Laws: Definition of law. Need for law. The basis of law. Necessity and limitations of a special forest law. History of Forest Laws in Indo-Pakistan.
- 3 Definition of common legal terms: Abetment, Adverse possession, Bail, cattle pound, cognizable and non-cognizable offences, collusion, compounding an offence, Confiscation, Confession, Criminal breach of trust, criminal misappropriation, criminal trespass, easement, Escheat, Evidence, Forfeiture, Inter-mission, Interruption, Leading question, Mischief, Mistake of law, Mistake of fact, Pre-emption, Recognizance, Reanullius: Right, Royal tree, Salvage, Search Warrant, Seizure, Servitude, Summary trials, Summons, summon cases Treasure trove, Warrant cases, waif wood, wasteland.
- 4 Acts, Regulations, Ordinances and Rules; Study of Salient Features of The Forest Act, 1927; The Baluchistan Forest Regulation. 1880; Guzara rules of Rawalpindi District, 1927; Cattle trespass Act, 1871; Sind grazing rules, 1936; NWFP(KP) Forest Ordinance

2002; The Jammu & Kashmir Forest Regulation 1930; The Gilgit Forest Rules 1932; West Pakistan Wildlife Protection Rules, 1960; Punjab Fisheries Act, 1914; Choas Act, 1900

***Recommended Texts***

1. *Forest Act, 1927*. Updated 2012

***Suggested Readings***

1. Government of Pakistan. Ministry of Climate Change (2015). *Forest policy*.

## SEMESTER VII

FRST-6728

Remote Sensing and GIS in Forestry

3(2-1)

### **Introduction**

This course will acquaint the students with modern tools of GIS and RS for forest management. This will increase awareness of GIS and modeling tools and to describe how geographical information is used, managed, and marketed globally. This course introduces students to the basics of remote sensing, characteristics of remote sensors, and remote sensing applications in academic disciplines and professional industries. The graduates will be able to understand main concepts that define Geographic Information Systems, describe the geographic space with concepts and terms commonly used to build operating models in GIS, know and use GIS and its geo-processes and functions, some basic techniques to thematic mapping design. The students would be able to describe Remote Sensing concepts, physical fundamentals and components and adequately use vocabulary, terminology and nomenclature of the discipline.

### **Course Learning Objectives**

1. Explain the basic concepts of GIS and remote sensing, spatial data structure, raster and vector data and global positioning system
2. Understand techniques to measure and inventory forest vegetation and soil with precision and accuracy
3. Analyze vegetation health, forest area, soil health and soil classification using satellite imagery

### **Contents**

#### *Theory*

- 1 Aerial Photos. Sensors, Cameras, films and filters.
- 2 Types of photos scale of photos. Season of photography.
- 3 Aerial photo interpretation techniques
- 4 Photo-grammetry, measurement of scale, distance, heights and slope.
- 5 Satellite based Remote Sensing.
- 6 Introduction to energy sources and radiation principles.
- 7 Thermal Infrared and microwave Remote Sensing.
- 8 Introduction to GIS
- 9 Spatial data
- 10 Global Positioning System (GPS)

#### *Practical*

- 1 Introduction to RS and GIS softwares
- 2 Geo-referencing, digitizing and map making

### **Recommended Texts**

1. Paul, B. (2008). *GIS fundamentals, a first text on GIS*. (3<sup>rd</sup> ed.). Eider Press.

### **Suggested Readings**

1. Lillesand, T. M., Kiefer, R. W. & Chipman, J. (2007). *Remote sensing and image interpretation*. (6<sup>th</sup> ed.). Wiley and Sons.

**Introduction**

This course is designed for the students of final semesters to educate and train them for preparing their own research proposal, conducting research and to develop scientific writing skills. By studying this course, students conceive the precise concept of research and research methodologies to be followed. The main objective of this course is to give students practical exposure in the field. Students will be assigned the individual research assignments and they will learn how to execute and finalize a research project independently right from the selection of research topic, review of literature, designing the research methods and procedures, data collection, analyzing and presenting the data of their research experiments. The course intends to teach the undergraduate students, the basic research ethics and the concept of plagiarism and its consequences while writing their research projects. Students are also encouraged to get them attached with some relevant and well renowned research institutions under the supervision and patronage of the mother institution, in order to have a practical exposure in their fields of interest.

**Course Learning Objectives**

1. Understand the concepts of research and scientific writing
2. Prepare a draft of synopsis, thesis and research paper
3. Use the bibliographic software
4. Understand the journal quality and their ranking systems

**Contents***Theory*

- 1 Definition and concept of research in Forestry
- 2 Objectives of research projects.
- 3 Funding sources and developing a format for seeking research grants
- 4 Selection of research topic, understanding the problems to be solved.
- 5 Review of literature.
- 6 Study plans, layout of experiments, experimental designs, conduct of experiments in Forestry
- 7 Data collection, Data Analysis and Interpretation by using modern statistical packages.
- 8 Preparing manuscripts for publications.

*Practical*

- 1 Exercise of writing research proposal
- 2 Assigning different title to the students
- 3 Exercise of collecting materials from different sources on assigned topics
- 4 Oral presentation

**Recommended Texts**

1. Day, R. A. (1983). *How to write and publish a scientific paper*. Philadelphia: ISI Press.
2. Matthews, J. R., Brown, J. M. & Matthews, R. W. (2000). *Successful scientific writing*. McGraw Hills.

***Suggested Readings***

1. LeClerg, E. L. (1965). *Field plot technique*. U.S.A: Library of Congress catalog No. 62-16455.
2. Hussain, R. W. & Sheikh, M. I. (1988). *A guide book for forestry research*. Peshawar: PFI.

**Introduction**

Forestry is an integrated discipline and as such many of the subjects are intimately related to it such as basic sciences: botany, physics chemistry, plant physiology, ecology and economics. Sustainable forest management (SFM) requires knowledge of basic as well as applied sciences such as engineering, information technology and management.

A professional forester needs to maintain a balance between the demand for the forest's natural resources and the vitality of the forest. In this era of technological advancement and globally well-connected people through social media, you need to learn innovative solutions rather than oversimplified solution like planting new saplings for sustainable forestry. Conventional paradigm of conservation forestry or just timber production has shifted to ecosystem services and forest certification.

**Course Learning Objectives**

1. Describe the principles of sustainable forest management (SFM) and their importance for environmental, economic, and social sustainability.
2. Assess Forest Health and Function
3. Apply Management Practices
4. Evaluate Policy and Governance

**Contents**

Concept of sustainable forest management. Elements, objectives and principles of SFM

Influence of climate on forests and management under climate change. Protected area management.

Forest landscape restoration (FLR)

Forest fire management

Forest carbon stock assessment, trading and accounting

Valuation of ecosystem services

Forest certification and international standards

**Recommended text:**

1. Ashraf, M.I. & Khan, S. (2021). Sustainable Forest Management. Prepared for GEF & UNDP funded project under Ministry of Climate Change, Government of Pakistan.
2. Siry, J. P., Cabbage, F. W., & Ahmed, M. R. (2005). Sustainable forest management: global trends and opportunities. *Forest policy and Economics*, 7(4), 551-561.
3. Von Gadow, K., Pukkala, T., & Tomé, M. (Eds.). (2012). *Sustainable forest management* (Vol. 1). Springer Science & Business Media.

**Introduction**

Forest management is much more than just yield regulation. It embraces the entire gamut of activities which concern the organization of production from forests to achieve specific goals. Forest management heavily emphasizes the collection of facts bearing on management of the forest estate and their analysis and interpretation in a valid manner. For sufficient and reliable information, the forest may be managed without conventional formulae, more focused on the scientific sustainable management with clear-cut objectives of the forest management. It is quite essential to have the knowledge of the forest property, composition, production capacities, volume and increment of growing stock/forest and socio-economic condition, etc. The basic intended outcome of this course is to learn the skills of setting the basic objectives of forest management and how to achieve these objectives by different possible ways under given circumstances. The students will understand how to collect data through forest inventory by different methods such as Partial (rope and prism) and Full enumeration. Based on the information thus collected, forest manager can devise the strategies to achieve the desired goals in the light of the national forest policy.

**Course Learning Objectives**

1. Understand Forest Ecosystems
2. Grasp Forest Management Principles
3. Develop Forest Management Plans

**Contents***Theory*

- 1 Concept of Working plan, planning and preparation of working plan.
- 2 Forest inventory, types and sampling design.
- 3 Determining plot size, number and distribution. Grid size calculations, forest map, its scales and conversion.
- 4 Orientation of forest map.
- 5 Determining plot points. On plot measurements. Precautions in plot measurements.
- 6 Recording of data, tally sheets.
- 7 Present and future stand and stock tables.
- 8 Movement ratio and yield calculations using different formulas.

*Practical*

- 1 Sampling Intensity, Sampling Design, Fixed area plots methods.
- 2 Scale conversions of Forest maps. Grid preparation. Collection of socio-economic data.
- 3 After conducting the inventory of the forests each group of students have to prepare the working plan of the given forests providing following information:
- 4 The forest tract to deal with: Name and Situation, configuration of ground, Geology, soil type, State of boundary, Legal positions, Rights and concession.
- 5 The forest: Species Composition, Injuries liable to forest.
- 6 Utilization of Produce: Agricultural crops, Market of the products.
- 7 Staff and labor supply: availability of labor

- 8 Past system of Management: Statistics of Growth and Yield
- 9 Basis of Proposal: National Forest Policy, General objectives of Forest Management, Working circles, Blocks and compartments. Period of Plan, Allocation of working circles in the forest.
- 10 Miscellaneous Regulation: Petty felling, Fire Protection, Maintenance of Boundaries.
- 11 Financial Forecasts: Budget allocation, Control and Maintenance of records

***Recommended Texts***

1. Khattak, G. M. (1973). *Forest management*. Peshawar: Feroz sons.

***Suggested Readings***

1. Hush, B., Miller, C. I. & Beers, T. W. (1982). *Forest mensuration*. (3<sup>rd</sup> ed.). Rome, Italy: FAO.

**Introduction**

By the end of this course, students will be able to learn about the fundamental knowledge of forest engineering and concepts of forest layouts. Students can describe engineering practices for planning and designing of forest components. Students will practice engineering techniques for designing of forest landscapes and structures.

**Course Learning Objectives**

1. Describe the core principles of forest engineering
2. Develop and implement engineering designs for forest roads, logging systems, and other infrastructure to support efficient and sustainable forest management.
3. Apply engineering tools and technologies, such as Geographic Information Systems (GIS), remote sensing, and computer-aided design (CAD), to plan and manage forest engineering projects.

**Contents***Theory*

1. Introduction: Road Management Policy; vision for Forest Roads; Guiding principles for road management; Road density; Site Selection; Efficient Road Design; Temporary Roads; Drainage of Surface Water; Rock Pits and Quarries; Road Maintenance; Transportation
2. Planning and Forest Road Design: Objectives of Transportation Planning; Vision of Transportation Planning; Inventory and current conditions; Roads Manual and goals for Road designing; Road design strategies; Engineering Procedures; Road design criteria; Site selection; Road Prism Design; road Drainage; Surface drainage; Subgrade shapes; road grades; Design of stream crossing structures; temporary road design by timber contractors; Road construction; referencing centerline; Culvert referencing; Cut and Fill slopes; Maximum vehicle Off-tracking;
3. Forest Road Construction: Road Construction Strategies; Timing; Clearing and Grubbing; Options for Disposal of Clearing and Grubbing Debris; Pile and Burn; End-Haul; Chipping and Scattering; Balanced Cut and Fill Construction; Full Bench Construction; construction on Marginally Stable Slopes; Grading and Compaction: Subgrade and Surfacing; Erosion Control;
4. Natural Resource Management: Debris management, composting, surface hydrology, water supply and drainage, Environmental and safety aspects of forestry operations; Occupational Safety and Health Act, Resource Conservation ethics.

*Practical*

1. Engineering mechanics basic principles
2. Beam deflection, shear force and bending moment diagram.
3. Building materials properties
4. Geological and Soil Characterization; study of rocks, study of basic properties of soil
5. Water analysis: basic parameters, physical, chemical, and biological

***Recommended Text & Suggested Readings***

1. Hapke, A. 2016. Forestry and Forest Engineering. Google Books
2. Koppad, A. G. 2011. Textbook of Forest Engineering. Indian Council of Agriculture
3. Research.
4. Pearce, J. K. 1973. Forest Engineering Handbook. A Guide for Logging Planning and Forest
5. Road Engineering. Bureau of Land Management, Oregon State Office, USA.
6. Spinelle, R. 2018. Forests Operations, Engineering and Management. ISBN 978-3-03897-184-9 (Pbk); ISBN 978-3-03897-185-6.
7. 03897-184-9 (Pbk); ISBN 978-3-03897-185-6.

**Introduction**

The Range Vegetation-Livestock Interactions course provides an in-depth exploration of the complex dynamics between range vegetation and livestock management. This course aims to equip students with the knowledge and skills needed to understand how livestock grazing impacts rangeland ecosystems and how vegetation management can enhance sustainable livestock production. By integrating ecological principles with practical livestock management strategies, students will learn to assess and optimize the health and productivity of rangeland resources while balancing the needs of both vegetation and livestock. The course combines theoretical foundations with hands-on experience to prepare students for effective decision-making in diverse rangeland environments.

**Course Learning Objectives**

1. Describe the structure, function, and dynamics of rangeland ecosystems.
2. Identify different types of rangeland vegetation and their ecological roles
3. Analyze Vegetation-Livestock Interactions

**Contents**

1. Physical features, palatability and nutrition of range forage species.
2. Methods for determining the nutritional value of grazing animal diets.
3. Diet and nutritional quality of livestock on different ranges.
4. Forage intake of grazing animals.
5. Comparative nutritive value of plant parts.
6. Seasonal effects on forage nutritional quality.
7. Grazing intensity effects on forage nutritional quality
8. Supplementing Range Livestock.
9. Poisonous and undesirable plants on rangelands and their control.
10. Introduction to grazing management systems
11. Grazing resource inventory
12. Grazing plan development
13. Pasture management
14. Grazing systems and their monitoring

**Recommended Texts**

1. Range Management by Stoddart, Smith and Box. 1975. McGraw-Hill Book, New York.
2. Range Management: Principles and Practices. 5<sup>th</sup> Edition by Jerry L. Holechek, D. Rex. Pieper and Carlton H. Herbel.

**Suggested Readings**

3. Range Management in Pakistan by Masood A.A. Quaraishi. 1993. University of Agriculture, Faisalabad.
4. Rangeland Management in Pakistan by Mohammad, N. 1989. P: 198. International Centre for Integrated Mountain Development, Kathmandu, Nepal.

## **SEMESTER VIII**

**FRST-6734**

**Field Experience / Internship**

**3(0-3)**

### **Introduction**

The main objective of this course is to give students practical exposure in the field. Students will be assigned individual research assignments and they will learn how to independently execute and finalized a research project and how to collect, analyze and present data of the research experiments. This course is an undergraduate course for B.Sc. (Hons.) classes. This course aims to provide concepts about conduction research project and writing report. Moreover, students are allowed in this course to be attached with research institutions in order to give them practical exposure in their fields. At the end of course, each student is required to write a comprehensive research/internship report.

### **Course Learning Objectives**

1. Apply Theoretical Knowledge
2. Develop Professional Skills
3. Gain Industry-Specific Experience
4. Conduct and Document Work Activities

### **Contents**

- 1 Designing and carrying out independent research project
- 2 Preparing synopsis of research project
- 3 Conducting field and/or laboratory experiments
- 4 Reading and presentation of research articles
- 5 Recording of scientific data using different data collection methods
- 6 Arranging of data for analysis
- 7 Learning data analysis tools
- 8 Analysis of scientific data using statistical packages
- 9 Describing the analyzed results
- 10 Writing a scientific report
- 11 Presentation of scientific project

### **Recommended Texts**

1. Ghani, M.A. & M. Ashfaq (Edit). (1987). *A Resume of Post-Graduate Research, 1929-1985*. Faisalabad: Department of Entomology, University of Agriculture, Faisalabad.
2. Gilbert, I. & Himalton, C.J. (1983). *Entomology: A Guide of Information Sources*. London: Mansell Publishing Co. Ltd.
3. Ghafoor, A. (2016). *Manual for synopsis and thesis preparation*. Faisalabad, University of Agriculture Press.

### **Suggested Readings**

1. Quinn, G.P. & Michael, J.K. (2002). *Experimental Design and Data Analysis for Biology*. London: Cambridge University Press.
2. Review of recent and relevant literature and reseach articles

**Introduction**

In the world universities degree programs particularly in undergraduate programs, the capstone project (CP) has become pivotal. It may be of different forms but its core objective does not change. The CP makes the student able to work independently in group research with the purpose of devising a state-of-the-art solution for any existing global problem. Though CP project is sometimes challenging but in long run it becomes rewarding for the students of the universities. The CP is generally considered as the final project or the assignment, but it plays a vigorous role developing students' research abilities to compete in the world in research and technology and it hones students' research skills and knowledge. The CP course also paves the way for students to get contacted with industry partners and provides solutions to the world, in this way, a strong networking develops between students and industry and even between universities and industries.

**Course Learning Objectives**

1. Synthesize knowledge and skills from coursework and field experiences to address a complex, real-world problem or project in their field of study.
2. Design and conduct original research or develop innovative solutions related to the capstone project topic.
3. Plan, execute, and manage the capstone project effectively, including defining objectives, developing a timeline, and allocating resources.
4. Use the capstone project experience to demonstrate readiness for professional practice, including applying discipline-specific skills and knowledge in a real-world context.

**Contents**

1. What is Capstone Project?
2. Significance of Capstone Project
3. Misconceptions
4. Role of Supervisor, Coordinator, and Capstone Team.
5. How to choose Supervisor?
6. Evaluation Criteria
7. Get others know your work
8. Capstone proposal development including abstract, project success criteria, supervisor selection, and Dos and Dots.
9. Capstone proposal (Research) including abstract, background, research methodology, project scope. Functional specifications/requirements including project code, internal advisor, external advisor if any, project manager, project team, and submission date. While, non-functional requirements are performance requirements, safety requirements, security requirements, user documentation.
10. Literature review-elaboration of problem. Appendices, references.

**Recommended Texts**

1. Hauhart, R. C., & Grahe, J. E. (2015). Designing and teaching undergraduate capstone courses. John Wiley & Sons.
2. Bemker, M., & Schreiner, B. (Eds.). (2016). The DNP degree & capstone project: A practical guide. DEStech Publications, Inc.

### ***Suggested Readings***

1. Ghafoor, A. (2016). *Manual for synopsis and thesis preparation*. Faisalabad, University of Agriculture Press.
2. Clear, T. (2009). Thinking Issues: the three p's of capstone project performance. *ACM SIGCSE Bulletin*, 41(2), 69-70.
3. Relevant latest literature on target issues.



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