FORMAN CHRISTIAN COLLEGE
(A Chartered University)

BY LOVE SERVE ONE ANOTHER

Estd. 1864

**POSTGRADUATE
DEGREE PROGRAM CATALOG
2023-2024**

Contents

Message from the Rector

Forman Christian College (A Chartered University) was founded in 1864 by Presbyterian missionaries from. the United States. By the turn of the 20th century it had become recognized as a leading institution in the Indian subcontinent.

Since independence in August 1947 Forman has served Pakistan with distinction. The number and quality of our distinguished alumni is rivaled by few other universities anywhere and our graduates have assumed leadership positions in government, business, education, various professions, religion and the arts.

FC College achieved Chartered University status in 2004, as approved by the Punjab Provincial Assembly. The following year FCCU introduced a four-year BA/BSc Honors degree program. In 2007, the first Postgraduate degrees were offered. We now offer 14 MS/MPhil and other Postgraduate degrees as well as four PhD programs. (***Note:** Please confirm these figures -- we added three new Mphil programs this year; also please confirm the number of PhD programs that we offer!*)

FCCU is a private, not-for-profit institution. Standards and traditions developed throughout our history continue to be upheld and strengthened. We also remain committed to providing an outstanding education experience rooted in a well-qualified faculty that strives for excellence in both teaching and research.

In addition, we maintain strong co-curricular programs, enabling students to not only enjoy themselves but also learn outside the classroom. Indeed, students often find that the values and habits acquired while participating in such activities serve as important milestones in preparing them for later success.

Forman Christian College (A Chartered University) is situated on 108 beautiful acres on Canal Bank Road in Lahore. Its facilities and labs are world-class. Hostel space is available on-campus and in a nearby "satellite" campus for a limited number of female Postgraduate students.

We look forward to welcoming new Postgraduate students to our campus, offering them an opportunity to share in the Forman experience while also contributing to it as part of their own journey to become the kind of teachers, researchers, managers, entrepreneurs, innovators and leaders who are committed to strengthening Pakistan and making it a better place.

Sincerely and with every blessing,
Dr. Jonathan Addleton
Rector

Introduction to FCCU

Forman Christian College (A Chartered University) was founded in 1864 by Dr Charles W Forman, a Presbyterian missionary from the USA. The college was initially known as the Lahore Mission College, but in 1894 the name was officially changed to Forman Christian College in honor of the founder. In the early years, degrees were awarded through the Calcutta University. College level instruction was interrupted in 1869 due to the illness of key

faculty members. College classes resumed in 1886, with degrees being awarded through the University of the Punjab. In 2004, FCCU became a chartered university and from 2009 onwards has awarded its own degrees.

The early years of the college were marked by rapid growth in enrollment, and a constant struggle to find enough space to house the growing college. Enrollment grew from 18 students in 1886 to 130 in 1890, 311 in 1900, 426 in 1910 and 600 in 1915. Enrollment had reached 1,500 students by the time the college was nationalized in 1972. Enrollment in the university section alone stands at over 4,000 students today.

The campus was located in the Anarkali (Nila Gumbad) area of Lahore for many years. Four major buildings were constructed by the college on that campus by 1916, and Ewing Hall, built in 1916, is still used as a hostel by the University. In 1940 the college moved to its present spacious campus of over 100 acres on the scenic banks of Lahore Canal.

FCCU has been served by a large number of distinguished educational leaders and teachers throughout its history. Dr CW Forman, Dr Sir JCR Ewing, Dr CH Rice, Dr ED Lucas, Dr SK Dutta, Dr HC Velte, Dr JH Orbison, Nobel Laureate Dr Arthur Compton, Maulvi Muhammad Bakar, Dr HD Griswold, Prof JM Benade, Shamsul Ulema Maulavi Muhammad Hussain, Dr KC Chatterji, Dr P Carter Speers, Dr SL Sheets, Prof MS Bhatti, Maulana Farzand Ali, Dr RH Ewing, Dr EJ Sinclair, Dr Robert F Tebbe and Dr Carl Wheeless are among many who have impacted the lives of students and shaped the future of the college through the years. Under their leadership, the college became widely regarded as one of the very best in the entire subcontinent.

For many decades, FCCU has been widely recognized for its meritorious work of nurturing and consolidating the social and intellectual capital of Pakistan. The University motto, "By love serve one another," has been a guiding principle for Formanites throughout the history of the college. Among the graduates of the college are two Presidents of Pakistan, a Prime Minister of India, the first Chief Justice of Pakistan, a number of Governors and Chief Ministers of the Punjab and other provinces, an Attorney General of Pakistan, two Foreign Ministers of Pakistan, a President of the Security Council of the United Nations, numerous Ambassadors to other nations, a Chairman of the Pakistan Atomic Energy Commission, a Chairman of the Senate, a Chairman of the Pakistan Agricultural Research Council, several Speakers of the National Assembly, numerous Generals and Admirals and an equally impressive list of leaders in the fields of education, law, medicine, arts and entertainment.

FCCU has been a leader in the development of curriculum among the universities of Pakistan. Through the years the college introduced into the curriculum such subjects as the Sciences, Economics, Psychology, Geography, Technical Chemistry and Sociology. FCCU is the first college in the subcontinent in whose laboratories research work of Nobel Prize caliber was conducted and Dr Arthur Compton received the Nobel Prize in 1932 for research conducted, in a large part, at FCCU. In 1902, the college was the first in Punjab to admit women.

FCCU also has a distinguished record of performing service for the nation. At the time of Independence, the college converted two hostels into a hospital for refugees seeking medical assistance and thus began United Christian Hospital. During the Kangra Valley earthquake disaster in 1905, Dr JCR Ewing organized and led the relief effort. Similarly, at the time of the Quetta earthquake in 1935, the college did devoted relief work, this time under the leadership of Prof Jagun Nath. Social service by students was made popular by

Prof DJ Fleming many years ago.

In 1972, the college was nationalized by the government. It was returned to the present owners of the college on 19 March 2003. In March 2004, the government granted university status to FCCU. The University embarked upon an exciting new stage in its history in September 2005 when it began a fouryear Baccalaureate (Honors) program designed in accordance with worldclass standards for accreditation.

Mission
The mission of Forman Christian College (A Chartered University) is to impart, create and disseminate knowledge and to develop informed, ethical and responsible citizens who are prepared and committed to learn, lead and serve; persons who exemplify the FCCU motto, "By love serve one another".

Vision
The vision of FCCU is to be recognized as one of the very best educational institutions in the entire subcontinent. This is in keeping with the distinguished reputation established during the first century in its life.

Goals
The educational programs and the faculty approach to teaching are designed to graduate:
Empowered learners with strong written, oral and quantitative skills that they can use to evaluate a constant flood of information. The idea is to create in them the ability to think independently and critically, solve problems and continue a lifetime of self-directed learning. Informed learners who understand global and cross-cultural relationships, value the philosophy and history underlying the nation of Pakistan, and are fluent in both their native language and English.

Responsible learners who understand the ethical consequences of actions and are well-groomed to be active citizens who accept their public duty and participate in the decision-making process of a democracy.

Our Commitments

Commitment to Excellence
Forman Christian College (A Chartered University) operates all of its programs in accordance with the highest standards of excellence in education. The educational programs are designed and implemented in accordance with world-class standards of accreditation. The University has begun the process of seeking accreditation with one of the six regional accrediting associations in the USA.

Commitment to Individual Development
FCCU is concerned with the development of the whole person, and therefore encourages the intellectual, spiritual, cultural, social, emotional and physical growth of each student. We seek to prepare students for the basic responsibilities of life, and especially for competent and humane leadership and service. The FCCU experience is designed to help students go beyond the limitations caused by ignorance, narrowness, conformity, self-centeredness and irresponsibility. Our goal is to help individuals achieve excellence in thought and conduct.

Commitment to Core Values
The faculty and staff of FCCU seek to live by, and to teach students, its core values. In a

variety of different settings, students are asked to learn and live by the following values beginning with signing a 'Shared Commitment' document that highlights the practice of the core values on a regular basis.

Integrity
Integrity I will speak the truth and keep my commitments. I will take my responsibilities seriously and fulfill them to the best of my ability.

Excellence I will be steadfast in my pursuit of excellence. I will set high standards in my intellectual life, personal behavior and interpersonal relationships. I will honor the traditions of the University and preserve the beauty of the campus.

Respect for the Dignity of Each Human Being I will treat others with respect, kindness, generosity of heart and compassion. I will accept and tolerate differences. I will handle disagreements with candor and civility.

Discipline and Accountability for My Actions I will uphold the policies of the University and follow the rules and regulations. I understand that behavior has consequences. This understanding is an essential component in the development of my self-discipline.

Fairness and Justice I will be fair in all of my decisions and work towards justice for others.
 Service I will live by the motto "By love serve one another," knowing that serving others is a way of life that will enrich the community and the nation in which I live .

Community I will take the concerns of others in the University community to heart. Because we are bound together by common purpose, objectives and values, the welfare of all will be my concern.

Commitment of Faculty to Students
The faculty of FCCU is committed to student learning and to helping students succeed in their studies and be well-prepared for a meaningful and productive life after University. Students will form a close personal relationship with one or more members of the faculty, and this close student-faculty contact has been one of the strengths of FCCU throughout its history. Faculty members provide assistance to students, as needed, outside of the classroom, and they do not charge tuition for this help. Indeed, their contract with the University prohibits faculty members from charging tuition for extra assistance.

Commitment to Career Preparation
Enriched with the enduring qualities of a liberal arts education, FCCU seeks to graduate students who are well-prepared for success in their careers. Through the major field of study selected by the student, he or she will receive a basic knowledge of a particular field in enough depth to be successful in entry level positions in a career and to advance successfully to increased levels of responsibility on the job. However, it is impossible to predict what a person will need to know for success on the job twenty years from now, but we do know that in most jobs new knowledge will have to be mastered that does not even exist today. Therefore, it is more important to learn how to learn, how to think, how to solve problems, and how to communicate effectively rather than just to focus narrowly on the content of an academic discipline. The educational program is designed to help students develop these skills.

Commitment to Coeducation
All programs of FCCU are co-educational. FCCU first admitted women in 1902, and it seeks

to provide a learning environment in which both men and women can learn effectively and develop the character traits and personality that will enable them to succeed in later life. The core value of respect for the dignity of each human being is also an important consideration for creating a wholesome and positive atmosphere for learning for both men and women.

Commitment to Lifelong Learning
FCCU seeks to prepare students for a lifetime of self-directed learning. This will be essential for success in a rapidly changing and increasingly complex world. The faculty models this commitment by constantly learning about new knowledge in their academic discipline, and by participation in a variety of professional development programs presented to them by the University management to help them learn new approaches to teaching and learning.

Commitment to Equality of Opportunity
At FCCU, students, faculty and staff are free within the University from all forms of discrimination based upon gender, race, age, ethnicity, nationality, religion or physical disability. Decisions regarding employment and admission to the University are based upon merit. Grades in courses and graduation from the University are based upon the performance of the student in meeting course and graduation requirements.

Financial Integrity
FCCU is a private, not-for-profit education institution. All tuition and other fee income goes directly to the support of the educational program. Indeed, tuition and fees pay only a portion (approximately 69%) of the educational costs per student. Thanks to the support of donors, the balance of costs is paid from endowment and gift income from individuals, churches, corporations and foundations.

Campus

Forman Christian College (A Chartered University) has an impressive and well-maintained campus with all the facilities needed to create an environment that is truly academic and conducive to purposeful learning. Centrally located in a beautiful residential area of Lahore, the campus sprawls over 108 acres along the left bank of the canal.

There are two new purpose-built buildings for University students. Inaugurated in 2007, the Business and Social Sciences Building houses the Social Science disciplines including the Departments of Business Management and Economics. The Armacost Science Building is a modern state-of-the-art science building for the Departments of Biological Sciences, Chemistry, Physics and Computer Studies/Information Technology. It was inaugurated in February 2010.

The Ewing Memorial Library has been functioning since 1943 and now contains over 100,000 volumes. It has an automated Library Management System and state-of-the-art online and electronic reference services. Students can use the web-based Information Portal to search the library catalog and log in to their accounts to view their activity information. The Information Commons in the Armacost Science Building has computer and multimedia workstations, printers, study booths, an information literacy classroom and a research help desk. The Ahmad Saeed Administration Building (former N Block) houses administrative offices.

The Canteen cafeteria offers a setting for students to relax between classes. Basketball courts, a gymnasium, badminton and table tennis facilities are also located in Lucas Center

as are the offices of the Health and Physical Education Department.

Sinclair Hall houses the largest auditorium – seating 740 people – of the University. This is where major events including the annual play and Christmas pageant, etc. are held.
FCCU has a large sports ground in the center of campus that includes facilities for cricket, football and hockey, plus a 400-meter oval-shaped running track. A modern 25-meter swimming pool and six tennis courts are also located on campus.

Hope Tower provides accommodation for approximately 385 women on campus.
Learning is not restricted to the classrooms and many of the most important lessons learned during the University years are learned through participation in co-curricular and sports programs. FCCU offers a great variety of programs that provide opportunities for students to participate in activities that contribute to their learning and enjoyment.

Student Life
Learning is not confined to the classrooms and many of the most important lessons learned during the University years are learned through participation in co-curricular and sports programs. Forman Christian College Lahore offers a great variety of programs that provide opportunities for students to participate in activities that contribute to their learning and development and also helps students to understand the importance of critical thinking skills, time management, and academic and intellectual competence.

Residential Life
Residential Life strives to provide a safe and supportive residential environment that complements and extends the educational experience of students. An on-campus residential facility is available to women students only who come from different cities other than Lahore. Due to limited residential facilities, the Residential Life Office allots rooms to the students on a first-come-first-serve basis. The hostels are supervised by the Guardians with the assistance of senior students, they serve as Residential Assistants to supervise activities, and engage students in co-curricular activities.

Co-Curricular
FCCU is committed to providing a holistic education. Classroom learning is supplemented by opportunities for students' intellectual and moral growth through carefully planned literary, academic, cultural and recreational activities and programs. The Office of Student Activities coordinates and promotes activities through student societies. All academic departments have a student society besides campus-wide societies. Each society plans and conducts programs throughout the year that enrich the learning experiences of students and provide leadership opportunities for students.

Student societies have their own website: www.fccsocieties.org. The following societies are currently functioning:

Armacost Psychological Society	Forman Statistics Society
The Art Junction	FCC IEEE Chapter
Bazm-e-Fikr-o-Nazar	Formanites Debating Society
Benade Physics Society	Formanites Education Society
Character Building Society	Formanites Journalism Society
Christian Life Program	Griswold History Society
Dean Geography Society	International Affairs Society

Earth Watch Society	Islamic Society
Ewing English Society	Leadership Forum
FCC ACM Chapter	Lucas Economics Society
Forman Biology Society	Philosophy Society
Forman Dramatics Society	Forman Sports Society
FORMUN Model United Nations	Rotaract Club
Forman Music Society	Speers Chemical Society
Forman Pharmaceutical Society	Undergraduate Mathematics Society
Forman Photographic Society	Women's Empowerment Society
Forman Political Science Society	Young Entrepreneurial Platform
Forman Sociological Society	

Religious Life

As a University, we are committed to cultivating solid values, and strengthening positive character and discipline in our students. For Muslim students, there are two mosques on campus. Juma prayers are offered at the main mosque. We also convene Dars-e-Quran classes together with symposiums and discussions to which eminent Muslim scholars are invited to deliver talks and/or to engage students in discussions on important religious, social and moral issues. For Christian students a weekly chapel service is offered on Friday. In addition to the weekly chapel program, we offer regular Bible study groups and opportunities for volunteer service. No classes are scheduled on Friday during Juma or Chapel time.

Sports

Athletics and Sports Department along with Sports Society organizes, promotes and conducts games. The Sports Society oversees a very active intramural sports program with competition in athletics, basketball, cricket, football, hockey, table tennis, wrestling, lawn tennis and swimming. Players at all skill levels are welcome to participate, and often these competitions and matches are quite competitive. Selection in the University team and participating in inter-varsity competitions can be a source of pride for the player.

Cafeterias

Student-faculty-staff social interaction in a more relaxed setting takes place at the Cafeteria. The faculty is available to assist students outside the class, and the Cafeteria is occasionally an appropriate setting for this interaction. More typically, it is simply a place for students to go for lunch or snacks between classes.

On-Campus Health Services

Mercy Health Center is an on-campus facility focused on promoting wellness and providing medical care for our campus community. The medical team includes a full-time doctor as well as several fully certified nurses. The Health Center has on-going relationships with several nearby hospitals and medical laboratories for cases that require specialized attention. Mercy Health Center provides the following services:

· Treatment of minor injuries and illnesses
· Confidential medical guidance and support
· Health guidance for students living with chronic illness/disability
· Referrals to outside medical care and community resources
· Seminars and small group classes on various healthy living topics

Writing Center
FCCU's Writing Center is an establishment that primarily guides students in their writing and research needs. The demands of writing at university level are highly specialized and may require coaching outside the classroom. FCCU is one of the few universities in Pakistan to boast a functional writing center. The facility provides students one-to-one tutoring for their specific writing needs with trained tutors. Students may sign up for appointments or walk

in to meet a tutor at their convenience. The Writing Center also arranges workshops run by experts on different aspects of university level writing and research.

Counseling
The Campus Counseling Center, located in the Mercy Health Center, is a facility to help students deal with concerns and difficulties that they may not want to discuss with family, friends or their teachers. The Counseling Center offers an emotional and physical space for the Forman community to share openly and honestly without the fear of judgment. Individual counseling plans are devised to suit the unique needs of each client. Campus Counseling Center provides the following services:
·   Individual and confidential counseling
·   Referrals to other professionals when needed
·   Crisis intervention
·   Seminars and workshops
·   Access to books and articles that deal with mental health and emotional wellbeing

Discipline
·   All students are expected to act with dignity and self-respect, to be honest, considerate, well-behaved and courteous. Moreover, students must observe strict disciplinary standards. The decision of the Rector in all disciplinary matters shall be final and legally binding on all students. Proctors maintain discipline, enforce rules of good conduct and take disciplinary action against students wherever required:
·   Students are required to observe the rules and regulations governing their studies (both theory and practical) as may be made from time to time
·   Students are expected to attend all lecture and laboratory session and academic activity of the classes in which they are enrolled
·   Acts of dishonesty and cheating, especially during examinations, are strictly prohibited, and subject to punitive action if proven
·   Students are required to abstain from undesirable behavior that poses a threat to any fellow student, faculty or staff member or any other person working as an employee of the University

Any student involved in the following activities will face serious disciplinary consequences that will lead to fine or/and parents' undertaking or/and expulsion from the University for period of one semester or one year depending on the severity of the offense.

· Caused, attempted to cause or threatened physical injury to another person (i.e. fighting etc.)
·   Willfully used force on another person except in self-defense
· Possession of a dangerous object that can cause harm or injury to another person (i.e. metal rod, knife, gun etc.)
· Selling, possession or use of alcohol, drugs, intoxicants, or a controlled substance.
· Possessing or smoking tobacco or using tobacco products of any kind.
· Hate violence and/or degrading or inflammatory behavior towards others, including hazing.
· Offering to sell a controlled substance and delivering a substitute.
· Continued disruption of class or university activities or repeated willful defiance of

University authorities.
· Intimidation or bullying or threats to university staff and student(s)

Dress Code
The purpose of the FCCU dress code is to ensure that our students are dressed in a dignified manner. This means that the clothing worn should be clean, neat, modest and reflective of the culture in which we are operating. The FCCU ID card must be visibly displayed at all times on campus.

Sexual Harassment Policy
Sexual harassment is unacceptable behavior at Forman Christian College (A Chartered University) and such behavior will be subject to disciplinary action. Harassment refers to behaviors that are intended to be offensive, threatening or disturbing to the recipient. To harass is to persistently annoy, attack, or bother someone.

Sexual harassment is defined as any unwelcome sexual advance, request for sexual favors, or other verbal or physical conduct of a sexual nature that is offensive, embarrassing, intimidating or humiliating. This includes:

· Instances when the harassment has the purpose or effect of unreasonably interfering with an individual's work performance or creating an intimidating, hostile or offensive environment
· Instances when submission to the harassment is made either explicitly or implicitly a term or condition of fair treatment

Specific examples include, but are not limited to:

· Touching in an inappropriate way

· Staring or leering

· Requests for sex

· Subtle pressure for sexual activity or sexual innuendoes

· Display of sexually explicit pictures

· Repeated references to various parts of the body at inappropriate times

· Requests for dates when the other person has made it clear that she or he is not interested

· Hooting, whistles or other suggestive noises or gestures

· Suggestive comments or jokes

· Insults, name-calling or taunts based on a person's gender

· Derogatory graffiti referring to a person's character or making sexual implications

· Sexually explicit emails, text messages, social media communication, etc

· Spreading rumors about another person's sexual behavior

· Intrusive questions about a person's private life or body

· Any romantic or sexual behavior that you would consider to be inappropriate if directed at a member of your family

Sexual harassment does not refer to compliments or other behaviors that are considered to be socially appropriate.

There should be no relationships of a romantic or sexual nature between any faculty or staff member and a student. There is no exception to this. A student should not attempt to initiate such a relationship for any reason. There should be no attempt by a student to gain better grades or access to exams or assignments by encouraging or offering such relationships. Any pursuit of such relationships by a faculty or staff member should be immediately reported to the counselor or the Chief Student Services Officer.

All faculty and staff members are required to report instances of harassment if they are aware of any. Any faculty or staff member encouraging a student not to report such instances will be subject to disciplinary action.

FCCU has adopted the Code of Conduct from the Protection against the Harassment of Women Act of 2010.

The link to that full document can be found at www.aasha.org.pk.

Merit Scholarships And Teaching Assistantships

Merit scholarships and limited teaching assistantship opportunities are awarded to students entering the Postgraduate programs based on the merit determined by the department concerned. Students qualifying for merit scholarship or teaching assistantship are required to submit an application form in Financial Aid Office along with required documents.

Other Scholarships
There are also some other scholarship opportunities which Postgraduate students can avail if they meet the eligibility criteria of the concerned organizations/donor agencies. Following are the details of scholarship opportunities:

The Punjab Educational Endowment Fund (PEEF) offers full-fee scholarships along with stipend to Postgraduate students who fulfill the prescribed criteria. For more details, you can visit: http://www.peef.org.pk/ MasterLevelScholarship.asp.

Application forms for PEEF scholarship are submitted in the Financial Aid Office, Room 015 Ahmad Saeed Administration Building.

Important Note: All scholarship opportunities are advertised on Financial Aidpage of FCCU's website.

Academic Policies

FCCU is continuously expanding its Postgraduate programs based on the availability of required infrastructure, expertise and demand. Keeping this in view, MPhils and PhDs in various disciplines of Natural and Social Sciences and Humanities have been recently

launched. The purpose of Postgraduate Policy is to make uniform rules and regulations governing these programs.

Maximum Duration of Graduate and Postgraduate Programs
Unless specified in the departmental section, the maximum duration a student can remain enrolled in a postgraduate program is twice the minimum duration of the program. A further extension of one year can be granted as an exception by the Rector for MS/M.Phil.

The student, after lapse of such period, has to go through the readmission procedures afresh (application, tests, interviews, etc.) in competition with the new cohort of that academic year - i.e. readmission is a privilege and not a right

Payment of all charges (admissions plus cost of courses/credits retaken) would be at the rate applicable at that point of time

Such students are to be treated as transfer students and thus it is the prerogative of the Department to decide which courses merit transfer

Deficiency Courses
These are undergraduate courses that are required to be taken to overcome any deficiency in the postgraduate student's understanding of the relevant topic(s). These are not courses that are required to be eligible for admission. However, such courses are to be taken as per direction of the PG Program Coordinator or Department Chairperson. Enrollment in these courses need approval of the respective Dean. They are charged in addition to the post-graduate tuition, at the prevailing per-credit tuition rate. These courses are listed on the student's transcript as "Postgrad Background Requisite", and are graded on a pass/fail basis only. Credits earned are for information purposes only, and are not part of the student's Term or Cum GPA.

MS/MPhil Programs

The MS/MPhil will generally consist of 2 semesters of coursework during the first year, and 2 semesters of thesis in the second year. However, some departments may have more than 2 semesters of coursework. The maximum registration in MPhil programs is for four years.

Admission
Postgraduate admissions lie with departments. Students may be admitted in the first or second semester. Transfer students can be admitted any time provided they meet the eligibility requirements. Criteria established for admission is GPA 2.0/4.00 or 60% for conventional Master's students for admission to MS/MPhil. Students will take either the GAT or an internal test devised by the department.

Course Credit
The MS/MPhil will have a minimum of one year of coursework. The coursework is expected to take one year, but students may repeat a course, if they wish, in order to get a better grade. In the Natural Sciences, Journal Club/Seminar is for 2 credits, whereas in Humanities and Social Science it can be up to 3 credits. A student with a CGPA of below 2.50/4.00 during coursework is placed on probation. Students must have a CGPA of 2.50 before proceeding to the thesis research. A student has the right to retake a course on payment to meet the benchmark of research. If a course is not being offered in a particular semester, the student may take an alternative course with the permission of the Chairperson of Department. A student may take a retake with any letter grade, B to F.

To graduate, a student should have a CGPA of 2.50 or more.

If the student is registered to retake a course in the following semester to meet the benchmark. However, the student will not be allowed to appear for the thesis viva until the CGPA requirement is met. Billing for tuition will be done per annum, paid per semester. Any other arrangement will have to be done with the agreement of Accounts Office.

Billing per credit will only be done for courses that are retaken. The charge for tuition is the same whether the year is for coursework or thesis. If a student goes beyond the second year, he/she must register and pay full tuition for every subsequent semester taken. Same deadlines for payment as undergraduates as stated on the Academic Calendar will apply. The maximum registration in the MPhil program is for four years.

Thesis Synopsis/Proposal
The thesis synopsis or proposal will be developed after the coursework is complete. The formal MPhil thesis synopsis must be approved by the Board of Study of the Department, and the Board of Advanced Studies and Research of the University. This may either be a synopsis or a proposal, depending on the department. Departments are encouraged to be flexible. Once the synopsisor proposal is approved, the title is sacrosanct. If the title changes, it must go back to the Board of Study of the Department for approval. An MPhil thesis may be supervised by an MPhil or PhD, although a PhD is preferred. The time limit on the MPhil thesis is 3 years. No faculty may supervise more than 5 MPhil theses at a time.

Guidelines for Thesis
Thesis Format (available on FCCU webpage) needs to be adhered to.
The lower word limit for the thesis can be set by the Board of Studies of the Department. Before the submission of the thesis, the advisor will ensure that the thesis has undergone a Turnitin check and report is attached. If the thesis passes the review, the committee will send it to external examiners. A list of external examiners who are experts in a variety of fields is prepared by the Department and approved by the Board of Studies and the Board of Advanced Studies and Research. When the thesis is submitted, it will be sent to one external examiner from the pre-approved list by the Controller of Examinations. If an external examiner declines to review a thesis, another person on the list will be selected. Also, if the external reviewer does not make a decision on the thesis in the time allotted, another examiner from the list will be identified. If the external examiners do not pass the thesis, the student may rewrite it to address deficiencies identified. It must then be resubmitted to the external examiners if required. Once the thesis is reviewed by the external examiner, a mutually agreed date will be set for the oral examination during which the candidate presents the finding of the research. A grade would be awarded based on the evaluation of the external examiner and notified through the Controller's Office.

PhD Programs

Admission requirement:
For admission into a PhD program the Minimum CGPA Requirement for admission in PhD programs, is 3.0 (out of 4.0 in the semester system) or First Division (in the annual system) in the most recent degree obtained (BS/MS/MPhil) is required, whether such was degree obtained from an HEC-recognized Pakistani or accredited foreign university.

Testing Requirement:
Applicants to PhD programs shall be required to fulfil the following testing requirements:
a. All applicants to PhD programs shall be required to take one of the following non-subject specific admissions test:

i. The Graduate Record Examination (GRE) test administered by the Education Testing Service;

ii. A graduate admission test administered by the Education Testing Council; or

iii. With the permission of the HEC, an equivalent test developed by the university, or by another university, for admissions to graduate programs.

b. Subject tests shall not be required for admission to most PhD programs, with the possible exception of certain science disciplines, at the discretion of the university.

Subject Test:
Students seeking admission in a PhD program, in sciences, shall appear for the relevant subject test. The test would be conducted by the University Committee of PhD faculty members in the subject area and be at par with GRE Test. The qualifying level for this test is 70%.

Transfer of Credits:
The limit of postgraduate transfers is two postgraduate courses

Coursework
Students enrolling from the BS stream shall have to do 48 credit hours of coursework, whereas entrants from MS/MPhil stream shall require 24 credits coursework, as prescribed by the program. Deficiency courses, if any, of the studies may be determined by the admitting Departmental PhD Committee. Thus, a student may be enrolled, on the recommendation of the supervisor, in a bachelor's or MPhil course, which he/she has not taken earlier; BS per credit fee will be charged for undergraduate deficiency courses and the MS/MPhil per credit rate will be charged for master's deficiency courses.

PhD Thesis
Thesis Format (available on FCCU webpage) needs to be adhered to. The synopsis or proposal for the PhD thesis must be approved by the Board of Study of the Department and by the Board of Advanced Study and Research of the University.

There must be a Departmental PhD Committee which approves topic and synopsis or proposal. There will also be a supervisory committee comprising of a supervisor and two other faculty members not necessarily from the same department, who will advise and monitor the progress of the research. The function of the supervisory committee is essentially to keep the process moving.

The Department will draw up a list of external examiners from industrially advanced countries (available on HEC web portal) who are experts in a variety of fields, and approved by the BoASR. After receiving positive evaluation from at least two external examiners, two local external examiners are appointed from the approved list. A date is mutually set for an oral defense of the thesis.

The candidate will give a presentation. Anyone on the University faculty can attend and ask questions. Based on an evaluation by the viva voce committee constituted for the purpose that includes the Chairperson of the Department, Supervisor and the external examiner, the student passes or otherwise.

Research:
After successfully completing course work, students are required to register for research work, towards their dissertation, in every semester until commencement.

Foreign Expert Evaluation:

In addition to the PhD committee members, the PhD dissertation must be evaluated by at least two external experts who may be either:

a. Pakistan-based Distinguished National Professors, Meritorious Professors, or Tenure Track Professors, or

b. PhD experts from academically advanced countries (approved list of academically advanced countries for evaluation of PhD Dissertation per HEC specification).

If the PhD candidate publishes his or her dissertation research, as first author, in a peer reviewed journal that is classified by the HEC as category X or above, the PhD dissertation will only require evaluation by one external expert.

Plagiarism Test:

A plagiarism test in accordance with the HEC's Plagiarism Policy must be conducted on the dissertation before its submission to the external experts.

Copy of PhD Dissertation to HEC:

A copy of PhD Dissertation (both hard and soft) must be submitted to the HEC for record keeping in the PhD Country Directory.

Comprehensive Examination:

Following the completion of PhD coursework, every PhD student shall be required to pass a comprehensive examination in order to be granted candidacy as a PhD researcher; provided that if the student fails to pass the comprehensive test, he or she shall be allowed one more attempt to take the test. The comprehensive exam shall be based on the higher level courses and shall be formulated by the Departmental PhD Committee. The comprehensive exam should be the same for all students in a given cohort.

Degree Completion Timeline:

The PhD degree shall be awarded by universities after a minimum of three (3) years and not more than eight (8) years after the enrolment of the student provided that for students who are unable to complete the program within eight (8) years, the Board of Advanced Studies and Research will determine whether the delay was caused by circumstances beyond the student's control, and if so, grant an extension in such exceptional circumstances; provided further that in no event shall the PhD degree be awarded more than ten (10) years after the enrolment of the student in the program. The date of notification of the award of the PhD degree, subsequent to the PhD defense, shall be considered to be the date of the completion of PhD studies.

Students must register for courses during the first year.

A PhD student will submit a PhD synopsis to the Departmental PhD Committee and subsequently the Board of Studies within six months after successfully completing course work (CGPA ≥ 2.75) and passing the comprehensive exam (in no more than two attempts), to earn Candidacy in PhD.

The synopsis will then be sent for approval to the Board of Advanced Studies and Research (BASR). The approval of PhD synopsis by the BASR is mandatory before starting research as a PhD candidate.

A PhD student shall present at least two departmental seminars on the research work before

submission of the Dissertation for evaluation. One of those will be the synopsis defense highlighting the novelty, aims, and approaches for completion of the research and the second will be the Departmental Seminar before the submission of the Dissertation.

At the time of admission, a PhD student may apply to transfer the credit hours of MS/MPhil/PhD courses after proper permission by the Departmental PhD Committee. The credit transfers will only be allowed from an HEC recognized University as per HEC criteria.

Semester-wise progress reports, duly signed by the Supervisor, must be submitted to the Departmental PhD Committee. In the case of two consecutive adverse reports by the Supervisor, the Board of Advanced Studies and Research will recommend that the authorities cancel the candidacy of the student.

In certain exceptional circumstances, a change of supervisor may be allowed on the concurrence of the current and proposed supervisor. The change of supervisor will be finally approved by the Departmental PhD Committee and Board of Advanced Studies and Research.

A co-supervisor may be allowed from within the Department/University or from another University/ Research Organization if essential to the research of the PhD student. Permission will be granted on the recommendation of the supervisor and the Departmental PhD Committee and Board of Advanced Studies and Research.

Exit from PhD Program:
The MS/MPhil degree can be awarded on the basis of PhD Studies. If a student successfully completes the full set of requirements for the award of an MS/MPhil (or equivalent) degree during the course of their PhD studies, the university may award the applicable degree to such students upon completion of the relevant requirements. They may depart the program or are permitted to continue so as to earn the PhD.

General Policies

Class Attendance
Students are expected to attend all classes and laboratory sessions in the courses for which they are registered. Students who miss classes are far less likely to succeed in meeting the requirements of the course. The University's minimum accepted attendance is 67%; however, individual teachers may set higher requirements. Each teacher outlines his or her expectations for class attendance in the course syllabus. Teachers are expected to keep accurate records of student attendance. If a student does not attend the percentage set by the instructor on the course syllabus of the class and laboratory sessions, he/she will not be permitted to take the final examination in the course.

Academic Review
At the close of each semester the Academic Review Committee reviews the progress of every student who fails a course, receives a voluntary withdrawal (W), has more D grades than B or better grades, is on academic probation, or is otherwise identified as not making satisfactory progress. The Committee may place on probation or dismiss any student who according to its judgment is not making satisfactory academic progress.

Academic Integrity Issues
The Academic Integrity Committee will review all cases where student breach of Academic Integrity has taken place. This includes but is not limited to cases of forgery (signing by

students for advisors/faculty/staff), and plagiarism. All cases of forgery will entail a fine and an automatic hearing by the designate committee.

Termination of Study
A student at Forman can have his/her study terminated – enrolment annulled, on the following grounds:
(1) Completion of the Degree after obtaining accounts clearance (completion of degree audit and official listing in graduation booklet at commencement).
(2) Withdrawing from the University after obtaining clearance.
(3) Completion of the Tenure of the programme (double the minimum duration of the program).
(4) Removal from the rolls on disciplinary or Administrative reasons (breach of academic integrity, etc.).
(5) Decision of Academic Review committee recommending dismissal.

Such students can reapply for enrolment anew, other than ones removed from rolls on discipline grounds, in competition with fresh enrolment, as transfer students, and the Departments can look at what courses can merit transfer. (needing to complete 50% credits at FCC including transferred courses).

Transfer Policy for Postgrads
Credit is earned by migration or transfer from another degree-granting institution recognized by the Higher Education Commission or accredited in the USA or UK. A student transferring to FCCU from another institution should request a transcript of work done in the other institution to be sent to the Admissions Office. When the transcript has been evaluated by Academic Services Office, the applicant is notified of the credit acceptance by the Admissions Office.

Policy for transfer is applied to Post Grad students (including our own students seeking readmission).
(1) Students admitted/readmitted to the M.Phil./MS/PhD, after fulfilling all the admission requirements.
(2) The departmental admission committee determines which courses to transfer.
(3) Transfer the courses only with letter grades of B or above (as per HEC Policy), such courses that are present in, or are closely related to our courses in the postgraduate catalog.
(4) The department admission committee can also recommend these students to study courses (both graduate and undergraduate – on payment) in addition to the courses that can be transferred at FCCU.
(5) These students cannot transfer directly into research (all coursework transferred) unless the supervisor or co-supervisor is the same as the synopsis needs to be approved by the BASR afresh.
(6) Need to complete 50% of credits at FCCU.

Process
A student transferring to FCCU from another institution should first submit an official transcript of work done in the other institution to the Admissions Office. Upon submission of the transcript, a process of evaluation is begun.

This process can take up to two weeks and must be started at an appropriate date. During this time, the applicant can conditionally continue to fulfill the admission criteria and

application procedures. When the transcript has been evaluated, the applicant is notified of the credit acceptance by the Admissions Office.

Registration Policies

Unofficial Presence in Class
Students are only allowed in class when they are officially registered for it. An instructor confirms official registration by checking the class roster. Students must attend classes of all registered courses in a particular semester to earn a grade. An NS grade will be given to students who do not attend classes.

Registration Timeframe
Registration dates are published in the academic calendar. All courses for which the student wishes to earn credit must be registered through student web services. The student is responsible for every course listed on his/her account schedule and can receive no credit for courses not listed here.

After registration, official changes in registration may be made only during official add/drop periods when access to registration is again available online. No course may be added after this deadline.

Confirmation of Registration
Upon completion of the registration procedures as outlined in the registration post on the University website, the student's registration is confirmed on payment of the estimated bill provided on the students web account. Payment must be made in entirety by the last date mentioned on the academic calendar.

Research Registration Continuity
As the minimum duration to complete MS/M.Phil is two years (4 semesters) that includes one year of coursework and one year of research theses/dissertation and PHD is three years (6 semesters) that includes one year of the coursework and two years of research theses/dissertation. In order to ensure the student registration into research course of MS/M.Phil or Phd and to avoid inconvenience for other administrative offices and students, the research thesis/dissertation will be divided into XXXX699A and XXXX699B for MS/M.Phil and XXXX799A, XXXX799B, XXXX799C and XXXX799D for Phd students.

Furthermore, if the research thesis/dissertation is extended after completion of minimum required semesters, the student must register for research course again. Whereas, the previous research course will remain on student's transcript with "I" grade. It will have no effect on GPA/CGPA/credits and latest research course grade will be considered as final and the same grade will be counted towards calculation of CGPA.

Business Holds
Students whose dues remain in arrears will be put on business holds. Students can reregister during add/drop for any lost courses. All courses on a student's schedule at the end of add/drop will be charged. No courses will be deregistered but a business hold will be placed on the account and no further registrations will be done until all fees are cleared. A fine will be charged for fees paid after the stated deadline.

Grading Policies
Grades are final as given by an Instructor unless a reason exists for change as stated below. All grades will be locked onto the transcript at the time of degree awarding and will not be changed subsequently.

Grading Legend

Grade	Point Value	Numerical Value	Meaning
A	4.00	93-100	Superior
A-	3.70	90-92	
B+	3.30	87-89	Good
B	3.00	83-86	
B-	2.70	80-82	
C+	2.30	77-79	Satisfactory
C	2.00	73-76	
C-	1.70	70-72	
D+	1.30	67-69	Passing
D	1.00	60-66	
F	0.00	59 or below	Failing
NS	0.00	0.00	Did not show up in class
W			Officially Withdrawn
AW			Administrative Withdrawal/
			Dismissal
AU			Audit/Listener Status
I			Incomplete
T			Transferred credit

Transcript Updates

It is the student's responsibility to check his/her transcript after grading each semester and apprise the Academic Services Office of errors resulting in incorrectly placed Academic Probation and incorrectly applied Repeat to course credits.

Additionally, any course taken to replace an exempted course must be brought with proper approvals to the Academic Services Office for substitution immediately after grading.

Grade Change Policy
If an instructor of a student determines that a grade was issued incorrectly because of a

clerical or procedural error (a calculation error or one in transcribing the grade), it can be corrected by submitting a grade change form to the Academic Services Office or by submitting a grade change request remotely via EMPOWER login.

The manual procedure is as follows:
An original grade change form must be picked up from the Academic Services Office by only an Instructor of the course for which the change is being made.

- Forms will not be given to the student requesting the grade change or department administrative staff
- Grade Change forms must not be stored in excess by instructors/ departments
- The grade change form must be filled completely:
- The reason for the change must be stated clearly
- The form must be signed and dated by the instructor.
- If the instructor is no longer on faculty, the grade change form can be processed by the department Chairperson with approval from the respective Dean of Faculty
- All grade changes carry a time limit
- Incompletes in courses and any other grade changes due to typing errors or miscalculations will continue to be accepted by the Academic Services Office up to 8 weeks of the following regular semester.
- Research should be awarded an "I" in the semester registered and changed within 3 years
- A late grade change form can be submitted to the Academic Services Office after approval of the Dean of Faculty but final approval will be granted by the Vice Rector

The grade change form must be submitted in person by the Instructor within the stated time frame. Only original forms will be accepted for grade change. Photocopied grade change forms will not be approved.

Grade of 'I' (Incomplete)
A grade of "I" (Incomplete) indicates that, although a substantial proportion of the course requirements have been met, the student has not completed all course requirements by the end of the term In the judgment of the instructor, the student:
- Has been in good standing
- Is facing an emergency situation beyond his/her control

A student must submit the work required within six (6) weeks of the following semester. If the work is not completed the grade of incomplete "I" is changed to an F.

An Incomplete should never be given to a student who has performed poorly during the entire semester and wants extra time to improve the grade.

Research should be awarded an "I" in the semester registered and changed within 3 years.

Retaking a Course
The first is where a student has received a letter grade of B or F in a course. In this situation he/she is allowed to retake that course. The second earned grade will count and be factored into the CGPA

If repeating a course has caused double credits to appear on a transcript, the student must apprise the Academic Services Office of this anomaly and get it corrected immediately to avoid untoward circumstances delaying graduation.
Withdrawal Policies

Course Withdrawal (Online Form)

Students are allowed to withdraw from a course until the end of the tenth week of the regular semester. Students who withdraw from a course by the withdrawal deadline will receive a grade of "W" by the instructor

If a student does not officially drop a course or withdraws from a course after the deadline, he/she will receive a grade of F or NS

In circumstances where Academic Policy has been breached or disciplinary action taken, the Vice Rector's Office may award an AW (Administrative Withdrawal) to a student and withdraw the grade given for the applicable course.

In extreme circumstances beyond the student's control, such as illness, accident or death of a parent, permission will be granted to withdraw after the withdrawal deadline. In extenuating circumstances "W" will be awarded by the Vice Rector's Office

Temporary Withdrawal/Leave of Absence (Discontinuing for One Semester or Year)
A Temporary Withdrawal means the student has decided to discontinue one semester or one year of studies. Depending on the date of withdrawal, the student may be entitled to a refund

Students who need to withdraw should initiate the process by meeting first with their Department Chairperson and then with the Vice Rector, completing the withdrawal form and providing appropriate documentation to support their request to withdraw

Students who are recipients of financial aid must consult the Office of Financial Aid to confirm if their withdrawal will have any impact on their financial aid eligibility

The Vice Rector will forward the withdrawal form along with documents to the Head of Academics as soon as the decision to withdraw has been made

University Withdrawal (Online Form)
A University Withdrawal is defined as leaving the university permanently. If a student decides to leave the University, the procedure to be followed is given below:

The University Withdrawal Clearance form must be downloaded from the website

It is the student's responsibility to obtain clearance from the Library, Computer Lab, Chief Proctor, Accounts Office and Science Laboratories
- The University ID card must be returned to the Accounts Office
- On receiving the approved form with all clearances, the Academic Services Office will issue a "Letter of Release"
- The student must submit a copy of the "Letter of Release" to the Accounts Office in order to collect his/her security deposit
- If a student quits and fails to inform the University about the decision to discontinue at the University, he/she will receive failing grades for all courses. If the student does not cancel his/her registration prior to the drop deadline, he/she will be held financially responsible for applicable tuition fees.

Official Degree Audit
Degree Audits show progress towards a degree being earned at the University. It is mandatory that the student meet regularly with his/her advisor to keep a check on progress and plan for courses towards degree completion. The authority in degree audit is the published catalog which must be followed strictly. In terms of credit, overall, the minimum requirement to graduate depends upon programs.

Independent Degree Audit
After students have completed all degree requirements from their catalog, an independent degree audit is done by the Academic Services Office to determine compliance with Catalog requirements and eligibility for degree awarding.

The Academic Services Office will email and send SMS to students prior to commencement each year, that reflects degree completion status and eligibility for participation in commencement. It is the student's and advisor's responsibility to ensure that the requirements for graduation have been met specifically as stated in the published catalog.

Ineligibility for Commencement
If requirements have not been met, the student will need to report the matter to the Academic Advising Office and Academic Services Office, as well as apprise his/her department Chairperson of the situation. The degree application will need to be cancelled at the Academic Services Office and participation in Commencement will be withdrawn.

Urgent Degree
A student can apply for an urgent degree any time before Commencement provided the conditions for degree awarding have been fulfilled as stated above. Permission to walk in Commencement after receiving an urgent degree is granted by the Registrar's office.

If a student applied for Commencement, but his/her degree application was withdrawn for non-compliance, he/she can reapply for an urgent degree provided all requirements have been met at the time of application. A request for an urgent degree has to be given at the Academic Services Office. This process takes three weeks, and requires extra payment.

Anomalies in Departmental Offerings and Catalog Requirements
If anomalies exist between semester offerings and catalog requirements, students, along with their advisors must immediately apprise the department Chairperson of the need to facilitate them by offering a course that is listed on their catalog whether this is a core or a required elective.

One Course in Lieu of Another
If the department decides to change a core or required elective from a past catalog through deletion or dormancy or inactive, while the catalog is still active, the department Chairperson must:

· Acquire approval of the Dean of Faculty in regards to any exception being made in lieu of such a course, justifying its applicability to one or all students.
· The Dean will communicate this in writing to the Academic Services Office.

Policy on Privacy
FCCU guarantees both the privacy and the confidentiality of all student educational records and a student's right to access those records. The official custodian of student records is the Head of Academics. Processing of records is done through Academic Services Office Staff as authorized.

Access to student records is limited to the student, but can with the students written authorization and accompanied with the student ID, be granted to parents or guardian, current instructors, counseling and administrative staff with legitimate interests, or any party designated by the student.

Authorized officials of the government, accrediting agencies, as well as persons bearing a lawful judicial order or subpoena may also request access to student records by presenting proper documentation with a reason supporting such access.

A student or former student has the right of access to his or her records. However, the University may deny access if the student has unpaid financial obligations to the University. Requests for access or copies of records must be made in writing to the Head of Academics who will comply within seven business days. Following review, a student may request any portion of his or her record to be edited, provided that supporting documentation is produced or available.

Leave and Readmission
If a student drops out on informed leave for one semester, they may return with no extra procedure. After one year of uninformed leave, the student must go through readmission. Female students may live in the hostel, but are bound by hostel policy. They may remain in the hostel during vacations and summer holidays provided the Departments allow them to continue work during these times.

Time limits for lab working hours are determined by the respective departments. If a student wants to stay later, he or she must have special permission from the Chairperson of the Department, and one faculty member must be present. In the Social Sciences or Humanities, the student must leave within one and a half hour of the end of the last class unless he or she has permission to stay, a faculty member must be present.

Advisors
Advisors are selected/assigned during coursework. Advisors will be allotted one or two students each by the Chairperson of the Department after submission of recommendation. The Departmental Committee must first approve the title and synopsis or proposal, and then it is sent to Board of Studies. Any research proposal involving human and animal subjects needs to be reviewed by the Institutional Review Board. The University will maintain a record of all theses in the University library in both hard copy and soft copy form, and a soft copy is to be provided to HEC for uploading on its website. Access to a thesis may be restricted if a patent is involved. This includes sponsored research in which the sponsor owns the patent. Plagiarism or falsification of data in any way will be dealt under HEC guidelines and FCCU policies.

Postgraduate Medals

Engro Foods Medals:
Engro Chemicals is one of Pakistan's largest companies and their foods division is a high performer; these medals are awarded to the students securing the top three CGPAs amongst the University candidates in Master of Business Administration.
　　(1) Gold　(2) Silver　(3) Bronze

Shafqat Medal:
Dedicated to the father of Dr. Saeed Shafqat, Director of Centre for Public Policy and Governance at FCCU. The medal is awarded to the student securing the highest CGPA amongst the University candidates in Executive Master Public Policy.

Abdul Karim Medal:
Dedicated to the father of Dr. Zafar Iqbal Qureshi, former Dean, Faculty of Business and Management at FCCU. The medial is awarded to the student securing the highest CGPA amongst the University candidates in MBA Business Strategy.

C. R. Aslam Medal:
Dedicated to C. R. Aslam, a Forman Alumnus who graduated from Forman with an MA in Economics in the 1940's; Advocate Supreme Court, grandfather of Sarmad Sufian and

father of Dr. Sufian Aslam, Professor of Physics at Forman and a Forman Alumnus. C. R. Aslam was a renowned Political Economist and a labor and peasants' leader. This medal is awarded to the student securing the highest CGPA (3.500 or above) amongst the University MPhil/MS graduating class in the Department of Economics.

Research And Development

ORIC
The Office of Research, Innovation and Commercialization (ORIC) was established in July 2011 to encourage meaningful research by faculty and students and to forge linkages between industry, civil society and academia. ORIC's responsibilities are to:

Identify research grant opportunities for faculty to apply for funding Facilitate faculty to apply for research and amp, and travel grants

Provide legal, administrative and financial management support for research grants Support commercialization, licensing, etc of the University research products

ORIC also holds lectures and seminars with guest speakers to create awareness about various opportunities and themes for research in both social and natural sciences. This initiative increases the quality of undergraduate and graduate teaching at FCCU.

Objective
ORIC seeks to facilitate the growth of FCCU's research and economic development efforts and output so as to improve the University's industry competitiveness using innovation and becoming the driving force behind research and the economic development of Pakistan.

ORIC facilitates the University's research and external linkages through MoUs signed with the following organizations:

- Plan9
- LUMS
- PCSIR
- WWF
- HBL Foundation
- Commerce and Industry)
   BF Biosciences Ltd
- Pioneer Pakistan Seeds Ltd

- Waste Busters, Lahore
- Chughtai Lahore Labs
- International Center for Theoretical Physics
- LCCI (Lahore Chamber of
- Allama Iqbal Medical College (AIMC)/Jinnah Hospital
- FB Genetics

ORIC Management Includes
Dr Kauser Abdulla Malik, Director
Haroon Samson, Senior Manager

Academic Advising Office

Administration

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MS Clinical Psychology

Department of Psychology

The department of Psychology has been offering BA/BS Psychology for many years now. Over the years Psychology has become one of the fastest growing department at Forman Christian College (A Chartered University). More and more students opt for either majoring or minoring in Psychology every year. In 2017 a cognitive research lab and a psychological test recourse center were established in the department. With the establishment of the aforementioned, students will have more exposure of the apparatuses and tests, which in turn will enhance their learning and add to their repertoire vis-à-vis psychology. The BA/BS in Psychology covers a range of courses in breadth and depth. The faculty focus on the conceptual clarity of the concepts and emphasize on the critical thinking in terms of applying those theories and concept in the cultural context. Our students easily get admission in a graduate program both nationally and internationally.

MS in Clinical Psychology

Owing to our success at undergraduate level, the department strongly felt the need of starting a graduate program. After careful and deliberate thinking and diligent planning the department of Psychology offers an MS in Clinical Psychology. The duration of the MS in Clinical Psychology is two years and is a full-time program, five days a week divided in 04 semesters. The MS in Clinical Psychology program comprises of 46 credit hours of mandatory course work, a research thesis for 6 credits and minimum 840 supervised hours of clinical placement. Teaching will be in the form of lectures, discussion, tutorials, group projects, individual presentations, demonstrations, role plays and writing psychological assessment and clinical case reports based on their placements. The students would be required to do their supervised clinical placements in psychiatry departments of hospitals and/ or special education facilities.

Student Learning Objectives of MSCP

· Demonstrate an understanding and integration of different theories of Clinical Psychology

· Display a thorough knowledge of main classification systems (Diagnostic Statistical Manual of Psychiatric Disorder) and apply the knowledge to differentiate between different psychological disorders

· Administer and interpret different tools of psychological assessments and produce assessment reports

· Synthesize the knowledge of different interventions to produce and implement an effective management plan for psychological disorders

· Conceptualization of cases displaying cultural and individual sensitivity

· Effectively implement code of ethics to psychological assessment, diagnosis, intervention, and research

· Formulate a clinical case report based on individualized assessment, diagnosis, and intervention of psychological disorders

· Integrate the knowledge of psychological theories, statistics, research methods to develop and implement a research proposal

· Application of core clinical procedures to non-conventional clinical settings in the community

Admission Criteria for MS in Clinical Psychology Program:
1. Four-year BS (Hons) degree from an HEC recognized university in the discipline of applied or general Psychology, with a minimum of 2.5 CGPA and 130 credit hours.*
   OR
   Conventional MSc in applied or general Psychology with a minimum of 60% marks.*
2. The candidates will be required to pass both admission test and interview conducted by the department.
3. The selection shall be made on cumulative merit based on previous academic score and scores obtained in the written entry test and interview (conducted through departmental admission committee) with following weights.

Academic Qualifications	60 %
Entry test (written)	30%
Interview	10%
Total	100%

*Note: Provisional admission can be sought by students awaiting final results. Their admission will only be confirmed once they have submitted their complete official Transcript within the due dates.

Requirements for Award of Degree
1. MS in clinical Psychology is a full time professional training program.
2. Minimum 75% attendance is mandatory for appearing in examinations for all semesters.
3. For award of MS degree, candidates will require to complete 46 credit hours of course work. Trainees will be required to go for placements consisting of 840 supervised hours along with a minimum of 6 credit hours for research thesis.

Salient Features
· Thirteen full-time faculty members with primary appointments in Psychology; eight of them have extensive clinical backgrounds.
· A Psychological Assessment Center is equipped with personality, intelligence, aptitude, diagnostic and neurological tests.
· A Psychology Lab for students to do their own experiments.
· 840 hours of extensive supervised clinical training.
· Extensive clinical training for administering, scoring, interpreting and reporting psychological tests, as well as in clinical report writing.
· Extensive training in diagnosing disorders, differential diagnosis, and intervention.
· Hands-on training in making management plans for clients/patients.
· Training in professional ethics and international clinical practice standards.
· Numerous opportunities for personal and professional growth.

Resources
· One of the best clinical faculty on board. Most of the faculty members have a sound clinical experience of working in professional clinical settings nationally and internationally.
· Fully equipped Psychological Assessment Recourse Center which including intelligence tests, aptitude tests, personality tests, screening and diagnostic tests and neuropsychological assessment instruments.
· Well-equipped psychology lab that has a number of varied apparatuses to conduct experiments to enhance student learning

- Student teacher interaction is welcomed and encouraged in and outside classes that help the students to develop good relationships and also understand the role of boundaries in a relationship. Moreover, it helps them to hone their communication skills
- English language is used with the students at all times to enhance their level of English proficiency
- Ewing Memorial Library at Forman is well stocked with latest books, journals, and periodicals of Psychology
- Access to various electronic data basis.
- Many classrooms are smart classrooms that are equipped with multimedia and smart screens
- Rigorous clinical teaching and training to assess, diagnose, plan and implement clinical intervention. They also learn to write assessment and clinical reports
- Clinical placements at teaching hospitals and clinical institutes where the trainees would be supervised by experienced Clinical Psychologists
- The students get rigorous training in research too. The students also learn to write research academically, analyze the data, report the findings in an empirically manner and above all up hold academic integrity
- Ongoing workshops and seminars by national and foreign experts from the field of Clinical psychology to refresh or upgrade the knowledge of the students are regularly conducted.
- Clinical case conferences on regular basis would be held so that students learn from the experience of others and also learn to give positive feedback
- For the personal growth of the students "Growth Groups" are offered.
- A student body by the title of Armacost Psychological Society is in place to help students hone their leadership skills and also to learn to manage events under pressure

MS Roadmap (46 credits total):

Semester 1	Cr	Semester 2	Cr	Semester 3	Cr	Semester 4	Cr
Child Psychopathology	3	Adult Psychopathology	3	Biological Basis of Behavior	3	Community Wellness and Global Mental Health	3
Psychological Assessment for Children	3	Psychological Assessment for Adults	3	Adult Clinical Placement	280-Hours	Workshop	1
Therapeutic Intervention 1 (Behavior therapy, Gestalt therapy, and Client Centered Therapy)	3	Therapeutic Intervention 2 (Psychoanalysis and Cognitive Behavior therapy and Family therapy)	3	Thesis	3	Community Mental Health Placement	280-Hours
Legal & Ethical Issues	3	Child Placement	280-Hours	workshop	1	Thesis	3
Statistics	3	Research Methods	3	Case Conference	1	**Elective courses** • Psychopharmacology Medical Rehabilitation • Forensic Psychology	3
		Case Conference	1				
Totals:	15		13		8		10

Course Title PSYC501: Child Psychopathology
Credit Hours: 03
Course Description
This course provides an overall introduction to psychopathology and diagnostic clinical work with children and adolescents. It includes an overview of classification, the context of normal development, diagnostic procedures and techniques, issues of culture and diversity in regard to assessment and diagnosis, as well as some of the biological underpinnings of psychological development (genetics, temperament, etc.). Basic theoretical constructs from developmental psychodynamic, cognitive – behavioural, family systems and trauma perspectives are introduced to allow the student to generate hypotheses about clinical data in terms of etiology and treatment. DSM differential diagnosis is taught, and the major disorders are covered, including, but not limited to: conduct, oppositional – defiant and attention deficit hyperactivity disorders; learning disabilities; anxiety and depression; pervasive developmental disorders, psychosis.

Course Title PSYC502: Adult Psychopathology
Credit Hours: 03
Course Description
This course presents a broad overview of adult psychopathology, including, but not limited to, psychosis, mood, anxiety and personality disorders Course participants will examine and review critically the major historical and current perspectives regarding the etiology, diagnosis, and treatment of adult psychiatric disorders and will apply these perspective to contemporary, evidence-based clinical practice. Students will learn about the DSM and ICD classification systems, their controversies, and how to use these systems in clinical practice in order to use a common diagnostic language to facilitate assessment and treatment. The course will also examine the impact of socio-cultural variables on the development, personal experience, and meaning of psychiatric illness.

PSYC 503 Professional Development Group (Zero Credit)
This course provides an opportunity to the trainees (students) to get in touch with their own emotions such as fear, anger, love etc. They also will learn to utilize these emotions positively. Moreover, they will learn to help each other in a safe environment and train themselves to keep these matters confidential. The trainees will also learn to conduct themselves in a professional manner. They will get a chance to empathize, listen actively and use basic skills through different experiential exercises in a group setting.

PSYC 504 Self-Guided Study (Zero Credit)
This course is designed to help students learn to use the study skills that have been taught to them on their own, in pairs or in groups. Proving the trainees with a specific timing in which to study will also help them to learn the skills of self-discipline and time management. This course will also help them to improve critical analytical thinking through reflective exercises.

PSYC 505 Tutorial Study (Zero Credit)
This course provides an opportunity to the trainees to listen to different lectures by renowned international psychologists on broad range of topics such as rapport, NLP, personal development, Positive attitude training etc. They also will watch movies and clips related to clinical psychology such as anger management or I am sam.

Course Title PSYC510: Psychological Assessment for Children
Credit Hours:3
Course Description

This course will focus upon assessment theory and technique as it applies to cognition and intelligence. Students will be exposed to a variety of cognitive and intellectual measures throughout the course of the semester. Students will learn to administer, score, interpret, and report test findings. This course will also address a number of core topics: the fundamentals of test construction, its psychometric properties, the history and future of assessment, contemporary controversies, diversity, and special populations, are all topics that will be examined as they relate to cognitive and intellectual assessment. The course is designed as a "hands-on," pragmatic primer that will provide a beginning framework for all subsequent psychological testing endeavours.

Course Title PSYC511: Psychological Assessment for Adults
Credit Hours:3
Course Description
This course is designed as an advanced-level course that builds upon the basic principles learned in the psychological assessment sequence and applies them to the field of neuropsychological assessment. During this course students will learn about the theoretical and practical issues surrounding neuropsychological assessment in general as well as within the major cognitive domains (e.g., attention, executive functioning, language, visuospatial processing, memory). Specific assessment instruments will be critically reviewed and students will have the opportunity to enhance their testing skills through direct administration. Additionally, students will begin to develop skills in battery development, case conceptualization, and report writing. Class discussions and readings will explore how a neuropsychological evaluation can be used to better understand the complex relationship between nervous system function, cognition, emotion, and behaviour, and to apply this knowledge to the design of individualized patient interventions.

PSYC 512 Psychological Assessment Study (Zero Credit)
This course is designed provides a chance to the trainees to practice to administer, score and profile psychological tests that they will study.

PSYC 513 Student Seminar (Zero Credit)
This course is designed to help trainees brush up their presentation skills. They will give presentations on everyday problems such as anger management, assertiveness training, stress management. Faculty members will be present to facilitate discussion and provide feedback.

Course Title PSYC520: Therapeutic Intervention 1
Credit Hours:3
Course Description
Various interventions pertaining to clinical psychology will be covered. Moreover, this course will focus on research-based interventions used with children and adolescents. The emphasis will be on theoretical basis behind these interventions and their practical application.

Course Title PSYC521: Therapeutic Intervention 2
Credit Hours: 3
Course Description
Various interventions pertaining to clinical psychology will be covered. Moreover, this course will focus on research-based interventions used with children and adolescents. The emphasis will be on theoretical basis behind these interventions and their practical application.

Course Title PSYC530: Legal and Ethical Issues
Credit Hours:3
Course Description
This course provides students with a thorough review of the APA Ethics Code and other regulatory standards of practice. Ethics cases and their application (s) to clinical practice are used to deepen students' understanding of how these standards and principles are applied. The course also provides students with information regarding the current and changing picture of professional practice and its business component

Course Title PSYC545: Statistics
Credit Hours: 03
Prerequisite: PSYC 541
Course Description
This course deals with the principles and techniques of descriptive and inferential statistical methods applied to psychological research and program evaluation. Students learn when and how to apply simple parametric tests and some non – parametric statistical methods. Application and use of statistical software for completing analyses will be emphasized. The course also places a major emphasis on the interpretation of results and their implications for practice and/or policy.

Course Title PSYC541: Research Methods
Credit Hours: 3
Course Description
This course will cover the range of research designs encompassing both quantitative and qualitative methods. The emphasis will upon stating researchable questions in ways that can be systematically investigated, designing studies to answer such questions adequately, being aware of the appropriate types of analysis for various designs, developing knowledge of the advantages and disadvantages of the various approaches, and knowing how to critically evaluate studies that others have conducted.

Course Title PSYC550: Biological Basis of Behaviour
Credit Hours: 3
Course Description
This course focuses on the clinical and pathological aspects of neural processes associated with cognition, emotion, and behaviour. Focus will be on the biological bases of psychological disorders and their diagnosis through neuroimaging and other methods. This course will provide the background knowledge necessary to interact with practitioners within the field of neuropsychology and behavioural neurology. The principle goal of this course is an integrative approach to psychological conditions that transcends the mind-brain duality reflected in the separation of psychiatry and neurology.

Course Title PSYC 632 Forensic Psychology
Credit Hours: 3
Course Description
The course will cover the fundamentals of forensic psychology by focusing on the application of psychological principles to general and custodial forensic settings. It explains how forensic psychology crosses over with associated disciples such as sociology, criminology, law and clinical psychology. The content will help trainees to use concepts from different disciplines of psychology particularly clinical, personality, developmental, abnormal and testing psychology to understand and assess dimensions of offender

behaviours. It will introduce the students with ethical issues and standards specific to forensic psychology.

Course Title PSYC635 Psychopharmacology and Rehabilitation
Credit Hours: 3
Course Description
This course covers the use of medications in treating mental disorders. The focus will be on the principles of pharmacokinetics (what the body does to the medication) and pharmacodynamics (what the medications do to the body) as they apply specifically to the use of psychiatric medications. It will also cover rehabilitation in case of psychiatric and neurological patients.

Course Title PSYC670: Clinical Placement: Child
Credit Hours (280 supervised hours)
Prerequisite: PSYC 501, PSYC 510 and PSYC 520
Course Description
These courses consist of supervised clinical experience in approved setting. The focus will be on creating meaningful links between coursework and applied professional work. Each placement will be 4 hours, 4 days a week, for 14 weeks, totalling 280 hours.

Course Title PSYC671: Clinical Placement: Adult
Credit Hours: (280 supervised hours)
Prerequisite: PSYC 502, PSYC 511 and PSYC 521
Course Description
These courses consist of supervised clinical experience in approved setting. The focus will be on creating meaningful links between coursework and applied professional work. Each placement will be 4 hours, 4 days a week, for 14 weeks, totalling 280.

Course Title PSYC672: Clinical Placement: Community
Credit Hours (280 supervised hours)
Course Description
These courses consist of supervised clinical experience in approved setting. The focus will be on creating meaningful links between coursework and applied professional work. Each placement will be 4 hours, 4 days a week, for 14 weeks, totalling 280 hours.

Course Title PSYC580, PSYC680: Case Conferences
Credit Hours:2
Course Description
The purpose of this weekly case conference is to allow students the opportunity to present and participate in case presentations. The emphasis will be on case conceptualization. Students will practice creating clear and organized case presentations and reports. Additionally, students will learn how to provide and receive constructive feedback.

Course Title PSYC620: Workshop 1 and II
Credit Hours1+1
Course Description
Experts from different clinical fields would be invited to conduct workshops on significant clinical issues. These experts will focus on assessment, diagnosis and intervention of various clinical problems. The workshops will be conducted weekly. These workshops will help the trainees to familiarize themselves with common problems and also learn first-hand from the experts some state of the art strategies to assess and manage them.

Course Title PSYC630: Community Wellness and Global Mental Health
Credit Hours: 3
Course Description
This course will provide students with a broad introduction to public mental health, inclusive of exploration of topics such as social determinants of mental health, cultural aspects of mental health, the meaning of "being well", the culture of emotions, and global mental health.

Course Title: PSYC699: Thesis-I
Credit Hours: 03
Prerequisite: PSYC 545
Course Description:
An independent research project on a topic chosen by the student. This first section will focus on creating a research proposal, including literature review and proposed methodology. The research will be supervised by a faculty member of the psychology department with a co-chair of the student's choice.

Course Title: PSYC699: Thesis – II
Credit Hours: 03
Course Description:
An independent research project on a topic chosen by the student. This second section will focus on completing the proposed research project and writing up the results, discussion, and implications. The research will be supervised by a faculty member of the psychology department with a co-chair of the student's choice.

MS
Data Science

The MS (DS) program has been designed to give students the option to be part of a data science endeavor that begins with the identification of business processes, determination of data provenance and data ownership, understanding the ecosystem of the business decisions, skill sets, and tools that shape the data, making data amenable to analytics, identifying sub-problems, recognizing the technology matrix required for problem resolution, creating incrementally-complex data-driven models and then maintaining them to ultimately leverage them for business growth.

Learning Objectives
· To equip students to transform data into actionable insights to make complex business decisions.
· To enable students, understand and analyze a problem and arrive at computable solutions.
· To expose students to the set of technologies that match those solutions.
· To gain hands-on experience on data-centric tools for statistical analysis, visualization, and big data applications at the same rigorous scale as in a practical data science project.
· To understand the implications of handling data in terms of data security and business ethics.

Eligibility Criteria
The minimum requirements for admission in MS(DS) program are
a. A degree earned after 16 years of education in the following domains (Computer Science, Information Technology, Software Engineering, Computer Engineering, Electrical Engineering, Statistics, or Mathematics), AND
b. At least CGPA of 2.0 (on a scale of 4.0) or 60% Marks

Duration
The minimum duration for completion of an MS degree is two years. The HEC allows a maximum period of four years to complete MS degree requirements.

Degree Completion Requirements
To become eligible for the award of MS degree, a student must satisfy the following requirements:
a) Must have studied and passed the prescribed courses, totaling at least 30 credit hours.
b) Must have earned CGPA (Cumulative Grade Point Average) of at least 2.0 on a scale of 4.0.
c) A student has the option to pursue MS by undertaking either a 6 credit hour MS Thesis OR two courses (each of 3 credit hour) OR one course + Project

Course offering plan

Course types	Cumulative Credits
Program Core courses (3)	9
Specialization Requirement Courses (2)	6
Electives (3)	9
Thesis/Course-work	6

3 core courses
1.   CSDS 501 Statistical and Mathematical Methods for Data Science (3)
2.   CSDS 502 Tools and Techniques in Data Science (2+1)
3.   CSDS 503/COMP 552 Advanced Machine Learning (3)

2 Specialization Core Courses (Choose any 2)
1.   CSDS 551/COMP 566 Advanced Big Data Analytics (3)
2.   CSDS 552 Deep Learning (3)
3.   CSDS 553/COMP 554 Natural Language Processing (3)
4.   CSDS 554 Distributed Data Processing and Machine Learning (3)

Elective courses
Following is a non-exhaustive list of elective courses. New elective courses may be added to this list. Students may be recommended to make their choice of electives, in the light of a soft specialization within the field of data science.
CSDS 521/COMP 531: Digital Image Processing
CSDS 522/COMP 532: Advanced Computer Vision
CSDS 523/COMP 533: Advanced Topics in Computer Vision
CSDS 524/COMP 551: Advanced Artificial Intelligence
CSDS 525/COMP 553: Soft Computing
CSDS 526/COMP 555: Fuzzy Systems
CSDS 527: Python for Data Science
CSDS 528: Cloud computing
CSDS 550/COMP 561: Data Mining
CSDS 564/COMP 562: Data Warehousing
CSDS 565: Bayesian Data Analysis
CSDS 568: Algorithmic trading
CSDS 567: Computational Genomics
CSDS 555: Bioinformatics
CSDS 569: Probabilistic Graphical Models
CSDS 557: Scientific Computing in Finance
CSDS 558: Social Network Analysis
CSDS 559/COMP 634: 3D Computer Vision
CSDS 560/COMP 635: Computational Photography
CSDS 600/COMP 636: Biomedical Image Processing
CSDS 601: Distributed Machine Learning in Apache Spark
CSDS 602: High performance computing
CSDS 603: Inference and Representation
CSDS 604: Time series Analysis and Prediction
CSDS 605: Computational intelligence
CSDS 661: Applied Deep Learning
CSDS 662: Deep Reinforcement Learning
CSDS 663: Optimization Methods for Data Science and Machine Learning
CSDS 610/COMP 663: Information Integration on the Web
CSDS 611/COMP 664: Information Retrieval and Web Search
CSDS 612/COMP 665: Data Visualization
CSDS 665: Evolutionary Computation

Semester-wise course offering plan

Semester 1	Course Title	Credits
	Tools and Techniques in Data Science	2+1[1]
	Statistical and Mathematical Methods for Data Analysis	3
	Elective-I	

Semester 2	Course Title	Credits
	Advanced Machine Learning	3
	Specialization-Elective-I	3
	Specialization Elective-II	3

Semester 3	Course Title	Credits
	Elective II	3
	MS-Thesis-I/Course-work-I	3

Semester 4	Course Title	Credits
	Elective III	3
	MS-Thesis-II/Course-work-II/Project[2]	3

Course Descriptions
Statistical and Mathematical Methods for Data Science (3 credits)
Probability: Probability basics (axioms of probability, conditional probability, random variables, expectation, independence, etc.), multivariate distributions, Maximum a posteriori and maximum likelihood estimation; Statistics: introduction to concentration bounds, laws of large numbers, central limit theorem, minimum mean-squared error estimation, confidence intervals; Linear algebra: Vector spaces, Projections (will also cover the least regression), linear transformations, singular value decomposition (this substitute for PCA), eigen decomposition, power method; Optimization: Matrix calculus with Lagrange Multipliers, gradient descent, coordinate descent, introduction to convex optimization.

Data Mining (3 credits)
Data Mining studies algorithms and computational paradigms that allow computers to find patterns and regularities in databases, perform prediction and forecasting and generally improve their performance through interaction with data. It is currently regarded as the key elements of a more general process called Knowledge Discovery that deals with extracting useful knowledge from raw data. The knowledge discovery process includes data selection, cleaning, coding, using different statistical and machine learning techniques, and visualization of the generated structures. The course will cover all these issues and will illustrate the whole process with examples. Special emphasis will be given to the Machine Learning methods as they provide real knowledge discovery tools. Important related technologies, such as data warehousing and online analytical processing (OLAP) will be also discussed. The students will use recent Data Mining software.

Advanced Artificial Intelligence (3 credits)
The main research topics in AI include problem-solving, reasoning, planning, natural language understanding, computer vision, automatic programming, machine learning, and so on. Of course, these topics are closely related to each other. For example, the knowledge acquired through learning can be used both for problem-solving and reasoning. In fact, the skill for problem-solving itself should be acquired through learning. Also, methods for problem-solving are useful both for reasoning and planning. Further, both natural language understanding and computer vision can be solved using methods developed in the field of pattern recognition.
In this course, we will study the most fundamental knowledge for understanding AI. We will introduce some basic search algorithms for problem-solving; knowledge representation and reasoning; pattern recognition; fuzzy logic; and neural networks.

Data Warehousing (3 credits)
This course covers data architecture skills that are increasingly critical across a broad range of technology fields. You'll learn the basics of structured data modeling, gain practical SQL coding experience, and develop an in-depth understanding of data warehouse design and data manipulation. You'll have the opportunity to work with large data sets in a data warehouse environment to create dashboards and Visual Analytics. Students will use MicroStrategy, a leading BI tool, OLAP (online analytical processing), and Visual Insights capabilities to create dashboards and Visual Analytics. In the final Capstone Project, you'll apply your skills to build a small, basic data warehouse, populate it with data, and create dashboards and other visualizations to analyze and communicate the data to a broad audience.

3D Computer Vision (3 credits)

Topics include cameras and projection models, low-level image processing methods such as filtering and edge detection; mid-level vision topics such as segmentation and clustering; shape reconstruction from the stereo; high-level vision topics such as learned low-level visual representations; depth estimation and optical/scene flow; 6D pose estimation and object tracking. Prerequisites: linear algebra, basic probability, and statistics.

Fuzzy Systems (3 credits)

Classical and fuzzy sets, structures of truth-values, operations on fuzzy sets, classical and fuzzy relations, the composition of fuzzy relations, fuzzy relational equation, fuzzy equivalence, the fuzzy planning, the principle of extension, fuzzy matrix and fuzzy vectors, linguistic variables, fuzzy IF-THEN rules, classical and fuzzy logic, approximate reasoning, inference rules in fuzzy logic. Fuzzy systems: the concept of the fuzzy system, fuzzy controllers, fuzzy rules, fuzzy reasoning, fuzzy reasoning based on composition, fuzzification, and defuzzification, the basic types of fuzzy systems, fuzzy neural networks, fuzzy automata, fuzzy dynamic systems. Some applications of fuzzy sets and fuzzy logic.

Computational Photography (3 credits)

This course provides an overview of the state of the art in computational photography. At the start of the course, we will study modern image processing pipelines, including those encountered on mobile phones and DSLR cameras, and advanced image and video editing algorithms. Then we will continue to learn about the physical and computational aspects of tasks such as 3D scanning, coded photography, light-field imaging, time-of-flight imaging, VR/AR displays, and computational light transport. Near the end of the course, we will discuss active research topics, such as creating cameras that capture video at the speed of light, cameras that look around walls, or cameras that can see below the skin.

The course has a strong hands-on component, in the form of seven homework assignments and a final project. In the homework assignments, students will have the opportunity to implement many of the techniques covered in the class, by both acquiring their own images of indoor and outdoor scenes and developing the computational tools needed to extract information from them. Example homework includes building end-to-end HDR imaging pipelines and structured light scanners. For their final projects, students will have the choice to use modern sensors and other optical instrumentation provided by the instructors (light-field cameras, time-of-flight sensors, projectors, laser sources, and so on).

Advanced Big Data Analytics (3 credits)

This Big Data Analytics course shall first introduce the overview applications, market trends, and the things to learn. Then, topics will be introduced such as the fundamental platforms, such as Hadoop, Spark, and other tools, e.g., Linked Big Data. Afterward, the course will introduce several data storage methods and how to upload, distribute, and process them. This includes HDFS, HBase, KV stores, document database, and graph database. The course will go on to introduce different ways of handling analytics algorithms on different platforms. Then, I will introduce visualization issues and mobile issues on Big Data Analytics. Students will then have a fundamental knowledge of Big Data Analytics to handle various real-world challenges.

The course will discuss several methods to optimize the analytics based on different hardware platforms, such as Intel & Power chips, GPU, FPGA, etc. The lectures will conclude with an introduction of the future challenges of Big Data, especially on the ongoing

Linked Big Data issues which involve graphs, graphical models, Spatio-temporal analysis, cognitive analytics, etc

Information Integration on the Web (3 credits)
Information integration is the problem of combining data residing at different sources, and providing the user with a unified view of these data. The problem of designing information integration systems is important in current real-world applications and is characterized by a number of issues that are interesting from both a theoretical and a practical point of view. In the last few years, there has been a huge amount of research work on data integration, and a precise, clear picture of a systematic approach to such a problem is now available. This section will present an overview of the research work carried out in the area of data integration, with emphasis on the theoretical results that are relevant for the development of information integration solutions. Special attention will be devoted to the following aspects: architectures for information integration, modeling an information integration application, ontology-based data access and integration, processing queries in information integration, data exchange, and reasoning on queries.

Data Visualization (3 credits)
This course is all about data visualization, the art, and the science of turning data into readable graphics. We'll explore how to design and create data visualizations based on data available and tasks to be achieved. This process includes data modeling, data processing (such as aggregation and filtering), mapping data attributes to graphical attributes and strategic visual encoding based on known properties of visual perception as well as the task(s) at hand. Students will also learn to evaluate the effectiveness of visualization designs, and think critically about each design decision, such as choice of color and choice of visual encoding. Students will create their own data visualizations, and learn to use Open Source data visualization tools, especially D3.js. Students will also read papers from the current and past visualization literature and create video presentations of their findings.

Natural Language Processing (3 credits)
This course examines machine learning techniques that obtain leading results on the problem of natural language processing (NLP). NLP is a critical step towards effective communication between people and machines. You will learn how to represent words and text, the use of deep recurrent models for text prediction, and issues that separate NLP from other application domains. This will be reinforced by applying deep learning tools to NLP through examples and practical projects.

Social Network Analysis (3 credits)
This course gives a basic understanding of what social network analysis is and how it can be applied. The course will cover recent research on the structure and analysis of large social and information networks and on models and algorithms that abstract their basic properties. In this course, students will learn about social networks structure and evolution, and how to practically analyze large-scale network data, and how to reason about it. Topics covered in this course include methods for social network analysis, graph mining, link analysis, and network community detection, information propagation on the web, and connections with work in the social sciences and economics.

Information Retrieval and Web Search (3 credits)
Recent years have seen a dramatic growth of natural language text data, including web pages, news articles, scientific literature, emails, enterprise documents, and social media such as blog articles, forum posts, product reviews, and tweets. Text data are unique in that

they are usually generated directly by humans rather than a computer system or sensors, and are thus especially valuable for discovering knowledge about people's opinions and preferences, in addition to many other kinds of knowledge that we encode in text.

This course will cover search engine technologies, which play an important role in any data mining applications involving text data for two reasons. First, while the raw data may be large for any particular problem, it is often a relatively small subset of the data that are relevant, and a search engine is an essential tool for quickly discovering a small subset of relevant text data in a large text collection. Second, search engines are needed to help analysts interpret any patterns discovered in the data by allowing them to examine the relevant original text data to make sense of any discovered pattern. You will learn the basic concepts, principles, and the major techniques in text retrieval, which is the underlying science of search engines.

Digital Image Processing (3 credits)
The topics to be covered are Digital image fundamentals: representation, sampling, and quantization, image acquisition, basic relationships between pixels, imaging geometry; Image transforms: discrete Fourier transform, discrete cosine transform, Walsh and Hadamard transforms, Hotelling, transform; Image enhancement: in the spatial domain and in the frequency domain, image smoothing, and sharpening; Image restoration: degradation models, inverse filter, Wiener filter; Color and pseudo-color image processing; Image segmentation: detection of discontinuities, thresholding, region-oriented segmentation, the use of motion analysis in segmentation.

Biomedical Image Processing (3 credits)
The Biomedical imaging course prepares students with a knowledge of medical imaging and gives hands-on experience with ultrasound imaging, dual-energy X-ray absorptiometry (DEXA), spectral imaging, and medical image processing labs. This course covers various medical imaging modalities, such as planar X-ray, X-ray computed tomography (CT), DEXA, magnetic resonance imaging (MRI), nuclear medicine imaging - positron emission tomography (PET) & single-photon emission computed tomography (SPECT), ultrasound imaging, and spectral imaging. Students will also gain hands-on experience with medical image processing software to import CT or MRI scans and construct 3D models of the human anatomy. The course introduces the fundamental physical and engineering principles used in medical imaging and image processing. The primary focus of this course will be on physical principles, instrumentation methods, and image processing methods. Strengths, limitations, sensitivity, and appropriate applications for each modality of imaging will be examined as well. Concepts learned in class will be used to solve real-world medical imaging problems.

Soft Computing (3 credits)
Real-life decision problems are often too complicated to be modeled by e.g., mathematical tools. Even if they are modeled, these types of problems are often intractable and extremely challenging to solve. In recent years, the emergence of soft computing as an alternative way of solving problems in areas such as optimization has attracted attention from both academics and practitioners. This course offers alternative approaches to solve complex problems which could otherwise be difficult to solve by traditional techniques. It aims at training students in the field of heuristics, metaheuristics, hyper-heuristics, evolutionary computations as well as Bayesian Analysis to address decision-making problems in business. A variety of applications will be examined with more emphasis on transportation, logistics, and fleet management. The course's further aim is to enhance students' understanding of the critical nature of designing and/or selecting appropriate methods for

solving complex decision problems. It provides opportunities for students to learn from each other, from practitioners in the field, and from the latest theoretical and applied research in the field.

Tools and Techniques in Data Science (3 credits)
Many of the world's biggest discoveries and decisions in science, technology, business, medicine, politics, and society as a whole, are now being made on the basis of analyzing data sets. This course provides a broad and practical introduction to working with data: data analysis techniques including databases, data mining, machine learning, and data visualization; data analysis tools including spreadsheets, Tableau, relational databases and SQL, Python, and R; introduction to network analysis and unstructured data. Tools and techniques are hands-on but at a cursory level, providing a basis for future exploration and application.

Advanced Machine Learning (3 credits)
This course is about learning to extract statistical structure from data, making decisions and predictions, as well as for visualization. The course will cover many of the most important mathematical and computational tools for probabilistic modeling, as well as examine specific models from the literature and examine how they can be used for particular types of data. There will be a heavy emphasis on implementation.

Deep Learning (3 credits)
Deep Learning is a hierarchical learning methodology based on artificial neural networks which are algorithms inspired by the structure and function of the brain. It has applications in a wide range of industries these days such as face-recognizers working at massive scales, robotics, speech translation, text analysis, improving customer experience, autonomous vehicles, etc. In this course, we will take a "hands-on approach" and start with the implementation of basic building blocks such as training a simple perceptron and move to design and train a deep convolutional neural network. The course will concentrate on developing both mathematical knowledge and implementation capabilities. The implementations will be python based using TensorFlow and Keras. After establishing our foundation in convolutional neural networks we will start looking into applications of deep learning in both spatial as well as time-series data and explore various network architectures suited for each. The objective is to help you build a career in AI and Machine learning, to make you comfortable enough that you can understand various learning problems and develop your own deep learning-based solutions.

Distributed Data Processing and Machine learning (3 credits)
Distributed (data processing) systems are already pervasive, most members of our society interact with them daily. Social networks, government services, media streaming services-- all systems heavily interfacing with the members of our society--are powered by distributed (data processing systems). Such systems are composed of many physically distributed computers, all connected through a network that acts as a means of communication. The data processing component of large-scale distributed systems regards all services that handle data. Such systems include data storage (e.g., HDFS, Ceph), data transmission and queueing (e.g., gRPC, ZeroMQ), key-value stores (e.g., Redis, Cassandra), and analytics (e.g., Spark, Hive), batch (e.g., Hadoop) and stream processing (e.g., Flink), as well as machine learning (e.g., Tensorflow, PyTorch). Most of our online interactions generate data that passes through one or more of such systems.

Python for Data Science (3 credits)

This course will introduce you to the field of data science. First, and foremost, you'll learn how to conduct data science by learning how to analyze data. That includes knowing how to import data, explore it, analyze it, learn from it, visualize it, and ultimately generate easily shareable reports. We'll also introduce you to two powerful areas of data analysis: machine learning and natural language processing. To conduct data analysis, you'll learn a collection of powerful, open-source tools including python, jupyter notebooks, pandas, NumPy, matplotlib, and many other tools and you won't be learning these tools in isolation. You will learn these tools all within the context of solving compelling data science problems.

Cloud Computing (3 credits)
This course provides a hands-on comprehensive study of Cloud concepts and capabilities across the various Cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), and Business Process as a Service (BPaaS). IaaS topics start with a detailed study of the evolution of infrastructure migration approaches from VMWare/Xen/KVM virtualization, to adaptive virtualization, and Cloud-Computing/on-demand resources provisioning. Mainstream Cloud infrastructure services and related vendor solutions are also covered in detail. PaaS topics cover a broad range of Cloud vendor platforms including AWS, Google App Engine, Microsoft Azure, Eucalyptus, OpenStack, and others as well as a detailed study of related platform services such as storage services that leverage Google Storage, Amazon S3, Amazon Dynamo, or other services meant to provide Cloud resources management and monitoring capabilities. The SaaS and PaaS topics covered in the course will familiarize students with the use of vendor-maintained applications and processes available on the Cloud on a metered on-demand basis in multi-tenant environments. The course also covers the Cloud security model and associated challenges and delves into the implementation and support of High-Performance Computing and Big Data support capabilities on the Cloud.

Bayesian Data Analysis (3 credits)
This course will provide an introduction to practical methods for making inferences from data using probabilistic models for observed and missing data. This approach is an alternative to frequentist statistics, the presently dominant inference technique in sciences, and it supports a common-sense interpretation of statistical conclusions by using probabilities explicitly to quantify the uncertainty of inferences. The course will introduce Bayesian inference starting from first principles using basic probability and statistics, elementary calculus, and linear algebra. We will progress by first discussing the fundamental Bayesian principle of treating all unknowns as random variables, and by introducing the basic concepts (e. g. conjugate, noninformative priors) and the standard probability models (normal, binomial, Poisson) through some examples. Next, we will discuss multi-parameter problems, and large-sample asymptotic results leading to normal approximations to posterior distributions. We will continue with hierarchical models, model construction and checking, sensitivity analysis, and model comparison.

Algorithmic trading (3 credits)
This course investigates methods implemented in multiple quantitative trading strategies with an emphasis on automated trading and quantitative finance-based approaches to enhance the trade decision-making mechanism. The course provides a comprehensive view of the algorithmic trading paradigm and some of the key quantitative finance foundations of these trading strategies. Topics explore markets, financial modeling and its pitfalls, factor model-based strategies, portfolio optimization strategies, and order execution strategies. Data mining and machine learning-based trading strategies are also introduced, and these strategies include, but are not limited to, the Bayesian method, weak classifier

method, boosting, and general meta-algorithmic emerging methods.

Computational Genomics (3 credits)
This course focuses on the current problems of computational genomics. Students will explore bioinformatics software, discuss bioinformatics research, and learn the principles underlying a variety of bioinformatics algorithms. The emphasis is on algorithms that use probabilistic and statistical approaches.

Bioinformatics (3 credits)
The course is designed to introduce the most important and basic concepts, methods, and tools used in Bioinformatics. Topics include (but are not limited to) bioinformatics databases, sequence and structure alignment, protein structure prediction, protein folding, protein-protein interaction, Monte Carlo simulation, and molecular dynamics. Emphasis will be put on the understanding and utilization of these concepts and algorithms. The objective is to help the students to reach rapidly the frontier of bioinformatics and be able to use the bioinformatics tools to solve the problems on their own research.

Probabilistic Graphical Models (3 credits)
Probabilistic graphical models are an intuitive visual language for describing the structure of joint probability distributions using graphs. They enable the compact representation and manipulation of exponentially large probability distributions, which allows them to efficiently manage the uncertainty and partial observability that commonly occur in real-world problems. As a result, graphical models have become invaluable tools in a wide range of areas from computer vision and sensor networks to natural language processing and computational biology. The aim of this course is to develop the knowledge and skills necessary to effectively design, implement and apply these models to solve real problems. The course will cover (a) Bayesian and Markov (MRF) networks; (b) exact and approximate inference methods; (c) estimation of both the parameters and structure of graphical models.

Scientific Computing in Finance (3 credits)
The financial industry is a tremendous consumer of advanced computing technologies and mathematical modeling techniques and a primary employer of computer science graduates. In this course, we will present the principles of computational finance and financial data analysis, focusing on research problems of algorithmic interest. The first half of the course will serve as an introduction to how financial markets work, and standard mathematical approaches for working with financial data. The second half of the course will build on this foundation to discuss special topics of research interest, including online algorithms, short-term trading strategies, technical analysis, and text/data mining.

Distributed Machine Learning in Apache Spark (3 credits)
Building on the core ideas presented in Distributed Machine Learning with Spark, this course covers advanced topics for training and deploying large-scale learning pipelines. You will study state-of-the-art distributed algorithms for collaborative filtering, ensemble methods (e.g., random forests), clustering, and topic modeling, with a focus on model parallelism and the crucial tradeoffs between computation and communication.

After completing this course, you will have a thorough understanding of the statistical and algorithmic principles required to develop and deploy distributed machine learning pipelines. You will further have the expertise to write efficient and scalable code in Spark, using MLlib and the spark.ml package in particular.

High Performance computing (3 credits)
This course introduces the fundamentals of high-performance and parallel computing. It is targeted at students seeking to develop the software skills necessary for work in parallel software environments. These skills include big-data analysis, machine learning, parallel programming, and optimization. We will cover the basics of Linux environments and bash scripting all the way to high throughput computing and parallelizing code. After completing this course, students will become familiar with The components of a high-performance distributed computing system, Types of parallel programming models, the situations in which they might be used, High-throughput computing, and Shared memory parallelism.

Inference and Representation (3 credits)
This course covers how to think about and model data. We introduce the tools of probabilistic graphical models as a means of representing and manipulating data, modeling uncertainty, and discovering new insights from data. We will particularly emphasize latent variable models, examples of which include latent Dirichlet allocation (for topic modeling), factor analysis, and Gaussian processes. The class will also discuss modeling temporal data (e.g., hidden Markov models), hierarchical models, deep generative models, and structured prediction. On completing this course, students should be able to take a new problem or data set, formulate an appropriate model, learn the model from data, and ultimately answer their original question using inference in the model.

Time-series Analysis and Prediction (3 credits)
This course demonstrates how to build time series models for univariate and multivariate time series data. It brings together material previously available only in the professional literature and presents a unified view of the most advanced procedures available for time series model building. The authors begin with basic concepts in univariate time series, providing an up-to-date presentation of ARIMA models, including the Kalman filter, outlier analysis, automatic methods for building ARIMA models, and signal extraction. They then move on to advanced topics, focusing on heteroscedastic models, nonlinear time series models, Bayesian time series analysis, nonparametric time series analysis, and neural networks. Multivariate time series coverage includes presentations on vector ARMA models, cointegration, and multivariate linear systems.

Computational intelligence (3 credits)
The course goal is to make students familiar with basic principles of various computational methods of data processing that can commonly be called computational intelligence (CI). Here belong mainly bottom-up approaches to solutions of (hard) problems based on various heuristics (the so-called soft computing), rather than exact approaches of traditional artificial intelligence based on logic (hard computing). Examples of CI are nature-inspired methods (neural nets, evolutionary algorithms), fuzzy systems, as well as various probabilistic methods under uncertainty (e.g. Bayesian models) and machine learning methods (e.g. reinforcement learning). After the course, the students will be able to conceptually understand the important terms and algorithms of CI, such that they would be able to choose appropriate method(s) for a given task. The theoretical introduction will be complemented by practical examples of task solving.

Applied Deep Learning (3 credits)
This course provides a practical introduction to Deep Learning. We aim to help you understand the fundamentals of neural networks (DNNs, CNNs, and RNNs), and prepare you to successfully apply them in practice. This course will be taught using open-source software, including TensorFlow. In addition to covering the fundamental methods, we will

discuss the rapidly developing space of frameworks and applications, including deep learning on mobile and the web, and applications in healthcare.

Deep Reinforcement Learning (3 credits)
This course covers fundamental principles and techniques in deep and reinforcement learning. Topics include convolutional neural networks, recurrent and recursive neural networks, backpropagation algorithms, regularization and optimization techniques for training such networks, dynamic programming, Monte Carlo, and temporal difference, and function approximation reinforcement learning algorithms, and applications of deep and reinforcement learning. It also covers active research topics in deep and reinforcement learning areas.

Optimization Methods for Data Science and Machine Learning (3 credits)
This course offers an introduction to nonlinear mathematical optimization with applications in data science. The theoretical foundation and the fundamental algorithms for nonlinear optimization are studied and applied to supervised learning models, including nonlinear regression, logistic regression, support vector machines, and deep neural networks. Students write their own implementation of the algorithms in the Python programming language and explore their performance on realistic data sets. Research topics in deep and reinforcement learning areas.

Evolutionary Computation (3 credits)
The focus of this course will be on the history of evolutionary computation; major areas: genetic algorithms, evolution strategies, evolution programming, genetic programming, classifier systems; constraint handling; multi-objective cases; dynamic environments; parallel implementations; co-evolutionary systems; parameter control; hybrid approaches; commercial applications. Evolutionary Computation can be considered as a sub-field of Artificial Intelligence. Evolutionary algorithms use Nature as a metaphor and are inspired in the principles of natural selection and genetics. These algorithms have been applied successfully for solving difficult problems across a broad spectrum of fields.

Ms Software Engineering

This document presents a proposal for starting an MS program in Software Engineering (SE) by the Department of Computer Science at Forman Christian College, Lahore. At present, the department is successfully running its BS (Hons.) and MS programs in Computer Science. Recently the department has taken several initiatives to increase its outreach, including accreditation by HEC and intake of new faculty and lab engineers. The department feels that now it has enough experience to offer a postgraduate program in Software Engineering. The MS program proposed in this document is intended to be in line with Higher Education Commission (HEC) guidelines.

As the name 'Software Engineering" suggest, it is the domain to engineer or develop software. Software industry is built on the principles of software engineering and has been growing phenomenally over the years. In Pakistan the growth rate is more than 30% and more than 22% worldwide. This growth in industry indicates enormous scope for the engineers of software. Due to such a great potential youth of our nation is thronging Universities and colleges to get educated in this field. However number of institutes that provide quality education are limited, thus hampering the growth of this industry to its full potential. We at the Department of Computer Science, Forman Christian College, believe in imparting pertinent and high quality education which is pedagogically structured, accessible and affordable.

Students who will graduated from this proposed degree program will have great scope for students in getting jobs in country's leading software house. Not just that, as entrepreneurs, these students can start their own business and have a thriving business. Which in turn will increase Pakistan's revenue and provide the prosperity this nation deserve.

The proposal document is organized as follows: section 1 provides a brief introduction of the department. Section 2 highlights the basic characteristics of the program, Section 3 describes the rationale for introducing the proposed MS program. Section 4 lists program objectives. Section 5 describes eligibility criteria for admission into the program. Section 6 gives proposed program structure. Section 7 contains brief scheme of studies. Section 8 gives degree requirements. Section 9 is a discussion on sustainability/resource requirements of the proposal. Section 10 provides course outlines. References are given in the end.

The committee wishes to acknowledge the valuable guidelines and feedback provided by Dr. Ahmad Mahmood Qureshi (Dean Faculty of Computer and Mathematical Sciences) towards preparation of this proposal in line with University's expectations and requirements.

Learning Objectives
Following are the objectives for proposing SE program, and are aligned with the objectives highlighted by HEC:
a. Prepare students who can critically apply concepts, theories and practices to provide creative solutions of complex computing problems.
b. Prepare students who can define, plan, implement and test a medium-sized software project using appropriate software engineering processes, methods and techniques.
c. Prepare students to effectively communicate their ideas in written and electronic form, and prepare them to work collaboratively in a team environment.
d. Prepare students with a theoretical software engineering background and applied research needed to enter a doctorate program in software engineering.
e. Prepare students to join an appropriate and respectable level position in a computing-related field, and to maintain their professional skills in rapidly evolving field.

Eligibility Criteria

The minimum requirements for admission in MS-SE degree program are

a. A degree earned after sixteen years of education in computing or a related discipline, AND

b. At least CGPA of 2.0 (on a scale of 4.0) or 60% Marks

All degrees must have been obtained from HEC recognized local/foreign institutions. Final decision for admission will be based on following criteria:

Performance in admission test conducted by the department

Performance in interview. Shortlisted students may be required to appear for interviews.

Degree Requirements

To become eligible for award of MS SE degree, a student must satisfy the following requirements:

a) Must have earned CGPA (Cumulative Grade Point Average) of at least 2.5 on a scale of 4.0.

b) Must have studied and passed the prescribed courses, totaling at least 30 credit hours. OR

Must have studied and passed the 24 credit hours of courses from the prescribed course list and successfully completed 6 credit hours of Thesis/Research Work Or had additional 6 credit hour course work.

Duration:

Min. 2 years (4 semesters), max. 4 years (with permission from Chairperson and Dean)

Table 1. Core Courses

Code	Course Title	Cr. Hrs.
CSSE501	Advanced Requirements Engineering	3
CSSE502	Advanced Software System Architecture	3
CSSE504	Software Testing and Quality Assurance	3
	Total	9

Proposed Study Plan

Table 2. Domain Elective Courses

Code	Course Title	Credit Hours
CSSE601	Software Measurement and Metrics	3
CSSE603/ COMP522	Component-Based Software Engineering	3
CSSE519	Advanced Formal Method in Software Engineering	3
CSSE522	Advanced Human Computer Interaction	3
CSSE520	Agile Software Development Methods	3
CSSE605 /COMP620	Empirical Software Engineering	3
CSSE518	Advanced Software Project Management	3
	Total(Any 2 of the above for thesis option OR any 2-4 courses for non-thesis option)	

Table 3. General Elective Courses

Code	Course Title	Credit Hours
CSSE510	Software Risk Management	3
CSSE515	Research Methodology	3
CSSE511	Software Configuration Management	3
CSSE512	Complex Networks	3
CSSE514	Agent Based Modeling	3
	Total (Any 3 of the above for thesis option OR any 3-5 courses for non-thesis option)	

Semester 1

Code	Course Title	Cr. Hrs.
CSSE 501	Advanced Requirements Engineering	3
CSSE 502	Advanced Software System Architecture	3
	Elective 1	3
	Total	9

Semester 2

Code	Course Title	Cr. Hrs.
CSSE504	Software Testing and QA	3
	Elective 2	3
	Elective 3	3
	Total	9

Semester 3

Code	Course Title	Cr. Hrs.
	Elective 4	3
	Thesis Part 1/Elective 5	3
	Total	6

Semester 4

Code	Course Title	Cr. Hrs.
	Elective 6	3
	Thesis Part 2/Elective 7	3
	Total	6

Total Program Credit Hours   = 30

Course Descriptions

Advanced Formal Methods (3 credits)
Introduction to formal methods and specification. State-Based Formal Methods. Transformational systems. Traditional approaches. Z specification. Formal development cycle. Temporal Specification: reactive systems, syntax and semantics of temporal logic, temporal specification of reactive systems (safety, aliveness, fairness). Model Checking: Generating finite models, Analysis of a simple model checking algorithm. Symbolic model checking. Overview of reduction methods. Spin and Promela. Case study and practical verification of properties. Current research topics based on Formal Methods.

Advanced Human-Computer Interaction (3 credits)
Introduction to HCI. Importance of usable and useful software products. The theories of HCI. How to evaluate/develop software products. How to apply theoretical results from HCI research to software products. How to conduct their own research about aspects of usability and user experience. Concepts of Human Computer Interaction. The psychology of usable things. Usability Engineering. Prototypes. Usability inspection methods. Usability testing methods. Usability in practice. User Experience (UX). Web Usability. Mobile Usability. Mobile User Experience. Site objectives and user needs. Information architecture. Information and navigation design. Implementation and optimization. Experiments and HCI guidelines. Current research topics in Human- Computer Interaction.

Advanced Requirements Engineering (3 credits)
Software Requirements Fundamentals: Product and process requirements, Functional and non-functional requirements, Emergent properties, Quantifiable requirements, System and software requirements. Requirements Process: Process models, Process actors, Process support and management, Process quality and improvement.

Requirements Analysis: Requirements sources, Elicitation techniques. Requirements Analysis: Requirements classification, Conceptual modeling, Architectural design and requirements allocation, Requirements negotiation, Formal analysis. Requirements Specification: System definition document, System requirements document, Software requirements specification. Requirements Validation: Requirements reviews, Prototyping, Model validation, Acceptance tests. Practical Considerations: Iterative nature of the requirements process, Change management, Requirements attributes, Requirements tracing, Measuring requirements. Software Requirements Tools. Current research topics in requirement engineering.

Advanced Software Project Management (3 credits)

Introduction to project management. Algorithmic cost estimation models. Advanced cost estimation models. Function points estimation Risk assessment. Life cycle models. Prototyping. Management of software reuse. Software maintenance. Software maturity framework. An Overview of Project Planning. Program Management and Project Evaluation. Software Effort Estimation. Activity Planning. Risk Analysis and Management. Resource Allocation. Project tracking and Control. Contract Management. Software Quality Assurance. Configuration Management. Various tools of Software Project Management. Project Cost Management. Project Human Resource Management. Project Communications Management. Project Procurement Management. Case studies, Current research topics in Software Project Management.

Advanced Software System Architecture (3 credits)

Quality attributes in the context of architecting. Qualitative and quantitative assessment of architectures. Architectural modeling through Architecture Description Languages. System modeling its relation to software architecting. Architecting for evolution and variability. Partitioned and layered architectures. System-of-Systems and Ultra-Large Scale Systems. Software Product Lines and Configurable Software. Self-Adaptive Software. Architectural Description Languages. Feature Modeling. Architecture and Model-Based Testing. Current research topics in software system architecture.

Agent Based Modeling (3 credits)

Introduction to agent based modeling. Introduction to Net Logo. Complexity in Social Worlds. Net Logo Commands. Net Logo Procedures. Model properties (Why agent- based objects? Agents, environments, and timescales).Biological systems: fireflies, flocking, slime mold, bees, ants (flocking behavior slime mold).Biological systems: predator/prey, debugging (Verification and validation).Social systems: segregation, Schelling, Micro motives and Macro behavior. A self-forming neighborhood model.

Cellular automata. Critical phenomena. Sand piles. Current research topics in Agent Based Modeling.

Agile Software Development (3 credits)

Agile values and principles. Agile Practices. Pair programming Refactoring. Test-driven development. Continuous integration and delivery. Automated build. Coding standards simplicity. SMART user stories and release and deployment. Applying Agile methods: Integration, XP+SCRUM, SCRUM +Kanban, Agile methods +User-Centered Design. Distributed Agile teams. Current research topics in **Agile Software Development.**

Complex Networks (3 credits)

Introduction to complex networks. What is a complex system? Basic metrics. Degree distribution (DD).Clustering coefficient (CC). Centrality. Page Rank. Hubs and authorities. Bib-coupling. Co-citation index. Edge reciprocity. Rich club phenomenon. Social Network. Homophily. Cohesiveness. Equivalence of ties. Ego-centric networks. Community Structures. Hierarchical Agglomerative. Linear algebra techniques and spectral methods. Citation Networks, Rise and fall of CS fields. Inter-disciplinarily of CS fields. Temporal structures of citation profiles. Citation count prediction. Co- authorship circles. Economic and financial network analytics. Graph mining. Measuring user engagement. Basic definitions and metrics: walks, paths, cycles, connectedness, trees. The clustering coefficient. The World Wide Web. Scale-free networks. Random graphs with a given degree

sequence. The Barabasi-Albert model and other models of growing graphs. Degree correlations. The Internet and other assortative and dissertated networks. Community structures: spectral bisection and hierarchical clustering methods. The modularity and Girvan-Newman algorithm. Current research topics in Complex Networks.

Component Based Software Engineering (3 credits)
Introduction to Software Component (Component. Definition and Essentials, What is CBSE? Why CBSE? The Anatomy of Components: internals, application interfaces, platform interfaces, middleware, Component Characteristics: Properties of Software Component in CBSE). Basic Concepts in CBSE (Improving SW through Software Process Improvement (SPI)).Component-Based Software Development (CBSD).Approach. Component Patterns & Abstraction. Challenges of CBSE. Technical Issues and Objectives of Component Based Software Engineering. Reuse Dimensions. Software Components Types: open, closed, COTS, in house. Challenges in Software.

Empirical Software Engineering (3 credits)
Quantitative study design. Qualitative study designs. Measurement and data collection. State-of-the practice. Archival data analysis. Human variation & impact of experience. Evidence-based software engineering. Simulation of software process. Current research techniques in Empirical Software Engineering.

Reliability Engineering (3 credits)
Introduction to Reliability Engineering. The Need for Reliable Software. Software Reliability Engineering Concepts. Basic Definitions. Software Reliability and System Reliability. The Dependability Concept. Reliability Modeling. Availability Modeling. Statistical Reliability Models for Software Reliability. Best Current Practices of software Reliability Engineering. Software Metrics for Reliability Assessment. Software Testing and Reliability. Software Reliability Tools. Review of Reliability Theory. Analytical Techniques and Basic Statistics for Reliability Engineering. Current research topics in Reliability Engineering.

Research Methodology (3 credits)
Introduction to Research. Objectives of Research. Importance of Research Methodology in Research Study. Types of Research. Steps in Conducting Research. What is Literature Review? Why need for Literature Review. Types of Literature Review. Systematic Literature Review Protocol. Problem Statement and Problem formulation. Criteria for selecting a problem. Identifying Types of variables in Research. Types of hypothesis.

Identifying Target Population. Types of Sampling. Sampling Techniques. Quantitative Research Methods. Scientific Methods. Design of Quantitative Surveys. Techniques to Conduct Quantitative Methods. Introduction to Qualitative Research. Qualitative Research Methods. Data Analysis and Theory in Qualitative Research Articles.

Introduction to Mixed Methods Research. Design of Mixed Methods Research. Evaluation of Mixed Methods Research. Case Study. How to Conduct a Case Study. Case Study Protocol. Importance and Benefits of Case Study. Types of Statistical Tests to Conduct Data Analysis. Data Analysis Tools. Introduction to SPSS. Hands on Practice of SPSS. How to Define variables in SPSS. How to Record Collected Data in SPSS. Types of Tests via SPSS including Regression. Correlation. Cross tabulation and others. How to write Good Research Proposal. Contents of Thesis. Important Elements of Research Thesis.

Software Configuration Management (3 credits)
Management of the SCM Process. Organizational Context for SCM. Constraints and Guidance for the SCM Process. Planning for SCM. SCM Plan. Surveillance of Software Configuration Management. Software Configuration Identification. Identifying Items to Be Controlled. Software Library. Software Configuration Control. Requesting, Evaluating, and Approving Software Changes. Implementing Software Changes.
Deviations and Waivers. Software Configuration Status Accounting. Software Configuration Status Information. Software Configuration Status Reporting. Software Configuration Auditing. Software Functional Configuration Audit. Software Physical Configuration Audit. In-process Audits of a Software Baseline. Software Release Management and Delivery. Software Building. Software Release Management. Software Configuration Management Tools. Current research topics in Software Configuration Management.

Software Measurement and Metrics (3 credits)
Introduction to quality control and planning needs (Measurement Concepts, Measurement as a support process, Review Metrics Models and Standards). Measurement goals (Formulating problem and goal statement, Prioritize information needs and objectives, Formalize measurement goals). Specify Measures (Identify questions and indicators, Identify data elements, Operational definitions for measures). Specify Data Collection and Storage Procedures. Sources of data. How to collect and store the measurement data? Specify Analysis Procedures. Potential data analyses.

Methods and tools for measuring software. Develop software measurement reporting. Current research topics in Software Measurement and Metrics.

Software Risk Management (3 credits)
What is risk and risk management?. Motivation for risk management. Reasons we don't do risk management. SEI's Risk Management paradigm. Identifying and recording software risk. Risk Taxonomy. Tools and methods for identifying and recording risks. Analyzing and classifying risks. Complex project management theory. Software Risk Identification. Software Risk Analysis. Software Risk Planning. Software Risk Monitoring. Software Qualitative Risk Analysis. Quantitative Risk Analysis. Risk management and the SDLC. Risk management in CMM. Other useful tools for successful risk management. Current research topics in Software Risk Management.

Software Testing and Quality Assurance (3 credits)
Testing techniques. Black Box testing, White Box and Grey Box testing techniques. Quality Assurance planning and execution. Automated testing topics include constructing a framework, scripting techniques, generating a test data, generating test architecture, pre/post-processing, test maintenance, and job specific metrics. Current research topics in Software Testing and Quality Assurance.

MS
Computer
Science

The Department of Computer Science currently offers one of the best BS (Hons.) programs in the region. BS (Hons.) program is accredited by NCEAC (National Computing Education Accreditation Council) of HEC with the highest ranking of 'W'.MS program is also approved by HEC.The department is housed in the Armacost Building with 5 computing labs equipped with modern facilities of desktop computers, printers, multimedia, LAN and Wi-Fi Internet access. The department has an active Computing Society and ACM (Association for Computing Machinery) Chapter.

The MS program in Computer Science is an evening program and is in compliance with HEC guidelines. It is a 2-year program of 4 semesters comprising 30 credit hours (24 credits of course work and 6 credits of thesis). It is aimed at preparing students not only for jobs in the industry through its state of the art courses, but also for academia and the pursuit of a doctoral degree through its research orientation. Offered specializations are Software Engineering, Data Science, Intelligent Systems, Computational Imaging and Vision, and Information Sciences & Technology.

Admission Criteria
Students who wish to study at the graduate level will have two options available to them: 2-year degree program or a non-degree enrollment. Criteria for these two options are as under:
2-yearDegree Program
In order to qualify for admissions application process, a candidate must fulfill at least one of the following four criteria:
I. BS (CS/SE/IT) 4 Years Degree (min. 130 credit hours).
II. Computer Science Conversion Course 2 Years Degree referred to as "MCS" or "MSc (CS/SE/IT)".
III. Science and Engineering graduates with 16 years of education are eligible but have to make up deficiencies in prerequisite undergraduate coursework.
All degrees must have been obtained from HEC recognized local/foreign institutions. Final decision for admission will be based on the following criteria:
I. Academic record. As a minimum academic performance, all applicants must have maintained a CGPA of at least 2.0 (on a scale of 4) or at least 60% marks in all university-level degrees.
II. Performance in admission test conducted by the department.
III. Performance in interview. Shortlisted students may be required to appear for interview.

Non-Degree Option
Students not admitted to the 2-year degree program can still register for graduate courses as non degree-seeking students.
· Non-degree students must meet course and/or program prerequisites to enroll in graduate courses.
· Enrollment as a non-degree student does not constitute admission to a degree program. Students can however transfer credit hours earned while on non-degree status to a degree program. The policy limits the number of hours that can be petitioned into a graduate program to 12 credit hours.
· A certificate of achievement (with the grade achieved in the course) will be issued to a student after successful completion of a graduate level course.

Program Structure

I. **Duration:** Minimum 2 years (4 semesters); Maximum 5 years (with permission from the Chair and Dean)

II. **Timing:** Evening

III. **Type:** Full time

IV. **Specialization Tracks:**
a. Software Engineering
b. Intelligent Systems
c. Computational Imaging and Vision
d. Information Sciences and Technology
e. Data Science

V. Distribution of Courses
A student will need to complete 30 credit hours of studies. These will be distributed as follows:
· 4 CS core courses of 3 credit hours each (Table 1).
· 4 CS elective courses (of 3 credit hours each), out of which at least 3 will be selected from the student's selected specialization track (Table 2). The student must declare a specialization while registering for Semester II. Any courses not related to opted specialization will count towards CS electives.
· Research Thesis or Project (6 credit hours), taken in the last 2 semesters.

Table 1. CS Core Courses

#	Code	Course Title	Credit Hours
1	COMP502	Advanced Algorithm Analysis	3
2	COMP503	Advanced Theory of Computation	3
3	COMP 504	Advanced Operating Systems	3
4	COMP505	Theory of Programming Languages	3

The list of electives is given below, but it is open to expansion/change. Offering (or not) of any specialization is at the department's discretion.

Table 2. CS Elective Courses

Specialization Track	Code	Course Title	Credit Hours
Software Engineering	COMP513	Advanced Software Engineering	3
	COMP514	Software Quality Engineering	3
	COMP515	Software Requirements Engineering	3
	COMP516	Software Architecture	3
	COMP518	Software Project Management	3
	COMP519	Formal Method in Software Engineering	3
	COMP522	Component-Based Software Engineering	3
	COMP523	Model-Driven Software Development	3
	COMP611	Software Evolution and Reengineering	3
	COMP612	Software Engineering for Safety-Critical Systems	3
	COMP617	Agent Oriented Software Engineering	3
	COMP620	Empirical Software Engineering	3
	COMP621	Software Process Improvement	3
Computational Imaging and Vision	COMP531	Digital Image Processing	3
	COMP532	Advanced Computer Vision	3
	COMP533	Advanced Topics in Computer Vision	3
	COMP634	3D Computer Vision	3
	COMP635	Computational Photography	3
	COMP636	Biomedical Image Processing	3
Intelligent Systems	COMP532	Advanced Computer Vision (cross-listed	3

		with Computational Vision and Imaging)	
	COMP551	Advanced Artificial Intelligence	3
	COMP552	Advanced Machine Learning	3
	COMP553	Soft Computing	3
	COMP554	Natural Language Processing	3
	COMP555	Fuzzy Systems	3
	COMP561	Data Mining	3
Data Science	COMP551	Advanced Artificial Intelligence	3
	COMP552	Advanced Machine Learning	3
	COMP554	Natural Language Processing	3
	COMP561	Data Mining	3
	COMP562	Data Warehousing	3
	COMP566	Advanced Big Data Analytics	3
	COMP663	Information Integration on the Web	3
	COMP664	Information Retrieval and Web Search	3
	COMP665	Data Visualization	3
Information Sciences & Technology	COMP571	Semantic Web	3
	COMP572	Human and Information Interaction	3
	COMP573	Web Services	3
	COMP574	e-Government	3
	COMP575	Social Network Analysis	3
	COMP576	Ubiquitous Information Interaction	3
	COMP663	Information Integration on the Web	3
	COMP664	Information Retrieval and Web Search	3

Free CS Electives[1]	COMP581 /681	Selected Topics in Computer Science	3
	COMP 501	Mathematical Methods for Computer Science	3
	COMP582	Network Performance Modeling & Evaluation	3
	COMP583	Parallel and Distributed Computing	3
	COMP584	Topics in Computer Networks	3
	COMP585	Network Security	3
	COMP586	Operations Research	3
	COMP587	Research Methods in Computer Science	3
	COMP589	Advanced Optimization Methods	3
	COMP590	Advanced Database Systems	3
	COMP591	Advanced Topics in Mobile and Wireless Networks	3

VI. Distribution of Credit Hours

Table 3. Distribution of Credits

Course Category	Credit Hours
Core	12
Electives	12
Research Methodology	3
Thesis/Project	6

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[1] In addition to courses noted here, a student can also take courses outside his/her specialization track to count towards Free CS Electives.

I. Semester-wise Plan

Semester 1

Courses		Credit Hours
1	Core Course 1	3
2	Core Course 2	3
3	Core Course 3 /Elective 1	3
		Total: 9

Semester 2

Courses		Credit Hours
1	Elective 1/Core Course 4	3
2	Elective 2	3
3	Elective 3	3
		Total: 9

Semester 3

Courses		Credit Hours
1	Thesis (partial registration)	3
2	Elective 4	3
3	Elective 5	3
		Total: 9

Semester 4

Courses		Credit Hours
1	Thesis (full registration)	3
		Total: 3

Total (all semesters) = 30

Award of Degree

For the award of MS degree, a student must have:

· Passed at least 33 credit hours of course work, including 4 core courses and 4 electives courses.
· Obtained a CGPA of at least 2.5.

Course Outlines

COMP 501: Mathematical Methods for Computer Science (3 credits)

Prerequisites: Discrete Mathematics (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously).

Logic. Sets. Functions. Sums. Algorithms. Proofs. Induction. Number Theory. Counting. Probability. Expectation. Matrices. Vectors. Factorization. Singular Value Decomposition. Systems of Linear Equations. Eigenvalues. Polynomials. Graph Theory. Boolean algebra. Optimization. Basic signal processing. Basic differential equations.

COMP 502: Advanced Algorithm Analysis (3 credits)

Prerequisites: Design and Analysis of Algorithms (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously)

NP completeness; Search Techniques; Graph and tree algorithms; asymptotic analysis of complexity bounds; Randomized Algorithms. Heuristic and Approximation Algorithms; brute-force, greedy, divide-and-conquer, backtracking, branch-and-bound, pattern matching, numerical approximation algorithms.

COMP 503: Advanced Theory of Computation (3 credits)
Prerequisites: Theory of Automata (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously)
Automata theory; formal languages; Turing machines; computability theory; reducibility, computational complexity, determinism, NP completeness, selected advanced topics.

COMP 504: Advanced Operating Systems (3 credits)
Process management and scheduling, memory management and filesystems are core components of a standalone computer system. Once a standalone computer system is replaced by one spread over a geographically large area, new algorithms and techniques are required to make the system run efficiently. This course discusses the complications introduced when a computer system is not confined to a small region, and has to communicate and collaborate with computers in other cities, countries and continents.

COMP 505: Theory of Programming Languages (3 credits)
This course is about the basic concepts that form the basis of most programming languages today. The course aims to provide you with a framework for understanding how to use language constructs effectively and how to design correct and elegant programs. We will use multiple languages (functional and pure object-oriented) to help you think about the structure of programming languages instead of their syntax.

COMP 513: Advanced Software Engineering (3 credits)
Prerequisite: Software Engineering (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously).
Design Patterns, Object-oriented Software Engineering, Aspect Oriented Programming, Search-based Software Engineering, Software Product Lines, System Re-engineering, Domain-Specific Languages, Generative Development, Service Oriented Architecture.

COMP 514: Software Quality Engineering (3 credits)
Prerequisites: Software Engineering (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously).
Testing: Coverage and Usage Testing Based on Checklists and Partitions, Input Domain Partitioning and Boundary Testing, Coverage and Usage Testing Based on Finite-State Machines and Markov Chains, Control Flow, Data Dependency, and Interaction Testing, Defect Prevention and Process Improvement, Software Inspection, Formal Verification, Fault Tolerance and Failure Containment.

COMP 515: Software Requirements Engineering (3 credits)
Prerequisites: Software Engineering (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously).
Elicitation techniques, goal-oriented requirements engineering, Requirements Specification, Requirements verification and validation, Management of inconsistency and conflict, requirement change control, prioritization; Requirements management; Requirements traceability and impact analysis.

COMP 516: Software Architecture (3 credits)
Prerequisites: Software Engineering (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously).
Attribute-driven architectural design, Architecture reuse; QAW, Evaluating a software architecture (ATAM, CBAM, ARID), Views and styles; refinement, software interfaces;

Architecture Description Languages , AADL: Testing Architectures.

COMP 518: Software Project Management (3 credits)
Prerequisites: Software Engineering (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously).
Project plans, Work Breakdown Structures (WBS), Software measurement, Estimation, Scheduling, Resource management, Team management, Project Monitoring and Control: Requirements Management, Verification & Validation, Software Configuration Management, Risk management, Change control, Documentation, Cutover/Migration, Software Process Improvement.

COMP 519: Formal Methods in Software Engineering (3 credits)
Prerequisites: Software Engineering (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously),
Discrete Mathematics (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously).
Logic. Theorem proving; modelling software systems, sequential, concurrent and reactive systems; state based representations, Formal Specifications, completeness of specification; Automatic verification, Z-Specification, Structure and Schema. Object modeling, automatic analysis of object models.

COMP 522: Component Based Software Engineering (3 credits)
Prerequisites: Software Engineering (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously).
Modeling components with UML, Open Component Models and Technology, Component contracts; component specification techniques, Component integration and Predictable composition, Service Oriented Computing.

COMP 523: Model Driven Software Development (3 credits)
Prerequisites: Software Engineering (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously).
Meta-Modeling, Object Constraint Language (OCL), Meta-data interchange and serialization (XMI), Model-Driven Architecture (MDA), Software Factories, Model Transformations, Aspect-Oriented Model Transformations, Model-to-Text Transformations, Model-to-Model Transformations, Domain-Specific Languages.

COMP 611: Software Evolution and Reengineering (3 credits)
Prerequisites: Software Engineering (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously).
Legacy systems. Architecture recovery and reconstruction, Software aging, code decay, software change. Software maintenance.

COMP 612: Software Engineering for Safety Critical Systems (3 credits)
Prerequisites: Software Engineering (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously).
System safety: Risk assessment in system safety. Hazard analysis techniques: Fault-Tree Analysis, HAZOP, FME Analysis, STPA analysis; Formal methods for ensuring safety. Requirements analysis for safety assurance.

COMP 617: Agent-Oriented Software Engineering (3 credits)
Prerequisites: Artificial Intelligence (undergraduate level; must cover the deficiency by

studying with undergraduate class if not taken previously), Software Engineering (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously).

Software agents, Agent orient Unified Modeling Language (AUML), agent based analysis and design, agent communication and knowledge sharing, KQML, KIF, ontology engineering, agent-based system architecture and organization.

COMP 620: Empirical Software Engineering (3 credits)
Prerequisites: Software Engineering (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously), Probability and Statistics (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously).

Qualitative methods, statistical methods, simulations, Empirical strategies: experiments, case studies, surveys, focus groups, systematic literature reviews. Missing data handling, data analysis. Reporting. Building theories. Ethics.

COMP 621: Software Process Improvement (3 credits)
Prerequisites: Software Engineering (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously).

Process Modeling Techniques, UML, CMM, CMMI, PSP and TSP, Process Changes using PDCA and IDEAL models, Process Assessments, Base-lining, and Benchmarking, Quality Metrics.

COMP 531: Digital Image Processing (3 credits)
Prerequisites: COMP501 Mathematical Methods in Computer Science

2D signal processing techniques (2D convolution and filtering), image enhancement (noise removal, edge sharpening, etc.), image filtering, image compression, segmentation, visual feature extraction, object detection and classification, motion estimation.

COMP 532: Advanced Computer Vision (3 credits)
Prerequisites: COMP501 Mathematical Methods in Computer Science

Early, intermediate and high level vision, region splitting and merging; quadtree; mean and variance pyramids; computing the first and second derivatives of images using the isotropic, Sobel and Laplacian operators; Hough transform; Perceptual grouping: perceptual criteria; Relaxation labeling of images: detection of image features; Grouping of contours and straight lines into higher order features.

COMP 533: Advanced Topics in Computer Vision (3 credits)
Prerequisites: COMP532 Advanced Computer Vision

Low-level vision, geometrical and 3D vision, stereo, 3D scene reconstruction, motion analysis, visual tracking, object recognition; human motion analysis, video processing, vision-based interaction.

COMP 634: 3D Computer Vision (3 credits)
Prerequisites: COMP532 Advanced Computer Vision

2D projective geometry. 2D homography. Camera models and calibration. Epipolar geometry. 3D reconstruction. Triview tensor. Self-calibration. Multiview geometry, Correspondence estimation, Multiview stereo, Optical flow, Semantic reconstruction, Style and content separation.

COMP 635: Computational Photography (3 credits)
Prerequisites: COMP531 Digital Image Processing
Cameras, Image Formation, Visual Perception, Image and Video Processing Image Manipulation (warping, morphing, mosaicing, matting, compositing), High Dynamic Range Imaging, Image-Based Lighting, Image-Based Rendering, Non-photorealistic Rendering.

COMP 636: Biomedical Image Processing (3 credits)
Prerequisites: COMP531 Digital Image Processing, COMP532 Advanced Computer Vision
Study techniques to enhance and analyze 2D and 3D data generated from various medical imaging methods. e.g., X-ray, magnetic resonance imaging (MRI), electroencephalography (EEG), magnetoencephalography (MEG). Topics include acquisition, filtering, de-noising, coding, feature extraction and modeling of medical imaging data as well as machine learning on medical images.

COMP 551: Advanced Artificial Intelligence (3 credits)
Prerequisites: Artificial Intelligence (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously)
Search, Machine learning, reasoning, planning, probabilistic reasoning, reinforcement learning, evolutionary computation, advanced neural networks, natural language processing, constraint satisfaction, knowledge-based learning, robotics, emergent behavior, multi-agent systems.

COMP 552: Advanced Machine Learning (3 credits)
Prerequisites: COMP501 Mathematical Methods for Computer Science
Supervised learning; supervised learning. Logistic regression; Perceptron; Generative learning algorithms; Gaussian discriminant analysis; Support vector machines; Model selection and feature selection; Evaluating learning algorithms; Bias/variance tradeoff; K-means Clustering; EM algorithm. Factor analysis; PCA (Principal components analysis); ICA (Independent components analysis); Reinforcement learning and control.

COMP 553: Soft Computing (3 credits)
Prerequisites: Artificial Intelligence (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously)
Fuzzy Set Theory: Fuzzy Logic, Fuzzy Rules/Relations, Decision Making With Fuzzy Information, Single-Layer Networks, Multi-Layer Perceptron, Radial Basis Functions, Parameter Optimization Algorithms, Bayesian Nets: Neuro-Fuzzy Systems. Evolutionary Computation; Genetic Fuzzy Systems: Decision Tree Learning, Evaluating Hypotheses, Instance-Based Learning.

COMP 554: Advanced Natural Language Processing (3 credits)
Prerequisites: Discrete Mathematics (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously)
Study different approaches to build systems for semantic understanding natural language. Understanding of natural language processing tools like POS-tagger, sentence parser, named-entity recognizer, etc. Design of automatic systems for tasks like machine translation, question-answering, dialogue, summarization, sentiment analysis, opinion mining etc.

COMP 555: Fuzzy Systems (3 credits)
Prerequisites: Discrete Mathematics (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously)

Fuzzy Sets; Operations on Fuzzy Sets; Fuzzy Relations and the Extension Principle; Fuzzy Logic and Approximate Reasoning; Fuzzy Rule Base and Fuzzy Inference Engine; Fuzzy Systems as Nonlinear Mappings; Approximation Accuracy of the Fuzzy System; Design of Fuzzy Systems from Input-Output Data; Fuzzy Linear Programming .

COMP 561: Data Mining (3 credits)
Prerequisites: COMP501 Mathematical Methods for Computer Science
Data pre-processing (noisy and missing data, data normalization and discretization), outlier detection, association rule mining, clustering, classification, fuzzy logic, genetic algorithm, Bayesian networks, and neural network, decision trees, rules, patterns and trends.

COMP 562: Data Warehousing (3 credits)
Prerequisites: Database Systems (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously)
Designing multi-dimensional data model, cleansing and loading of data, determining refresh cycles and methods, efficient data retrieval using bitmap and join indexes, reporting, ad hoc querying, slicing, dicing, pivoting, drill-down, and roll-up operations. Association rules, and visualization.

COMP 566: Advanced Big Data Analytics (3 credits)
Prerequisites: Probability and Statistics (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously)
Topic modeling, structure learning, time-series analysis, learning with less supervision, and massive-scale data analytics.

COMP 663: Information Integration on the Web (3 credits)
Prerequisites: COMP554 Advanced Natural Language Processing, Artificial Intelligence (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously)
Semantic web (RDF, OWL, SPARQL), linked data and services, mash-ups, theory of data integration, schema mappings, record/entity linkage, data cleaning, source modeling, and information extraction.

COMP 664: Information Retrieval and Web Search (3 credits)
Prerequisites: COMP502 Advanced Algorithm Analysis
Search engine evaluation, crawling, identifying duplicates, information retrieval, Processing text, lexicon construction, normalization, inverted index, YouTube search engine, Google query, page rank, search engine advertising, map/reduce, spelling correction.

COMP 665: Data Visualization (3 credits)
Prerequisites: COMP502 Advanced Algorithm Analysis
Pattern discovery; pattern-based classification; scalable pattern discovery methods, pattern evaluation measures, sequential patterns, sub-graph patterns.

COMP 571: Semantic Web (3 credits)
Prerequisites: NIL
Data modeling techniques, relational models, Semi-Structured Data, XML, XPath, XQuery, RDF, RDFS, Formal Ontologies, Web Ontology Language OWL, SPARQL, Embedded Semantics, Micro format, Linked Open Data, Cloud and Semantic Data Integration.

COMP 572: Human and Information Interaction (3 credits)

Prerequisites: NIL
Information resources; vocabularies; Information Interaction in Search engines, Digital libraries; Search techniques; Web search; Information seeking behaviour; User modelling; Evaluation of search sources and results; Result Presentation to users.

COMP 573: Web Services (3 credits)
Prerequisites: NIL
Mark-up languages; APIs for developing web services; web service standards; service description languages; service publishing; service discovery; services composition; web services management.

COMP 574: e-Government (3 credits)
Prerequisites: NIL
Overview of trends driving the development of Government/Non-Profit web Site and Analysis; Citizen Centric Web Design; Overview of Key of e-government Practices and applications: Citizen to Government, Business to Government, Government to Government; Policy Issues in e-government: Public Access & Government Transparency, Privacy and Security Issues; IT Management for Governments and Non-profits.

COMP 575: Social Network Analysis (3 credits)
Prerequisites: NIL
Introduction to social networks; random network models; identifying connected components; giant component; average shortest path; diameter; preferential attachment; network centrality; betweenness; closeness; clustering; community structure; modularity; overlapping communities; small world network models; contagion; opinion formation; applications of social network analysis; social media networks.

COMP 576: Ubiquitous Information Interaction (3 credits)
Prerequisites: NIL
Information Interaction; Seminal ideas of ubiquitous computing; Tangibility and Embodiment; Social computing; Privacy; Critical and cultural perspectives; Mobility and Spatiality; Mobile Technology in the Messy Now; Infrastructure; Seams, seamlessness, seamfulness; Evaluating Interaction of Ubicomp systems

COMP 581/681: Selected Topics in Computer Science (3 credits)
Prerequisites: Will be stated when the course is offered.
This course covers topics of current interest in Computer Science which are not being covered in other courses.

COMP 582: Network Performance Modeling & Evaluation (3 credits)
Prerequisites: Computer Networks (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously),
Probability and Statistics (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously)
Probability. Random Variables. Markov Chains. The Poisson Process. Markov Processes. Queuing Theory. Modeling Complex Communication Networks; Congestion Control Analysis, End-to-End Analysis, Multiple Access Control, Wireless Networks, Ad-hoc Networks, Discrete Event Simulation, Performance Analysis Tools.

COMP 583: Parallel and Distributed Computing (3 credits)
Prerequisites: Computer Networks (undergraduate level; must cover the deficiency by

studying with undergraduate class if not taken previously)
Amdahl's Law, multiprocessors (shared memory), networks of workstations (distributed memory), clusters. threads and shared memory, processes and message passing, distributed shared memory (DSM), distributed shared data (DSD). Parallel Algorithms, Concurrency and synchronization, Data and work partitioning, Load balancing.

COMP 584: Topics in Computer Networks (3 credits)
Prerequisites: Computer Networks (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously)
QoS; Scheduling for best-effort and guaranteed services, web protocols, network interface design, optical networking, Route lookup algorithms; Router architecture; Internet routing protocols, Integrated and differentiated network service models; Traffic Engineering (TE), constraint-based routing algorithms. Multi-protocol label switching. Quality of service mechanisms for multimedia and real-time communications.

COMP 585 :Network Security (3 credits)
Prerequisites: Computer Networks (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously)
Cryptosystems; encryption techniques; Stream and block ciphers; DES; The Advanced Encryption Standard. Confidentiality; Message authentication: Hash functions; Public key Encryption. RSA; Digital signatures. Key management schemes; Dial-up security. E-mail security, PGP, S-MIME; Kerberos and directory authentication. Emerging Internet security standards; SET; SSL and IPsec; VPNs; Firewalls; Viruses; Miscellaneous topics.

COMP 586: Operations Research (3 credits)
Prerequisites: Probability and Statistics (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously)
Mathematical modeling. Linear program models, simplex method, sensitivity analysis, specialized LP models. Network based models, shortest path, min weight spanning tree, max flow, PERT/CPM. Decision models, dynamic programming, games theory. Probabilistic models, expected return models, Markov chains, stochastic processes.

COMP 587: Research Methods in Computer Science (3 credits)
Prerequisites: Probability and Statistics (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously)
Experiment design, writing short and long papers, thesis writing, grant writing, Reading papers, Paper review, case studies, Data processing, Statistics, multidisciplinary research, Graphs and visualization. Modeling. Abstraction. Feature selection. Logic. Axioms. Complexity. Experimentation. Simulation. Testing

COMP 589: Advanced Optimization Methods (3 credits)
Prerequisites: Discrete Mathematics (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously).
Convex sets, convex functions and convex optimization; quadratic optimization, Combinatorial optimization; Geometric and semi definite optimization. Duality; Computational complexity and NP completeness; unconstrained optimization; constrained optimization; discrete optimization, Multi objective Optimization.

COMP 590: Advanced Database Systems (3 credits)
Prerequisites: Database Systems (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously).

Modern database management system architectures; high-performance transaction processing systems (OLTP); large-scale analytical systems (OLAP); Advanced SQL; Object oriented and relational databases; XML; Query optimization; concurrency; recovery; efficiency and correctness of implementation.

COMP 591: Advanced Topics in Mobile andWireless Networks (3 credits)
Prerequisites: Computer Networks (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously).
Cellular systems, medium access control, radio propagation models, error control techniques, handoff, power control, common air protocols, radio resource and network management.

MBA

The School of Management was established in 2005 and has gained a reputation for the quality and diversity of its programs. At SoM we offer a full-time 2-year MBA, a modular 2-year Executive MBA, as well as short duration executive education courses.

Our mission is to provide a fresh approach to business education through a highly motivated faculty in a young and challenging program resulting in graduates who are bold, can think on their feet, and can adapt themselves to any environment or set of circumstances while adhering to strong values.

Three factors give SoM its distinctive edge. First, our faculty specializes in consulting and case writing and has close linkages with the corporate sector. Many of our faculty members are members of various boards as well as providing policy advice to the public sector. Second, we offer specializations in our Baccalaureate program. Third, the triangulation of our pedagogical method combines cases with conceptual understanding of specific subjects, including experiential exercises.

The MBA in particular aims to develop the functional competence any contemporary manager is expected to have in today's increasingly global business environment. The program has a general management orientation without compromising any essentials of the core functional areas. The Executive MBA has been designed for optimal flexibility while retaining the rigor of comparable international programs.

Masters in Business Administration
This is a two-year program with age neral management focus. The program aims to develop high quality professionals who will be agents of change through a combination of their creativity, initiative, compete nce and adaptability. The learning experience is highly inter active and offers the best mix of cases, simulations, and lectures to ensure that students gain both from theory and best practice of business. There is a strong emphasison understanding and managing modern enterprise in the Pakistani environment. The key to this is the experience of the faculty.

We want our students to have a strong entrepreneurial spirit and be able to adapt to challenging situations indiverse environments. Over the last two years ourgraduates have gone into a variety of professions, including the corporate sector, financial sector, charitable organizations, family businesses, academia and public sector. The program is designed to build upon skills and techniques developed in the first year and their application to more complex and integrated business issues in the second year.

MBA Degree Requirements
Students must maintain a CGPA of 2.50/4.00 to graduate from the MBA program. Students take a total of 72 credit hours (24 courses) as well as undertaking a mandatory Internship between the first and second year of the program. All MBA courses are of 3 credits hours.

MBA Courses

Year 1
BUSN 501 Financial Accounting (3 credits)
Focuses on construction and composition of financial statements, consolidation and group accounts, treatment of leasing, etc.

BUSN 506 Management Accounting (3 credits)
Focuses on critical concepts and tools of cost accounting, including CVP, planning and control, allocatiion, revenues, cost information, etc.

BUSN 510 Applied Quantitative Techniques (3 credits)
Introduces fundamental mathematical and statistical tools for decision making including data collection for surveys, modelling, evaluating quantitative data, etc.

BUSN 521 Managerial Economics (3 credits)
Applies microeconomic analysis to specific business decisions, including production analysis, pricing, capital budgeting and risk assessment.

BUSN 522 Macroeconomics (3 credits)
Examines determinants of aggregate trends in the economy, including national income, unemployment, inflation, investment, and international trade, etc.

BUSN 531 Principles of Finance (3 credits)
Focuses on critical concepts, tools and techniques, including time value of money, valuation, short-term financing, cost of capital, and risk-return analysis.

BUSN 550 Organizational Behavior(3 credits)
Investigates the impact of individuals, groups, and structures on behavior within organizations, including leadership skills, team structures, and conflicts, etc.

BUSN 560 Operations Management (3 credits)
Equips students with understanding of efficient management, focusing on interfunctional coordination to meet output targets, etc.

BUSN 570 Logic & Critical Thinking I(3 credits)
Makes students more effective professionals by enhancing critical analytical and communicative skills which impact on managerial performance.

BUSN 571 Logic & Critical Thinking II (3 credits)
This is a follow on course from BUSN 570.

BUSN 580 Marketing & Sales Management (3 credits)
Takes students across the spectrum of marketing conceptsand application, and introduce critical issues faced by the salesforce in operations.

BUSN 585 Marketing Research & Analysis (3 credits)
Covers concepts, tools, and techniques used in marketing research, including consumer behavior, research methodolgies, and statistical applications.

Year 2
BUSN 601 Reporting & Governance (3 credits)
Introduces students to the critical issue of corporate governance and the specific role of reporting standards in achieving the aims of governance.

BUSN 605 Management Control Systems (3 credits)
Focuses on imporatnce of implementation of control systems in organizations and develops understanding of differences in selection of control systems.

BUSN 622 Topics in Investment & Finance (3 credits)
Focuses on more complex issues such as portfolio management, dividend policy, interantional finance, financial engineering and corporate finance.

BUSN 625 Business Ethics (3 credits)
Focuses on the importance of adhereing to values and ethical behavior in the practical business environment.

BUSN 630 Management Information Systems (3 credits)
Focuses on the importance of implemenation of efficient data collection and processing systems for operational efficiencies.

BUSN 640 Entrepreneurship (3 credits)
Challenges the young minds to generate innovative business ideas and to go through the idea implementation phase in detail.

BUSN 650 Human Resource Management (3 credits)
Focuses on importance of HR, its evolution as an organizational function, and the challenges of finding the right HR on national and international levels.

BUSN 660 Business Law (3 credits)
Focuses on critical components of law which impact on business practice in Pakistan.These include corporate law, company registration, and labor laws, as well as

BUSN 670 New Product Development (3 credits)
Focuses on business innovation, new products and technologies for customer satisfaction, while maintain quality and competitive advantage.

BUSN 690 Business Strategy 1 (3 credits)
Focuses on developing an understanding the conceptual frameworks in the field of business strategy.

BUSN 692 Busines Strategy 2 (3 credits)
This is a follow on course from BUSN 690 and focuses more on analytical thinking and contemporray and relevant reference to local environment.

BUSN 695 Managerial Negotiations (3 credits)
Prepares the students for carrying out effective negotitaions in the practical business world.

BUSN 698 Internship (3 credits)
An internship is undertaken between the first and second year of the program.

Executive Masters in Business Administration

EMBA Structure and Degree Requirements:
The Executive MBA has a unique structure.A total of 66 credit hours are earned through 14

modules and one project.Each module is twelvebusiness days of instruction (3 hours 20 minutes a day) in the evening, for a total of 40 hours of classroom contact hours per module. With on-line assignments, there are 48 contact hours per module (as per international standards). Thus, each module, with the exception of the last, is 4 credit hours.

The 14[th]and final module includes a Business Simulation game which will enable the students to apply all the concepts learnt during the entire program. Therefore, this module is 6 credit hours. Students will also be required to undertake a project under the supervision of a faculty advisor. This project will be spread out over a period of almost one year and is 8 credit hours.

EMBA Program Modules

BUSN 675: Management Communications (4 credits)
Critical analyses of communication processes with practical applications of skills learnt.

BUSN 624: Managerial Economics (4 credits)
Key economic principles and their applications in the business and economy.

BUSN 610: Quantitative Methods for Business (4 credits)
Basic statistical tools used by businesses for interpreting data.

BUSN 654: Organizational Behavior (4 credits)
Human behavior and its impact on teams; work-groups and organizations.

BUSN 604: Financial Accounting (4 credits)
Basic accounting principles; preparation and analyses of key financial statements.

BUSN 684: Marketing and Sales Management (4 credits)
Critical marketing concepts, their applications and innovation; sales force and channel management.

BUSN 609: Cost Accounting & Control Systems (4 credits)
Cost accounting, budgeting and management of control systems.

BUSN 665: Law, Ethics & Governance (4 credits)
Impact of key laws and regulations on corporate practices; significance of corporate governance.

BUSN 628: Financial Management (4 credits)
Basic tools of financial and investment management; corporate value addition through informed financial decision-making.

BUSN 664: Operations Management (4 credits)
Dynamics of the product; design, development and production processes.

BUSN 655: Human Resource Management (4 credits)
Managing human capital in an organization.

BUSN 694: Business Strategy (4 credits)
Holistic perspective on decision-making in organizations.

BUSN 634: Entrepreneurship (4 credits)
Business start-ups, resources required, risk analysis.

BUSN 674A: Management Information Systems (MIS) (4 credits)
Integration of all the modules; design and development of information systems; Business Process Re-engineering; technological applications to businesses.

BUSN 674B: Business Simulation (2 credits)
Exposure to actual market conditions through computer-simulated environment; decision-making and analysis of impacts on business management.

BUSN 699: Business Project (8 credits)
Overall application of knowledge, skills and tools to current business perspective under the supervision of a faculty adviser.

Centre for Public Policy and Governance

The Centre for Public Policy and Governance (CPPG) was established in 2007 as an academic, research and training institute. Its first activities were the launch of its Faculty Seminar Series and the Research and News Quarterly publication, while designing a degree program in Public Policy. In 2009 it introduced the Executive MA in Public Policy, which is geared towards public, private and non-profit sector managers. In 2014 it launched its MPhil in Public Policy program. This first batch of Public Policy MPhil qualified in 2016. In both the above programs, students go through a rigorous regimen of theory and practice which leads to skill development in public policy. A final thesis is a requirement which is based on a research proposal, faculty presentations and public defense. CPPG also initiated its PhD in Public Policy in 2019. The Centre for Public Policy and Governance is committed to promoting and disseminating teaching and research in public policy that focuses on citizen welfare, distributive justice, participatory development, humane governance and consultative and transparent policy processes.

The CPPG degree programs are offered in Business and Social Sciences Block. In 2013, with support from USAID Small Grants Project, we established the FCCU Public Policy Research and Resource Center (PPRRC), designed to serve as a resource hub for the public policy research community. The Resource Center provides library services, a digital archive of public policy literature and statistical data sources. There is a functional library here where students, faculty and externals can become members as well as lifelong members. Research area and digitized data is available with printing and photocopy facility. CPPG research programs with external donors and entities are executed here.

In 2011, CPPG also launched the Monograph series and published two studies titled 'Pakistan, Afghanistan and US Relations: Implications and Future Directions' and 'Industrial Policy in Punjab: A Case Study of Sunder'.

Director's Message
The CPPG was established in 2007, and 2023 has completed fifteen years of its existence. In the fifteen years of its existence, the CPPG has made significant accomplishments in research, teaching, training, and advocacy in the areas of governance, civil service reforms, demography, urban policy, citizens engagement, youth, electoral democracy, energy, and conflict resolution and peacebuilding, to mention a few. Building on our initial achievements, the Centre is currently pursuing the following goals:

Firstly, we continue to encourage and promote a culture of research that feeds into policy processes at the local, provincial, and federal levels of government. We will continue to raise awareness of social issues among citizens and elected public and non-elected public officials. Our effort is to expand the listening capacity of decision-makers to achieve tangible results in improved governance, data-driven policy-making, and effective delivery of services for citizens.

Secondly, the CPPG will continue to solicit and bid for projects in the broad domain of Social Sciences and Public Policy to enhance policy outcomes while promoting citizen ownership of these policies.

We plan to initiate short courses and certifications in specific policy areas and research techniques. Simultaneously, we seek to expand merit-based scholarships and financial aid for our students. To this end, we aim to create an Endowment Fund and will welcome any suggestions to achieve this goal.

We launched our MPhil Program in 2014. Given our MPhil's success and growth, the CPPG

launched its doctoral program in 2019, expecting to get recognition as a Centre of Excellence in research, teaching, and training nationally and globally.

Dr. Saeed Shafqat
Professor and Founding Director CPPG

Mission and Vision: Centre for Public Policy and Governance (CPPG)
"The CPPG mission is to create an innovative and inclusive ecosystem for research and policy design in Pakistan."
CPPG is designed to combine the functions of teaching, training, and research through its master's and Doctoral degree programs in Public Policy. By interweaving these functions, CPPG acts as an academic institution and a policy think tank that provides technical and conceptual skills in a broad spectrum of Public Policy and Governance areas, including but not limited to Governance, Democracy, and Institution Building; Environment, Demography, and Urban Change; and Peace Building and Conflict Management.

In addition, CPPG has partnered with a number of development organizations, including USAID, USIP, GIZ, UNFPA, Planning Commission, and Urban Unit, among others. CPPG also organizes academic conferences, seminars, workshops, and short-term skill-oriented training for advocacy, awareness raising, and capacity building on public policy issues.

Learning Objectives:
To realize this vision the CPPG is pursuing the following three- pronged approach:
· As an academic institution, CPPG imparts quality education based on an innovative curriculum that promotes inclusivity, particularly of underrepresented groups across Pakistan;
· As a policy think tank, CPPG conducts applied and evidence-based research to inform the policy process. CPPG is a publishing institute and has released a multitude of monographs, articles, papers, reports, and other knowledge products; and finally,
· As a training institute, the Centre is committed to nurturing a new generation of Pakistani scholars and policy analysts and envisions contributing towards the training and skill development of public officials, journalists and non-profit and business managers.

Conferences
• The Centre for Public Policy and Governance co-hosted the 9th Annual Population Association of Pakistan conference on 'Population Dynamics and Security: Public Policy Challenges' in December 2008
• CPPG organized a two-day International Conference on 'Social Change and Security Imperatives: Challenges for Leadership and Democratic Governance in Pakistan' in December 2013
• On 2 December 2016, the Centre for Public Policy and Governance (CPPG) in collaboration with the Wilson Chair in Pakistan Studies, at the University of Texas at Austin hosted a workshop on Pakistan: The Long View, 2047. The one-day event brought together academicians, researchers, development practitioners and policy-makers to reflect on Pakistan's multi-faceted development challenges and future policy choices. As Pakistan approaches its 100th year of Independence in the year 2047, the workshop gave participants the opportunity to discuss the intersections of governance and public policy; social, economic and environmental well-being; and human and state security

Research Seminars
CPPG's seminars bring together academics, policy makers, students and civil society

members for two-hour discourses on issues relevant to the Centre's thematic interests. A variety of themes are addressed ranging from public service delivery, effective and participatory governance, internal and regional conflict to environmental wellbeing and sustainable development. Eminent scholars from Pakistan and abroad have participated in these seminars at CPPG to date. The interactive question-and-answer sessions are particularly popular and offer an opportunity for interesting dialogue on relevant public policy issues.

Some of the seminars held at the CPPG in 2022-23 are as follows:

· Building Economic Resilience during an Era of Political Instability by Dr. Khaqan Najeeb
· Christianity and Interreligious Encounter in Pakistan by Dr. Paul Rollier
· Reflections of a British Civil Servant: The Bureaucracy and Development by Graham Duncan
· Climate Change and its Relation to Social and Gender Equity by Andrew Shofer, Deputy Chief of Mission, Department of State, Mission Pakistan
· Modi's India: The Rise of Hindu Nationalism and Ethnic Democracy by Chritophe Jaffrelot
· Book Launch: China-Pakistan Relations in the Twenty-First Century by Ayesha Siddique
· Transformations in Pakistan's Political Economy and CPEC by Prof. Mathew McCartney
· Changing Dynamics of China-India Relations: CPEC and Prospects for Pakistan Dr. Saeed Shafqat, Saba Shahid and Mr. PengZheng Wu (Chair)
· The Current State of the Economy and the Need for Pro-Poor Growth by Dr. Sohail Jehangir Malik
· The Trauma of War on Terror and the Limits of Western Theory by Dr. Muhammad Waqar Azeem
· Japanese Culture and Education by Mr. Yusuke Sindo
· BRI in Africa: the case of Chinese engagement with Kenya and Ethopia by Mr. Nishat Kazmi
· Sharia and the State in Pakistan: Blasphemy Politics by Dr. Farhat Haq
· CPEC, Sustainable Economic Growth and Industrial Policy in Contemporary Pakistan by Dr. Matthew McCartney
· BJP or Congress: An Analysis of Indian Elections 2019, Past Trends and Future Projections by Dr. Ali Saleem
· Afghan Peace Process and Pakistan's Role: What does Future Promise? by Mr. Ahmed Rashid
· The Punjab Local Government Act, 2019 by Capt. Saif Anjum, Dr. Ali Cheema and Ms. Mumtaz Mughal
· Pakistan Economic Situation and Budget 2019-20 by Dr. Ali Saleem and Dr. Salahuddin Ayubi
· Status of Archival Research in Pakistan: Strategic Studies and Beyond by Dr. Rabia Akhtar
· US – China Trade War: Assessing the Trump Presidency by Dr. Charles Ramsey
· Migration, Integration and the Importance of Religion in the Processes: Norwegians in the United States and Pakistanis in Norway by Dr. Kari Guttormsen

Workshops and Interactive Policy Dialogs
In January 2017, CPPG in association with the NGO The Grief Directory conducted a workshop/short-course titled "Deliberate and Devise a Response for the Sufferers and Survivors of Political Violence in Pakistan." The workshop was conducted by Professor Marie Breen-Smyth, a native of Northern Ireland and currently a Distinguished Visiting Professor in the Department of Conflict Resolution, Human Security and Global Governance in the McCormack Graduate School of the University of Massachusetts in Boston.

In October 2016, the CPPG held a policy dialogue/workshop on "Rationalizing Discourse on

Pak-Afghan Relations: Is a Reset from Acrimony to Amity Possible?" a program conducted in collaboration with The Center for Research & Security Studies (CRSS). The aim was to inculcate a culture of communication and understanding between representatives of both countries by providing them a platform to initiate conversation. Shazia Marri, former Provincial Minister of Sindh for Information, Tourism and Electric Power and Sayed Ishaq Gailani, leader of Hezb-e-Nuhzat Hambastagi Milli participated from Pakistan and Afghanistan respectively.

In September 2016, CPPG held a 2-day interactive seminar on Civil Resistance in collaboration with the International Center on Non-Violent Conflict (ICNC).

In September 2015, CPPG, in collaboration with the United States Institute of Peace, conducted a two-day workshop on Peace-Building and Conflict Management.

Report Launches
In 2016, CPPG in collaboration with UNFPA & Migration Research Group launched the report "Internal Migration Study Report on Pakistan: The Case of Punjab."

The Centre for Public Policy and Governance launched the report "Improving Governance: Reforming Provincial Services in Punjab, an Action Research Report on Education, Health, Police and Revenue Departments" in April 2015 at the Planning and Development Department, Punjab.

Projects
The CPPG has been engaged in a range of funded development-related projects. Some of these that are ongoing and that have successfully been completed are listed below:
· Juvenile Justice System Act 2018: Assessment, Analysis and Capacity Building. Study funded by United States Institute of Peace (USIP) - Ongoing 2022-2023.
· Consultation and Research on Local Governance in Punjab funded by The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) 2019.
In 2015-16 the CPPG worked on a USAID Citizen's Voice Project, which was a research grant for Improving Governance: Reforming Provincial Civil Services in Punjab

Executive Masters Public Policy
Introduction of the Program
Executive Masters in a one year inter disciplinary and analytical degree program in Public Policy. This program has been created to bring together policy-relevant research, teaching, training, and professional skill development under one umbrella. It is designed to cater to professional needs of mid-career leaders. The program integrates domestic requirements, philosophical dimensions and futuristic vision to help students formulate citizen friendly policies and provide governance to public policy beneficiaries.

Learning Objectives
· Enabling the students to enhance and consolidate their careers in numerous arenas including potential experts of a specific or set of public policies, program coordinators for provincial and local governments, inter agency managers, data and policy analysts and government liaison managers for private businesses.
· To sharpen the skills and knowledge of program participants bringing change in attitude, orientation and leadership qualities
· To expose students to seminars, workshops, policy dialogues, and academic debates with international scholars to enhance their understanding of global governance and improve

their analytical capacity for policy analysis through a practice-oriented curriculum.
- A motivational instructional method develops Leadership Skills empowered to combine professional skills with natural instincts to excel and lead.
- Driven by the logic of Technological Change, implying the future of any organization, public, private or non-profit, would be affected by technology. The current trends in information technology and their possible usage to further policy objectives are explored

Degree Requirements:
A total of 32 credits over 1 year distributed as follows:
1. 4 Courses in Fall Semester (12 credits)
2. 4 Courses in Spring Semester (12 credits)
3. Summer Semester (8 credits)
4. Research Course CPPG 698 (6 credits) & Skills Course CPPG 605 (2 credits) required in Summer Semester

Course Descriptions
Core Courses
CPPG 601: Introduction to Public Policy (3 credits)
Provides an overview of key components of the policy analysis process: defining problems, selecting criteria to evaluate alternatives, developing policy design; construction of policy design; components of the policy analysis framework; participants would be expected to write a position paper at the end of the course.

CPPG 602: Introduction to Statistics, Economics & Accounting Concepts (3 credits)
Provides basic statistical, economic and accounting knowledge; descriptive and inferential statistics; GDP, growth rate, and capital accumulation; analysis of financial statements; training for statistical and analytical calculations through computing software.

CPPG 603: ICT Concepts and Tools for Policy Makers (3 credits)
Trains students in various information and communication technologies (ICT) (word processing, document packaging, spreadsheets, presentation, correspondence and research); explores Management Information Systems and their evolution from standalone to enterprise systems.

CPPG 604: Research Methods (3 credits)
Familiarizes participants with research tools; qualitative aspects of research and report writing; research variables; designing a research proposals and questionnaires; research methods including, case study, participant observation, content analysis, and comparative studies.

CPPG 698: Research Thesis (6 credits)
Students regularly work with their supervisors/faculty members on their research projects approved by the faculty. The professors emphasize that students working under their supervision learn to work on research projects independently. Students are required to meet twice a month to their supervisors to discuss progress on their projects.

Skills Development Courses

CPPG 605: Writing and Communicating Public Policy (2 credits)
Develops writing skills and familiarizes students with major written formats; communication through short paper exercises in writing, speaking and debating; examines real world cases

on successful policies.

CPPG 606: Policy Analysis: Policy Design (3 credits)
Advanced level course, a follow-up of Introduction to Public Policy
Discusses the required public policy framework; ongoing debates about motivational and institutional foundations of public policy; defining policy problems and setting up policy agendas; issues around delivery, implementation and evaluation of public policies.

CPPG 610: Cost Benefit Analysis (3 credits)
Students will learn to differentiate between economic and financial evaluation; challenges involved in accurately measuring them. The first part of the course will concentrate on theory and concepts, while the second part will evaluate existing public projects.

CPPG 611: E-Governance and Technology Policy (3 credits)
Follow up on 'ICT Concepts and Tools for Policy Makers' course
Discusses how technology's use can be used to improve departmental productivity; examines automation, process re-engineering and their organizational implication; reassesses organizational processes in view of available technologies using case studies of government departments.

CPPG 612: Quantitative Techniques for Policy Making and Administration (3 credits)
Pre-requisite: Introduction to Statistics, Economics and Accounting Concepts
Covers basic regression models, research design, data collection, data processing and presentation of research findings; explores research papers to discuss public policy design, evaluation, monitoring and administration.

Elective Courses

1. Governance, Democracy and Institution Building

CPPG 650: Federalism and Decentralization (3 credits)
Examines the theories of federalism and relates these to Pakistan's constitutional development; cuts across the disciplines of political science and economics while theorizing the issues of power-sharing and autonomy.

CPPG 651: Political Institutions and Policy Process (3 credits)
Examines the relationship between political institutions and policy process; analyzes the political economy surrounding economic and social development in developing, newly industrialized, and transitional countries with a special emphasis on Pakistan.

CPPG 652: Governance and Management in a Multicultural Society (3 credits)
Discusses the conceptual framework for inter-cultural communications; exploring traditions of other regions; best practices, theories, techniques and policies relevant for governance and management.

CPPG 653: Leadership theories, Governance and Management Change (3 credits)
Conducted like a seminar where participants will be encouraged to situate and test their leadership and policy skills needed for public service; uses readings, discussions, case studies, simulations, and self-assessment exercises for skill development.

CPPG 654: Organization Theory and Human Resource Management (3 credits)
Explores theories and strategies of human resource management; organizational culture and structure, improvement and compensation; competency based-organizational skill set and career planning.

CPPG 655: Political Economy of Public Policy (3 credits)
Applies a/the political economy framework to encourage participants to understand and analyze processes of public policy formulation and reform; relies on Game Theory to formulate and promote interactive decision making among the participants.

2. Environment, Demography and Urban Change

CPPG 675: Environmental Issues and Public Policy (3 credits)
Builds on the theoretical and empirical concepts of environmental science and policy; evaluates national and international environmental laws and policies; societies and states' responses to concerns on environmental issues and what can be done to educate citizens.

CPPG 676: The Informal Sector (3 credits)
Explores the informality debate to include socio-cultural domains of informality; looks at the continuum between the formal and informal variety, their linkages and relationships in light of their impact on the poor.

CPPG 677: Demography and Security (3 credits)
Makes a comparative analysis of countries where demographic transition, has either led to reduced or intensified conflict; explores successfully managed public policies used to reduce conflict, improve quality of manpower and security, and increase life expectancy.

CPPG 678: Urban growth, Environment and Security in South Asia (3 credits)
Seeks to understand the linkages between accelerated urbanization in South Asia and its impact on environment and human security, makes a comparative analysis of urban and environmental policies of South Asian states; discusses the relationship between economic, social and political factors.

CPPG 679: Gender and Population (3 credits)
Explores concepts, theories, policies and laws on gender and how gender, culture and religion reinforce gender identities; examines changing organization of gender relations in regard to education, marriage, family, reproductive health, migration and human trafficking.

MPhil Public Policy

Introduction of the Program
The MPhil in Public Policy is a two year program that aims to contribute to the education of a new generation of public policy makers and policy analysts. The program equips the students with the skills necessary for an in depth understanding of policy making in emerging democracies.

Learning Objectives

· To contribute to the education of a new generation of public policy makers and analysts
· The program equips students with the skills necessary for an in depth understanding of policy making in emerging democracies

- To develop leadership qualities, managerial skills and analytical acumen among students along with a deep understanding of the processes that formulate public policy and their consequences
- To equip students with qualitative as well as quantitative research methods along with the endurance to conduct good quality research.
- Prepare students for a career in public service, policy formulation and development studies

Degree Requirements:
A total of 30 credits over 2 years distributed as follows:
A total of 8 courses plus Research Thesis totaling 30 credit hours studied. The coursework must be completed in the first year. Students will be required to take 4 core courses, two in each of the semesters. Additionally they need to take 1 course from an area other than their opted specialization. The second year of the program is dedicated to the MPhil Thesis entailing original research on a topic of the participants' choice. The MPhil program shall not extend beyond three years.

1. Four Core Courses (12 credits) from: CPPG 507, CPPG 508, CPPG 615, CPPG 616, CPPG 617, CPPG 618, CPPG 619, CPPG 620, CPPG 621, CPPG 622
2. Three from any of the listed concentrations as well as one additional course from a different group (12 credits)
- *Governance, Democracy and Institution Building* : CPPG 625, CPPG 626, CPPG 627, CPPG 628, CPPG 629, CPPG 630, CPPG 631, CPPG 632, CPPG 633, CPPG 634
- *Environment, Demography and Urban Change*: CPPG 640, CPPG 641, CPPG 642, CPPG 643, CPPG 644, CPPG 645, CPPG 646, CPPG 647, CPPG 648, CPPG 649, CPPG 656, CPPG 657
- *Peace Building and Conflict Management*: CPPG 660, CPPG 661, CPPG 662, CPPG 663, CPPG 664, CPPG 665, CPPG 666, CPPG 667, CPPG 668, CPPG 669, CPPG 670
3. Research Thesis: CPPG 699 (6 credits)

Course Descriptions
CPPG 507/PLSC 507: Constitutional and Political Processes in Pakistan
Analysis of the political and constitutional developments in Pakistan since its creation; issues in constitution making; study of the constitutions of 1956, 1962 and 1973 and the amendments made; impact of constitution making on Pakistani politics.

CPPG 508/PLSC 508: Foreign Policy Analysis
This course is designed to give students an overview of different explanations for states' foreign policy behavior. Theories of International Relations, whether realist or neo-liberal, often assume that states act rationally in their self-interest. However, we know from experience that actors in the international arena often behave in self-destructive ways, especially the decision to go to war. Readings, lectures, and discussions will focus on the pressures of the international system, on the nature of national political regimes, societal forces such as the media and lobbyists, as well as institutional structures and processes. We will also turn our attention to the role of perceptions and misperceptions of individual leaders, their ideologies and beliefs, as well as the problem of images and biases in decision-making particularly during crises.

CPPG 517/PLSC 517: Politico-Strategic Dynamics of South Asia
Drive behind Muslim struggle for establishment of an independent state; dynamics of South

Asian politics; terrorism, conflicts about Kashmir, Siachin and water; mutual mistrust, the arms race, nuclear weapons; politico-strategic dynamics of South Asia which damage relations between India and Pakistan. Reference also to the politics of other SAARC members, including Bangladesh, Sri Lanka, Bhutan and the Maledives.

CPPG 519/PLSC 519: Local Government System in Pakistan
Understanding the political discourse in Pakistan is imperative if one aspires to further decode the political fabric governing both administrative and social contours of Pakistan. Pakistan, in its federalist construct, has an intricate political and administrative system divided under political leadership, legislative authorities, bureaucratic functionaries, provincial layout and local governance mechanism. This graduate level course will be an overview of the evolution of local governance system in Pakistan, its different manifestations and also a means to examine its pros and cons and forecast efficacy.

CPPG 615: Public Policy: Theories and Analysis (3 credits)
This course covers the formulation of public policies; its stages; theory and practice of policy analysis, issues surrounding the delivery, implementation and evaluation of public policies; and current debates and perspectives in public policy.

CPPG 616: Research Methodology (3 credits)
Familiarizes students with research methods in social sciences in general and public policy in particular; the epistemological and methodological concerns, both qualitative and quantitative, as they determine the nature and scope of research.

CPPG 617: Economics and Public Policy (3 credits)
Examines the economic aspects of government intervention in the economy; explores market failure, property rights, mixed goods; the nature of government as a producer and the political system as a mechanism for revealing consumer preferences; studies the economic literature on topics such as taxation, and the evaluation of public spending.

CPPG 618: Strategic Leadership and Governance (3 credits)
The course will analyze strategic leadership and governance to achieve efficient and effective outputs; will help to develop a critical understanding of the theory and practice of strategic leadership, governance and conflict management.

CPPG 619: Human Development (3 credits)
Looks at human development beyond the life-span development approach; the human behavior acquired, maintained and modified in a social environment and with economic, socio-cultural and political constructs; Development Theory, theories of Social, Human and Institutional Capital; methodologies and strategies for human development within the context of state policy.

CPPG 620: Independent Study Research Report Writing (3 credits)
The course will help participants refine their thesis topic, develop their research design and complete a working outline for their project report. Emphasis will be placed on completing the literature review and methodology sections of the thesis. Students will be required to write a research report on the selected topics at the end of the semester.

CPPG 621: Technology and Public Policy (3 credits)
Explores the theoretical relationship of science, technology and society; policies regarding science and technology and Information and Communication Technologies to assess

contemporary issues of governance and development will be studied.

CPPG 622: Institutionalism and Public Policy (3 credits)
Offers theory and practice on global institutions and policy issues: institutional causes and consequences of public policies: formulation of alternative and workable solutions to build sustainable institutions.

CPPG 699: Research (6 credits)
The research projects in M. Phil are designed to make an original contribution to knowledge in public policy, governance, and politics. The faculty members help students learn theories, use them, theorize public policy issues, and conceive solutions to the problems of their choice.

Specializations and Elective Courses

1. Governance, Democracy and Institution Building

CPPG 625: Leadership Theories and Governance (3 credits)
The seminar-based course that explores skills needed for leadership and policy-making at the senior management level. Instruction will be done through readings, discussions, case studies, simulations, and self-assessment exercises.

CPPG 626: Analyzing and Communicating Public Policy (3 credits)
Focuses on the application of the tools of policy analysis to inform and educate the public and to induce social change; the examination of why policies succeed or fail. Participants will be given exercises in writing and speaking, conducting meetings, making presentations and working with the media.

CPPG 627: Public Economics (3 credits)
Looks at the role of government and the ways in which its policies affect the economy; will study efficiency and equity; the public sector and its decision-making; review of the sources of market failure: public goods, club goods, imperfect competition, externalities and information; and taxation.

CPPG 628: International Trade Policy and Globalization (3 credits)
Provides an understanding of the intellectual and practical problems those arise from the economic interaction between countries; existing patterns of international trade and assessment of the potential for answers; the global financial crisis, its causes and timing and consequent concerns for policy makers globally.

CPPG 629: Political Leadership and Policy Making in Pakistan (3 credits)
Studies how different political regimes and political leadership have affected policy making in Pakistan. It will study Pakistan's political history with a focus on policy priorities for specific political regimes.

CPPG 630: Federalism, Provincial Autonomy and the Impact of 18th Amendment (3 credits)
Studies the theory and practice of federalism; power sharing and autonomy; the 18th Amendment and its implications for governance in Pakistan; the issues of federation-province relations; the degree of differentiation and autonomy at all levels of the government.

CPPG 631: Local Governance and Community Development (3 credits)
Explores the theoretical and institutional framework for citizens' participation in governance; skills needed to devise a community inclusive in the decision-making process; understanding of citizenship, the civil society, the commons and participatory democracy; will explore case studies on organizing communities for efficient decision-making and provision of social services and budgeting.

CPPG 632: Democracy and Institution Building in Pakistan (3 credits)
Provides students with insight into the structure of key institutions in a functioning democracy; their consequent role in democratic consolidation; and the development of Pakistan's key institution.

CPPG 633: Political Economy of Public Policy (3 credits)
Applies a political economy framework to analyze processes of public policy formulation and reform; use of Game Theory to formulate interactive decision-making among the participants; policy reforms such as democratic economies, autocratic economies, transition economies; reforms in health, environment and transportation, trade and agriculture sectors will be studied.

CPPG 634: Marketing, Strategic Planning and Communication in Public and Non Profit Sectors (3 credits)
Explores how public and nonprofit organizations/sectors interact with their external environment; their sources of revenue generation; development of their brand name/identity; application of private sector marketing techniques, methodologies and strategic plans.

2. Environment, Demography and Urban Change

CPPG 640: Climate Change Policy and Governance in Asia (3 credits)
Critiques traditional governance paradigms; will discover better governance solutions to the climate change problem; the role of traditional governance in compounding the problem of exploitation of natural resources.

CPPG 641: Urban Change in South Asia and South East Asia (3 credits)
Explores the forces behind urban change; the factors which changes cities; the effects of this change on consumerism, democracy, economic growth and human wellbeing as well as on new social movements, fashions and fads, political struggle and identity politics; and the effect of these factors on the nation's stability.

CPPG 642: Water Policy and Governance in South Asia (3 credits)
Analyzes water policies of Asian countries; developing critical insights to make and remake water policies; the effect of developmental activities on reservoir pollution; water management; policies and governance responses to the water crisis.

CPPG 643: Migration, Human Trafficking in South Asia (3 credits)
Examines linkages between migration, human trafficking and violence in South Asian States; the impact of internal and international migration on human trafficking and violence; its causes; and the response of different countries.

CPPG 644: Urban Governance and Security in South Asia (3 credits)
Studies the link between urban governance and security and the evolving nature of these challenges; the role of policing and civilian law enforcement in the South Asian context, and in Pakistan in particular; the increased rural-urban migration and the resulting urban violence.

CPPG 645: Environmental Issues and Public Policy (3 credits)
Explores the nature and causes of existing environmental issues, with a particular focus on their impact for the developing world; existing environmental policies – both global and local – and the drivers behind policy development.

CPPG 646: Comparative Urban Policy (3 credits)
Studies contemporary debates in urban policy and planning at the local and international level, with a specific focus on South Asia; the evolution of public spaces; service delivery; and the capacity of the government to meet the needs of rapidly expanding urban centers.

CPPG 647: Migration and Urbanization (3 credits)
Studies the drivers behind migration to urban centers; how urban centers can be planned to successfully accommodate their ever-growing populations.

CPPG 648/PLSC 648: Demography, Governance and Security (3 credits)
Studies the linkages between demographic changes in states and societies and how that helps in promoting security and in reducing conflict; a comparative analysis of countries where demographic transition has either led to reducing or intensifying conflict; and the lessons learnt from successful public policies.

CPPG 649: Gender and Population (3 credits)
Explores theories, policies and laws regarding gender; the changing dynamics of gender relations with regards to education, marriage, family and fertility; how culture and religion reinforce gender identities; reproductive health, migration and trafficking of women and children.

CPPG 656: Informal Economy and Urban Development (3 credits)
Explores the state's lack of policy regulation or its implementation and how that leads to an existing policy framework which facilitates or creates hurdles for the informal economy; and its impact on urban development issues.

CPPG 657: Social Entrepreneurship (3 credits)
Introduces concepts, practices and challenges of social entrepreneurship; analytical frameworks, approaches and tools to achieve social and financial goals and to become effective social entrepreneurs.

3.   Peace Building and Conflict Management

CPPG 660: Theories of Peace Building and Conflict Management (3 credits)
Explores conflict management and peacekeeping; methodologies, strategies and processes of conflict management and resolution based on the formulation of conflict due to differences in perspectives, human relationships, and communication problems.

CPPG 661/PLSC 661: Conflict Analysis and Resolution Strategies (3 credits)

Analyzes the context, actors and dynamics of underlying conflict f; the necessary peace-building strategies; tools and methodologies used for conflict analysis; issues such as stakeholder participation, ethics, gender and choice of qualitative versus quantitative research methodologies.

CPPG 662: Dialogue, Negotiation, Mediation and Facilitation Practicum (3 credits)
Builds upon the theoretical frameworks learnt in conflict management by applying conflict resolution strategies through practical exercises based on scenarios and role playing. Participants will explore the stages of negotiations and mediations, and apply techniques through a practicum involving case studies and simulation exercises.

CPPG 663/PLSC 663: Minorities and Public Policy in Pakistan (3 credits)
Studies the consequences of diversity for nation building, policy-making and administrative governance; legal framework of the state, minority representation in political parties, administrative institutions and civil society advocacy groups' highlighting of minority rights; policy responses to the existing challenges; the relationship of an Islamic State with minorities and human rights and insecurity among minorities.

CPPG 664/PLSC 664: Globalization and Transformation of Religion and Politics in South Asia (3 credits)
Analyzes the contradictory processes that globalization unleashes such as conflict, giving new sensibility to ethnicity, extremism, nationalism, cultural wars; the impact of globalization on politics; usage of religion in South Asia; and the effect of globalization on the styles and modes of governance.

CPPG 665: Diplomacy and International Relations in Peace Building (3 credits)
Explores conflict; tools and perspectives in diplomacy and international relations including multilateral and bilateral processes, Track I and II diplomacy; role of international institutions in conflict resolution and peace building; the history and politics of UN bodies; linkages between diplomatic history, institutional structure and international politics.

CPPG 666: Terrorism and Counter Terrorism Policies and Strategies (3 credits)
Explores the history of terrorism, the goals and structure of terrorist groups, their means of resource acquisition; their use of ideologies for recruitment and creating support; the role of states, its use of non-state actors for various policy objectives and political opposition; counter-terrorism methods.

CPPG 667/PLSC 667: Radicalism and De-radicalization in Pakistan (3 credits)
Investigates perspectives and frameworks of radicalization; identify factors fueling extremism; discuss, formulate and analyze de-radicalization methodologies and strategies within the framework of socio-cultural, legal and the political economy of policy reforms in Pakistan.

CPPG 668: Disaster Management, Reconstruction and Rehabilitation (3 credits)
Looks at the theory and practice of disaster management by exploring its phases; politics of disaster management, leadership, and the role of agency coordination; tools for vulnerability mapping, early warning, infrastructure protection, emergency management and assessment of reconstruction and healthcare.

CPPG 669: Discourse, Media and Violent Extremism (3 credits)
Explores the relationship between media and violent extremism on the basis of discourse

presented in the media; role of media; discourse of terrorist organizations and their use of media; comparison of mainstream media and terrorist narratives; reasons for their convergence or divergences.

CPPG 670: Security and Peace Building (3 credits)
Discusses the theory and practice of peace building; security dynamics of Pakistan and South Asia; Pakistan's current security concerns and issues; peace building exercises from different parts of the world; polices and interventions that can be applied to Pakistan's security environment.

Seminars, Training Workshops and Conferences
CPPG has organized more than 200 seminars since 2007. Distinguished scholars, policy analysts, professional and practitioners of public policy are invited. The seminars are meant to be interdisciplinary, spreading across broad policy themes and topics in Natural and Social Sciences and Humanities. These seminars bring together academics, policy makers, students and civil society members for two hour discourses on issues relevant to the Centre's thematic interests. It is mandatory for CPPG students to participate in seminars.

To list a few seminars this year:
· *Financial Inclusion- Public Policy for Open data Driven solutions* by Mohsin Termezy
· *Humanitarianism in Foreign Missions and Pakistan's Narrative* by Mr. Imran Ali, Pakistan's ambassador to Oman
· *Swept Aside: A Story of Christian Sweepers in Lahore* by Dr. Arya Indrias Patras.
· *International Climate Change Negotiations: Challenges to Justice and Security* by Jourdain Vaillant, Sohaib Anwar, Noor Ahmed (Embassy of France)
· *Modi's India: The rise of Hindu Nationalism and Ethnic Democracy* by Professor Christophe Jaffrelot
· *Building Economic Resilience During an Era of Political Instability* by Dr. Khaqan Najeeb.

For Trainings and Workshops, CPPG has been developing short term training modules with the aim to provide specific skills to professionals, academia, NGOs, media personnel and members of the civil bureaucracy. The trainings are usually 2-3 days in duration encompassing interactive sessions, paper and computer exercises.

CPPG has organized three Conferences so far out of which two were on international level while the third one was the Ninth Annual Research Conference of Population Association of Pakistan and the CPPG.

· *Pakistan: The Long View: 2047* – December 2, 2016
· *Social Change and Security Imperatives: Challenges for Leadership and Democratic Governance in Pakistan* – December 12 – 13, 2013
· *Population Dynamics and Security: Public Policy Challenges* – December 2 – 4, 2008

PhD Public Policy Program
The purpose of the PhD program in Public Policy is to create a generation of scholars and professionals equipped to deal with some of the most crucial policy problems in Pakistan and the world today. This program was launched in 2019. By combining elements of traditional graduate education in social sciences, particularly political science, anthropology, sociology, and economics, with a substantive component of training in policy sciences and information technology, the program's graduates will be uniquely situated to undertake serious research and policy assessments with the goal of contributing towards formulation,

interpretation, and implementation of public policies. The program includes a set of rigorous core requirements but also allows students to pursue in-depth research in a broad variety of critical policy issue areas.

Digital Lab
FCC Public Policy Research and Resource Centre has a digital lab that has a collection of Duplex Scanners and associated system to manage digitization process. The objective of the digital lab is to collect various government and civil society documents and to create a digital archive of knowledge pertaining to public policy.

MPhil English

The connection between Forman Christian College (A Chartered University) and the teaching of English has a very long history. FCCU evolved from the Mission School which was established in 1849 as the first English-medium school in Lahore. By 1901, FCC had started English MA classes. The English Department has benefitted from the teaching of great scholars such as Dr HC Velte, Dr FM Velte, Rev HD Griswold, Dr EJ Sinclair and Dr SL Sheets. The graduates of the English Department have distinguished themselves as writers, poets, civil servants, judges, lawyers, diplomats, politicians, and entrepreneurs.

Having offered a 4-year BS Honors degree in English for the last 10 years, this is an appropriate time to offer a higher degree. The MPhil English program will allow graduates and in-service professionals to upgrade their qualifications in English. As an evening program, many current teachers will be able to benefit from it. MPhil graduates will be equipped with analytical and critical research approaches to face the challenges of today's world. The program will carry on FCCU's rich legacy of research and quality teaching.

MPhil English
The MPhil English program is an evening program and is aimed both at students continuing their education as well as in-service practitioners who want to upgrade their qualifications. The program has a number of objectives. It will advance the levels of English communication and fluency skills within Pakistan and develop well-groomed leadership for research and publication in English. It will improve philological and pedagogical practices in English in the country and enhance ethical values by ensuring original work in the field. It will emphasize the importance of English language and literature through both local and global interactions.

Mission of MPhil English literature
The mission of **MPhil** English literature is to educate and train students for long life effective communication in English by connecting English literature with history, theology, culture and civilization and interpret them in the perspective of liberal arts education to prepare them for careers such as teaching, creative writing, civil services, journalism, news-casting, editing and publishing.

Objectives MPhil English Literature
The main objectives of MPhil in English literature are:
To enlighten the minds of students through interaction, analysis and interpretation of literary texts. To give them deep insight into a wide variety of critical approaches focusing on theory and praxis.   To equip students with research skills in favor of writing, presenting and publishing well-documented research.

Program Learning Objectives (PLOs) for MPhil English Literature
· The students will critique textual representations, interpret figurative expressions and appraise new theoretical perspectives. (ENGL 510)
· The students will be trained to identify various literary forms of expression in a variety of literary genres and to appraise these in relation to the critical and theoretical influences. (ENGL 510)
· Students will analyze and evaluate literary texts and their contexts, utilizing various methods and approaches, and focusing on both theory and praxis. (ENGL 510)
· The students will draw inferences, make comparisons, determine causes and effects, recognize the impact of frame-of-reference on judgment, evaluate resources, spot over generalizations, and distinguish between fact and opinion. (ENGL 690)
· The students will identify topics, formulate questions for productive inquiry, use appropriate methods and sources for research, evaluate critically the sources they find, and employ their chosen sources effectively in their own writing. (ENGL 501 & ENGL 699)

- Values: students will demonstrate integrity by writing plagiarism-free academic papers and will also abide by the FCCU core values.

Program Structure
- Successful completion of coursework, seminars and thesis (30+6 = 36 credit hours) Our MPhil students complete 3x3=9 credit hours of core courses and 21 credit hours of electives + 6 credit hours of research (36 credit hours)
- Successful defense of thesis before an external examiner and departmental committee
- Qualifying grade = 3 out of 4, equivalent to "B" (acceptable internationally and nationally by HEC)
- Comprehensive Examination to be passed before the Thesis is submitted in the 4th semester.

Note: MPhil English student will not **be awarded a degree or transcript if he/she** decides to drop out of the program at any time or for any reason during the two years or fails to submit his/her thesis.

Degree Requirements
Mphil English is a 2-year program consisting of four semesters. Coursework includes core and elective courses.

Semester I and II will be fully taught semesters of coursework
Semester III will include only ENGL 699: Research Seminar Course and ENGL 690 Thesis.
Semester IV will be a full thesis supervision focused semester.

Courses	Credit Hours
Core courses 1. ENGL 501 -Research Methods & Publishing 2. ENGL 520 -Critical Theory and Praxis 3. ENGL 690 –Special Research Seminar	9 credit hours
Current Elective courses (choice of 7 electives) 1. ENGL 510-Transcultural Literary Text & Context 2. ENGL 511-Translation Studies: Theory & Praxis 3. ENGL 513 : Language and Gender 4. ENGL 515-South Asian Literary Genres 5. ENGL 516 -Minority Literature in English 6. ENGL 612: Shakespearean Studies 7. ENGL 613: English World Literature in Translation 8. ENGL 616- American Literature 9. ENGL 617 Modern & Contemporary Continental Drama 10. ENGL 618 - Aesthetics & Poetry 11. ENGL 615- British Women Writers	21 credit hours
ENGL 699Thesis	6 credit hours

Road Map
Semester 1

Sr. no	Course code	Course Title	Credit Hours
1.	ENGL 510	Research Methods and Publishing	3
2.	ENGL 520	Critical Theory and Praxis	3
3.	ENGL 516	Minority Literature(s) in English	3
4.	ENGL 511	Translation studies: Theory and Practice	3
5.	ENGL 515	South Asian Literary Genres	3

Semester 2
1 Transcultural Literary Tests and Contexts
2 American Literature
3 Aesthetics and Poetry
4 British Women Writers

Semester 3
1 Special Research Seminar
2 Thesis Supervision

Semester 4
1 Thesis supervision

Total: 36 credit hours

Course Descriptions
ENGL 501: Research Methods and Publishing (3 credits)
Preparing and designing research projects, writing research papers and preparing for publishing; basic understanding of conducting research in Literature; understanding and critiquing various research methodologies; identifying and selecting a methodology; skills for presenting research at academic and literary forums; formatting and documenting research through citations, bibliographies (MLA); attending workshops, seminars and discussions; preparing for thesis supervision on one-to-one basis at the end of degree.

ENGL 507 Research Writing for Humanities and Social Sciences (2 credits)
This course tackles research writing by deconstructing well-written arguments into their component parts and then building them back up again. From the core of a single argument, we will extrapolate the outline of a full research paper in the social sciences and humanities. Using papers that the students have already written or are currently working on, we will work together to critique and revise according to standards of clear writing. This course also covers effective time management for research writers.

Note: The students will only be allowed to register for this course if they are recommended by Humanities and Social Sciences departments due to their deficiencies in academic writing at graduate level at the cap of 15 students per section.

ENGL 510: Transcultural Literary Texts and Contexts (3 credits)
Exploring interconnectedness through globalized mobility; transcultural and transnational perspectives of literary and nonliterary writings in English by diverse socio-cultural groups; reading a range of voices across continents to reflect outside own cultural bearing to imagine the belonging of others; includes some Anglo-American classics along with selections from the Caribbean, China, Africa, Canada, Australia and other hinterlands offering a good comparative study on colonial/postcolonial dynamic to train thinking beyond rigid ideologies; enabling readers critique independently texts and contexts that involve representative transcultural exchanges by deconstructing binary or oppositional paradigms in terms of race, class, ethnicity, gender or nationality.

ENGL 511: Translation Studies: Theory and Practice (3 credits)
Introducing major concepts in translation theory; focusing on their application to translation practice; cognitive and critical parameters allow readers to study a wide range of literature across cultures and engage with practicing translation skills; comprehensive overview of discipline of translation studies to create awareness of diversity of possible approaches to translation and relationships between these approaches.

ENGL 513 : Language and Gender (3 credits)
This course explores the relationship between language and gender by focusing on a wide variety of discourses from everyday communication to politics, media, and literary productions. It not only looks at differences in linguistic behaviours of women and men from a cross-cultural perspective, but also studies how these differences are linked to broader ideological constructs. In that, academic and activist approaches towards feminist thought will also get some attention with respect to discourses on rights. Topics for discussion may include, but are not limited to, a historical overview of linguistic stereotyping and discrimination, sociolinguistic analysis of sex differentiation, feminist stylistics, feminist facets around the globe, contemporary interventions in feminist ideology, models of gender based language analysis. Sex differences reflected in discourses and their social consequences are also examined in the course. In addition, it considers issues concerning sexism in English and the relative success of gendered language reforms.

ENGL 515: South Asian Literary Genres (3 credits)
Elective
Understanding diversity of South Asian culture and history through studying various genres from its literature, including drama, short story, film, autobiography and folk genres; identifying particulars of one or more literary genres by specific characteristics of cultural and social context of time of writing; writing research paper on one particular genre and/or preparing a comparative analysis of various genres; sources include texts from various South Asian vernaculars in English translation.

ENGL 516: Minority Literature(s) in English (3 credits)
Elective
Issues and paradigms related to literature representing minorities across the world; understanding the term 'minority' and how it is used in tagging certain classes, ethnicity, religious factions and instigating discriminatory and paradoxical notions of 'inclusive' vs 'exclusive' through identity politics; sources include representation of minorities in selected contemporary American, South Asian, British and diasporic literature and film; selection of texts and/or choice of focusing on a specific country/region based on discretion of instructor

and interests of students.

ENGL 520: Critical Theory and Praxis (3 credits)
Introducing a wide range of canonical 20 th century critical theories and methodologies/frameworks; inculcating essential critical and analytical thinking for research thorough discursive approach; Part I covers Psychoanalysis, Marxism, Feminism, Gender Studies, Race Studies, Queer Theory, The New Historicism, and Postcolonial Theory via exposure to original texts as well as materials from literature, film and pop culture to comprehend process of hermeneutics and praxis; theorizing, criticizing, and interpreting theoretical/critical paradigms from diverse standpoints.

ENGL 525: Literary Stylistics (3 credits)
Elective
Stylistic analysis of literature; focus on all three main genres (poetry, prose fiction and drama); examining poetry and patterns of lexis, phonetic and metrical organization and relationship to meaning; examining fiction through narratology, style variation and speech and thought representation; examining drama through pragmatics, considering topics such as patterns in turn-taking and their relationship to roles and functions of characters, speech act analysis and styles of politeness behavior; social and cultural context of all genres.

ENGL 550: Contemporary Muslim Women's Voices (3 credits)
Elective
This course intends to introduce different ways in which Muslim women from different countries and cultures challenge the structures imposed on them by traditions and politics in the locales they live. The focus of this course will be to unravel the strategies and modes that Muslim women adapt so to respond and resist the strategic oppressions they are subjected to, whether its patriarchal, colonial or capitalist. For this purpose, we will consider examples from fictional and nonfictional accounts written by representative Muslim women who have successfully disrupted the boundaries that were imposed on them. This will include the resistance through social movements, art, and literature that have remained crucial tools of feminist activism. We will start the course by defining why third world feminism needs to be considered as a category of its own by setting it apart from the mainstream first world feminisms.

ENGL 610: Digital Approaches to Literature (3 credits)
Elective
Investigating theoretical and practical role of digital approaches to literary works and their forms; looking into future possibility of digital literariness by exploring new literary and linguistic dimensions, their changing borders and broadening domains along with their innovative production that affects the experience of reading; tracing the role and engagement of electronic devices in English literary studies by asking questions like how digital and electronic methods shape the scope of English literary expression differently.

ENGL 611: Dystopian Fiction (3 credits)
Elective
This course aims at introducing the genre of dystopian fiction and its evolution over time at postgraduate level. It intends to discuss the notion of 'dystopia' and main characteristics of dystopian fiction in order to make students understand and critically analyze the socio-political significance of a dystopian literary text. This course will expand their mental horizons and add to the variety of literary texts they come in contact during this higher level

English literature degree. This field of English literature will expose them to a unique form of literary text/genre which postgraduate students might choose for their prospective research projects.

ENGL 612: Shakespearean Studies (3 credits)
This course will look closely at variety of Shakespeare's plays from the major genres of tragedy, comedy, history, and romance. The plays to be studied will varydepending on the choice and discretion of the instructor . Topics discussed will include theme, dramaturgy, spectacle, form, character, sources, the original conditions of production, and the reproduction of Shakespeare's plays in a contemporary context. Students will be encouraged to reflect on questions of the politics of production and reproduction, cultural value and authority, and canonicity. Film and TV adaptations of the plays may be used to enhance discussion and reflection. The course willcater to the requirements of students, who are with little or no prior knowledge of Shakespeare and also those wishing to do research athigher levels on the playwright's work.

ENGL 613: English World Literature in Translation (3 credits)
In the study of World Literature in Translation, students will learn how to approach works originally written in different languages and unfamiliar cultural and social contexts, so that they may read with understanding and appreciation authors from all over the world—from all the five continents. This course will explore sociocultural, political, and economic milieus in which these works have been written. The students will be introduced to different narrative voices and themes relating to different regions and areas of the globe. This course will enable the students to look into the different matters of the world from different perspectives and they will be able to view them with broader vision and deeper insight. On the other hand, this course will open new areas of research for our blooming scholars. In this way, it will enable the M.Phil research scholars to prove their mettle in the field.

ENGL 615: British Women Writers (3 credits)
Elective
Introduction to British women writers in multiple genres; analysis of relationship between women's practice of literary genres and socio-cultural milieu; emphasis on women writers' particular experimental narrative strategies and manipulation of the dominant language that created an alternative and distinct women's literary tradition; socio-economic factors that influenced production and reception of women writers in the market.

ENGL 616: American Literature (3 credits)
Elective
Detailed study and analysis of development of different literary forms, themes, and evolution of American English in the United States; in-depth survey and exploration of leading developments in different genres in American literature (poetry, novel, short story, drama, and non-fictional prose) in the United States in different ages; possible selections (based on instructor's choice) can be: 1) American Literature from 1820-1865, intensive examination of the formative period (often called the American Renaissance) of American literature as well as life and culture; 2) American literature from 1865-1918, representing the transition from Anglo-European literary traditions to Americanized language and literary forms; 3) American literature from 1918-onwards, covering modernism, postmodernism and anti-postmodernism.

ENGL 617: Modern to Contemporary Continental Drama (3 credits)
Elective
Exploring experiments in modern to contemporary continental drama; avant garde effects of 20th century and changing types; investigating dominant dramaturgical traditions in history of Western drama, theater and performance; improvisation challenging plot, characterization, language, setting, movement; Ibsen as pioneer of Modern Drama and his genius to substantiate human experience; various dramatists and their disapproval of conventional morality, religion or other accepted mores of their times; their radicalism in form and philosophy of art, concerns about families-in-crises, inspiration for human sentiment, devotion to Marxist or other ideas and ideologies; conflicts of diverse cultural backgrounds.

ENGL 618: Aesthetics and Poetry (3 credits)
Elective
Changing concepts of aesthetic values in poetry in different ages; critical discussion of Modernism; modernist aesthetic characterized by dislocation or abstraction of elements from nature into invented and autotelic artifact; dramatic shift from temporal aesthetic of Romantics to poetics of space in; relationship of an aesthetics of release and enduring forces of restraint.

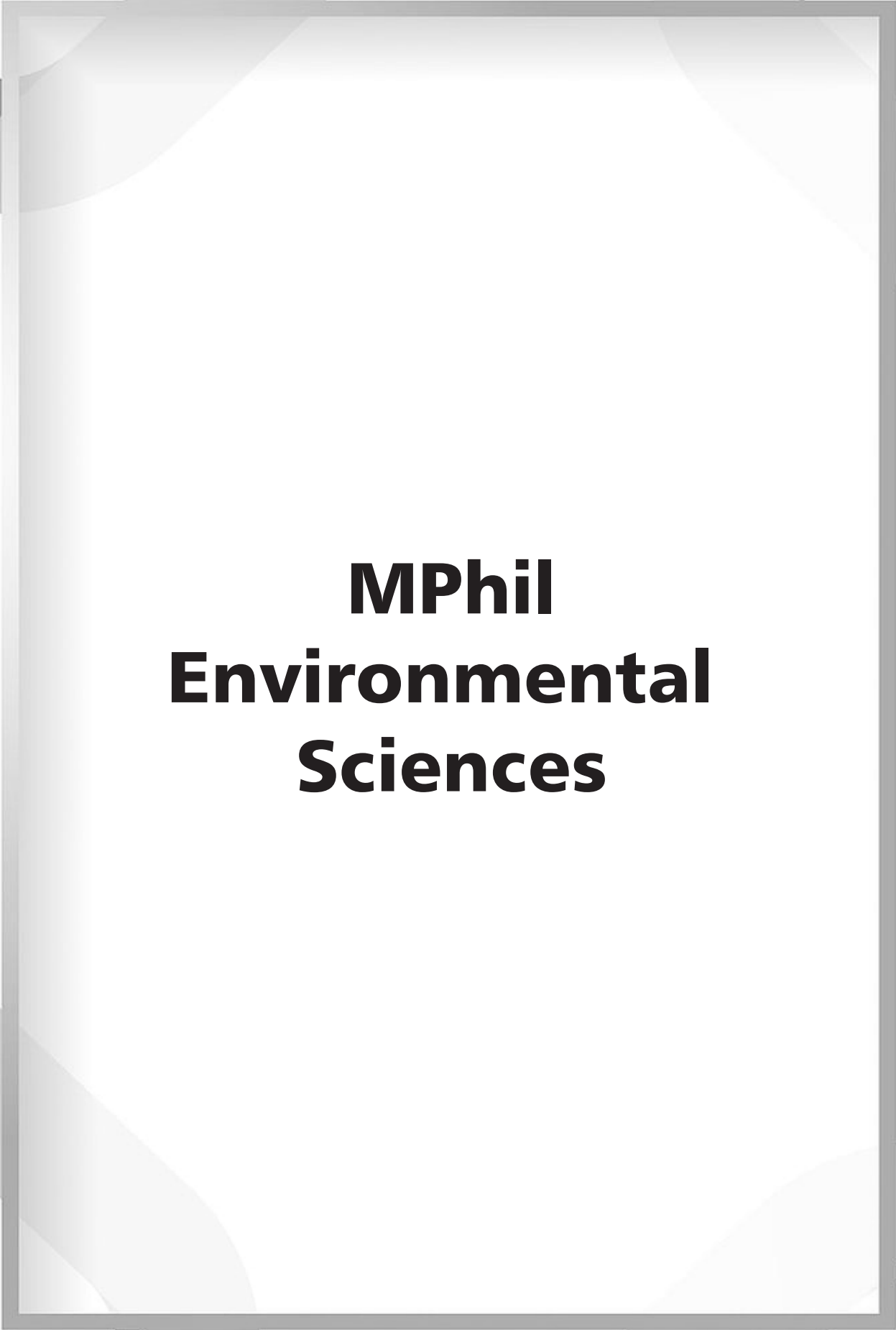**ENGL 620: Trauma Literature and Theory (3 credits)**
Elective
This course covers Trauma Literature in English from a wide range of geographical and historical contexts. The course adopts a transnational lens to scrutinize trauma literature/theory that deals with the repercussions of wars, catastrophes and genocides. Tracing the roots of trauma from the slavery in the US, Holocaust, WW II, and Hiroshima/Nagasaki atomic explosions, this course also contemplates the traumata of the subjects impacted by terrorism, militancy and War and Terror.

ENGL 690: Special Research Seminar (3 credits)
Preparing to conduct research independently and learning from and engaging in critical academic discussions; weekly seminars with regular attendance and interaction with academics and experts invited as guest speakers specializing in a specific area of Literary Studies, Critical Theory or any interdisciplinary area; preparing and presenting two major research papers (6,000 words each) focusing on two different topics covered during these interactions.

ENGL 699: Thesis and Viva (6 credits)
One-to-one supervision through guided academic writing practice and weekly tutorials given by an assigned thesis supervisor. Students are encouraged to prepare drafts of continuous writing (thesis chapters), on which the supervisor will give detailed feedback along with guidance on further readings. Students are expected to learn critical thinking and argumentation skills, apply research skills, develop a theoretical framework, and learn the significance of the theory and its application.There will be a comprehensive exam before thesis submission. Finally, students are expected to prepare a thesis of at least 30,000 words following MLA style to be submitted at the end of the final semester. The thesis will be evaluated by the external examiner and students will present a public defense to complete the requirements for thesis assessment.

MPhil
Environmental
Sciences

INTRODUCTION

Environmental Science is an interdisciplinary subject that draws upon knowledge from the Biological, Physical, Earth and Social Sciences. Study of the subject gives students the opportunity to find out how we, through our use of water, land and energy resources, are affecting our surroundings and the world at large. Knowledge is also gained about the actions that could be taken to reduce, control and, in some case, reverse the damage caused to the environment. An MPhil degree in Environmental Sciences from FCCU will not only make the graduate a very well-informed person about some of the greatest challenges faced by humanity today, but also point to a number of avenues for further higher studies or gainful employment, both locally, nationally and internationally, as worldwide demand for such professionals is growing. The Department of Environmental Sciences is part of Faculty of Natural Sciences.

The Department of Environmental Sciences has local and foreign trained faculty who are well-qualified and highly experienced in teaching and researching the broad subjects making up Environmental Sciences. Their aim is to make studying for an MPhil degree in Environmental Sciences at FCCU a good, rewarding and meaningful experience

The MPhil Environmental Sciences is a two-year program consisting of 2 semesters of coursework followed by 2 semesters of research.

Program vision

The vision of the BS Environmental Sciences program is to contribute to the improvement of the environment globally but with an emphasis on Pakistan and to sustainable development through the efforts of its graduates.

Program mission

The mission of the MPhil Environmental Sciences program is to prepare students for employment in environment-related areas and/or to pursue advanced degrees in environmental sciences related fields by imparting knowledge and developing understanding and relevant practical techniques and skills of environmental sciences.

Program objectives:

- To develop in our students an advanced understanding on environmental problems and how to analyze and assess them
- To enable students to carry out independent scientific research on environmental issues
- To instil in our graduates an understanding of different methods to develop sustainable solutions
- To provide a program to enhance the employability of our students in environmental sector
- To provide a program to enable our students to enter higher graduate degree programs in Environmental Sciences and related fields.
- To instil in our students the knowledge and skills in an ethical manner that reflects the values of the discipline and the Core Values of FCCU
- To prepare students for careers, citizenship and environmental stewardship through experimental curricular and co-curricular opportunities

Program Learning Objectives

Graduates of the program will:
· Be able to demonstrate the intricate linkages within and between biophysical and socioeconomic systems, and apply the principles and requirements that would facilitate the transition to sustainability within these systems.
· Be able to apply theoretical understanding to design a research study on environmental issues
· Be able to conduct research in an advanced topic in environmental problems
· Be able to formulate and implement solutions through professional judgment and skills to address problems of sustainability.
· Be able to demonstrate the ability to work on real-world challenges to combine theory and practice in responding to issues at different scales and contexts
· Demonstrate effective communication within professional context of environmental science/ concepts and problems to both scientific and public audiences.
· Be able to demonstrate understanding to successfully complete their research work by producing and defending an original and significant contribution to knowledge on time.
· Be able to apply the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
· Be able to apply the acquired knowledge within an interdisciplinary context in solving environmental issues in different professional and research context
· Be able to identify/ describe/list opportunities for higher studies and career advancement in the field of environmental sciences.

Requirements for the Program:
A total of 42 credit hours. 30 credit hours consist of mandatory coursework in the first 2 semesters. Students must maintain a minimum of 2.75 CGPA in coursework to proceed for the Seminar Course and Research Work for the MPhil Thesis.

Course Descriptions
ENVR 501: Wildlife, Forestry and Wetland Conservation and Management (3 credits)
Philosophy and conservation of wildlife; Wildlife of Pakistan: types, distribution, status; Threatened animals and plants: laws and regulations for wildlife protection in Pakistan; Protected areas in Pakistan: kinds, distribution and management; Wetlands: their importance, threats and conservation; Forests: their ecological and economic importance, ecological factors affecting forest growth and management; Status of forests in Pakistan: types, distribution, management, deforestation and its control; Rangeland management; Sustainable forest management.

ENVR 502: Water & Wastewater Management (3 credits)
Introduction to water treatment; Coagulation; Filtration, Disinfection; Constituents in wastewater and Treatment Selection: Quality parameters and characteristics of influent, effluent, and wastewater; Sources and impact of polluted water from the domestic and industrial sources; Analysis and design of wastewater treatment systems, Conventional treatment methods, Preliminary Treatment, Primary Treatment, Secondary Treatment, Trickling Filters, Activated Sludge Tanks, Constructed Wetlands; Disinfection processes, Treatment plant performance. Wastewater flow rates and constituent loadings, Removal of nutrients and toxic materials; Re-use and recycling: Wastewater reuse guidelines, technologies, practices and examples feasibility in Pakistan, Case studies of wastewater recycling; grey water reuse; industrial usage; cost and economics analysis.

ENVR 503: Advanced Environmental Analytical Techniques (3 credits)
Introduction; Principles of physical, chemical and microbiological analysis of environmental pollutants; Sampling Procedure for the examination of Water, Wastewater, Air and Solid Waste; sampling rules, sample collection and preservation. Laboratory Techniques and Field Monitoring for parameters of importance causing environmental pollution; Environmental Chemical Analysis; Instrumental Techniques like UV-Vis spectrophotometry, IR Spectrometry, Atomic Absorption, and Emission Analysis Gas Chromatography, GC-MS, High Pressure Liquid Chromatography; Assessment and Interpretation of Results using Statistical Tools.

ENVR 504: Remote Sensing & GIS applications (3 credits)
Image processing for GIS: change detection, classification, and feature extraction. Pushing remote sensing derived vector/raster results into GIS workflow; Use Model Builder to call ENVI processes. Web GIS/map server, relational databases. Geospatial statistics; monitoring air pollution; Case studies: Modeling surface water using ArcHydro and GPS; monitoring the human impact of sea level changes; optical, thermal data fusion; global atmospheric circulation analysis using TRMM. Interpretation of DEM, Geo-referencing, digitizing, mapping, contouring, Spatial analyst. Satellites, Image processing, ERDAS Imagine; Land use classifications.

ENVR 505: Environmental and Health Risk Assessment (3 credits)
Risks, Nature and causes; Risk Reduction & Management, Risk Management Process, Role of Risk Assessment; Quantitative Risk Assessment (QRA); costs and benefits analysis, make non-actuarial predictions. Exposure Assessment, Dose-Response Assessment. Worker Health and Safety: Basic facts (injury and illness statistics), OSHA budget and inspection info. Decision-Making: Distinction between good decision and good outcome, Brief discussion of priority-setting and "Worst things first" thinking, Decision-driven analysis versus analysis-driven decisions. Theories of risk perception, Risk communication strategies, Perception and communication of solutions as supplement/ alternative to risk, communication, Acceptability of risk—laws, policies, controversies, types of control. The Science-Policy Landscape of Risk Assessment.

ENVR 506: Climate Change Adaptation and Mitigation (3 Credits)
Introduction, types and their climatic effects, modeling of climate change, types of climate change models. Climate Change and Wetlands: impacts, adaptation and mitigation. Basic understanding of the physical science of climate change, climate change impacts and the human response to climate change.

Adaptation to climate change, natural and anthropogenic drivers and direct observations of recent climate change. Potential adaptation strategies in different sectors. Climate change impacts and adaptation practices for 67 ecosystems, land use, water resources, society and human health, Climate change mitigation strategies, Carbon sequestration, Transition to carbon neutral energy sources, Geo-engineering as well as measures to increase energy efficiency. Climate change policy and social change, international climate change negotiations, regulatory instruments, voluntary agreements and social change. Climate change and food production, climate change and its effects on Pakistan's agriculture, water resources, forests, etc.

ENVR 507: Strategic Environmental Assessment (3 credits)
Environmental Assessment Introduction and concepts, methods and tools for EA; Strategic Environmental Assessment: Key concepts. SEA legislation and process, regulatory and

planning framework of SEA and Implementation, SEA Tools and Techniques SEA case studies: examples from a wide spectrum of sectors; SEA case studies for Water and SEA case studies for Waste, Future directions: Cumulative impact assessment, Sustainability assessment.

ENVR 508: Applied Environmental Chemistry (3 credits)
Chemistry of atmosphere, Major layers in atmosphere, temperature changes in the atmosphere, units to describe atmospheric chemistry, chemical reactions in the atmosphere sources and effects of following pollutant on human health Carbon dioxide, Nitrogen oxides, Sulfur dioxide, Volatile organic compounds, automobile pollutants, Industrial smog, Photochemical smog, production of hydroxyl radical, their reaction with hydrocarbons, Indoor air pollution various indoor air pollutants, particulates, chemistry of ground level air pollution. Production of ozone in the stratosphere catalytic destruction of ozone, Hydroxyl Radical cycle, NO cycle, the chlorine cycle, Null cycles, Effects of ozone depletion on human health and environment, Green chemistry, its principles, Water pollution, Types of water pollutants oxidation Reduction reactions in aqueous systems. Suspended solids and sediments, Dissolved solids. Toxic organic compounds, pesticides, organochlorine insecticides, carbamates. Accumulation in biological systems. Biomagnification and Biodegradation. Toxic heavy metals and their Bioaccumulation.

ENVR 509: Industrial Ecology (3 credits)
Background and scope of applied ecology. Applications of ecological knowledge in solving different environmental issues. Energy and carbon balance: carbon emission and global climate change, effect of increased carbon dioxide concentration on agriculture. Human impact on Nitrogen cycle. Water as an ecological resource: Water and distribution of species, farming practices under limited water supply. Soil as a natural resource: soil salinity and water logging issues in Pakistan, soil erosion and conservation. Agro-ecology: ecology of food production, Sustainable agricultural practices. Forest ecology: conservation and management of forests and rangelands in Pakistan. Industrial ecology: impact of industrial pollution on ecosystems, pollutant transfer in plant and animals, phyto-remediation. Urban ecology: urban ecological footprint, urban environmental degradation, green cities. Ecological modeling in defining ecosystem problems. Ecological restoration: concepts and techniques.

ENVR 510: Population Dynamics and Environment (3 credits)
World Population: current scenario and future trends. Framework for understanding population-environment nexus, population size and environment, population distribution and environment. Population composition and environment, population growth and climate change, population growth and land use change, research need for correlation studies. Poverty- population-environment linkages in the context of migration and urbanization. Population-development nexus: integrating environment and development. Response to demographic crisis: Government responses, Individual attitudes and perceptions, sustainable approach to population stabilization, Population dynamics in Pakistan, Pakistan's Biocapacity, resource consumption & crisis

ENVR 511: Environmental Application of Nanomaterials (3 credits)
Introduction to nanomaterials; Application of nanomaterials in: remediation of polluted soil and water, pollutant sensing and detection, filtration membranes, green chemistry; Nanomaterials as adsorbents; Nanomaterials for groundwater remediation; Use of nanomaterials as antimicrobial agents; Renewable energy and nanotechnology; Eco-

toxicological risks associated with nano-materials; Future challenges in nanotechnology.

ENVR 601: Alternative Energy Sources (3 credits)
Energy and its forms, energy resources, types, uses; merits and demerits of development and use of energy resources (coal, gas, petroleum, nuclear) local, regional and global impacts of the use of different energy resources, energy resources of Pakistan, non-renewable and renewable, patterns of energy consumption in Pakistan, Future energy scenario of world and Pakistan, sustainable energy management for agriculture, transport, industry and domestic sectors, alternate energy resources, merits and demerits of wind, solar, hydropower, bio-energy resources.

ENVR 602: Cleaner Production and Pollution Control Technologies (3 credits)
Strategies for a better environment: Process internal solutions (process changes, raw materials changes etc.), process external solutions, product changes and other. Basic concepts of Cleaner Production. Process Management, Product Design and Material selection as components of Cleaner Production development. Air pollution control and gas cleaning technology. Waste water treatment. Process internal solutions and external solutions in order to minimize water pollutions. Introduction to environmental engineering and cover common forms of environmental pollution impacts on the environment. Emphasis will be placed on the causes, effects, and control of air, water, and land pollution. Scientific and engineering aspects of environmental pollution and control will be covered.

ENVR 603: Integrated Management Systems (3 credits)
Industry and environment, Legislation and environment since industrial revolution, General and environmental risk management, WTO and environmental management, Safety audits, Total quality environmental management, Organizational drivers and interventions, management commitment and environmental audit, Aspects, Impacts analysis, Country legislation and EMS, Organizational responsibility, EOP and EMP, Monitoring and measuring, EMS Audit, The corporate environmental plan and its implementation, Integrated approach and conceptual models, Devoid EMS model, Isolated EMS model, Devolved EMS model and Integrated EMS model and their analysis and applications. ISO 9001, ISO 18001, and ISO 14001, Theory and practice of integrated environmental management system in Pakistan and at international level. Auditing practices of integrated management system. Corporate Social Responsibility (CSR).

ENVR 604: Eco-Entrepreneurship (1 credit)
Strategic Planning, Survey Research Design and Evaluation, Financial Management and Environmental Accounting, Environmental Markets, Business Strategy and Leadership, Managing for Innovation, Entrepreneurial Marketing, Patents and Intellectual Property, New Product Development

ENVR 605: Research Methods and Scientific Writing (3 credits)
Introduction and Basic Research Concepts: Steps in the Process of Research; Identifying a hypothesis and/or research problem, specifying a purpose, creating research questions; reviewing literature; Ethics of research and informed consent. Qualitative Research Methods. Quantitative Research Methods and Statistics, Quantitative Data Collection Instruments. Reporting Results of Data Analysis; Introduction to Applied Statistics, Descriptive Statistics, Inferential Statistics. Mixed Methods Research. Data Mining - Finding the Patterns and Problems in the World of Data. Completing the Research Project

ENVR 606: Energy and Environment (3 credits)
Forms of energy, Sources of energy and their environmental/health concerns, Non-renewable and renewable sources: fossil fuels, nuclear, solar, wind, hydel, hydel, tidal, waste-to-energy, bio-fuels, thermal, fuel cells, hydrogen as energy carrier etc.; Overview of energy sources in Pakistani perspective; Losses of energy and its conservation; Building, insulation, cooling, lighting etc. materials, hybrid vehicles; Future trends in energy production and conservation.

ENVR 607: Solid and Hazardous Waste management (3 credits)
Introduction to solid waste management; Solid waste characterization: Sources, quantities, quality; Waste collection and transport; Treatment technologies: Bioremediation strategies; Composting: Types and methods, environmental requirements, incineration, reuse and recycling; Landfills: Site design and management; Pollution and risk assessment of landfills; Biogas generation: Use of biogas digest; Recent technologies used for solid waste management.

ENVR 609: Applied Environmental Microbiology (3 credits)
Fermentation Technology: Stages of fermentation process, Isolation, screening, preservation and improvement of industrial microorganisms, Media formulation, Sterilization, Inoculum development- The range of fermentation process, Submerged, Solid state fermentation The chronological development of the fermentation industry, The component parts of a fermentation, process Continuous culture, Fed-Batch culture, Chemo stat culture. Process Engineering: Bioreactor- Design, Operation, Cell Harvesting, and Disruption, Product recovery and Purification, Instrumentation and Process Control, Types of bioreactors. Fermentation Products: Alcohols, Alcoholic beverages, Organic acids, Polysaccharides, antibiotics, Vitamins, Fermented Foods, Organic acids Environmental Aspects: Mineral leaching with bacteria, microorganisms involved in the sulfide mineral leaching, chemistry of sulfide mineral oxidation by bacteria, exploitation of bacterial sulfide mineral oxidation, dump and heap leaching, in-situ bacterial leaching of ore, mineral concentrate-leaching utilization of bacterially generated solvents, heavy metal pollutants removal by bioaccumulation, Degradation of toxic wastes, mechanisms of detoxification, biotechnological remedies, waste recovery, single cell protein, biogas technology. Bioremediation: Microbial control of environmental pollution, Transport and fate, Biodegradation, microbial activities and Environmental effects on biodegradation, transform of metal pollutants, Phytoremediation: Mechanisms involving removal of hazardous compounds and heavy metals from soil and water.

ENVR 610: Sustainable Urban Planning and Management (3 credits)
Introduction to urban ecology. Humans as components of urban ecosystems. Global urbanization patterns (past, present, future) and recent trends in Pakistan. Populations and community diversity in the urban environment. Urbanization effects on environmental health. Functions in urban ecosystem: growth, productivity, disease, exotic species and invasive species in urban areas. Landscape signature and urban heat-island effect. Ecological design and sustainable cities. Concept of urban green spaces for people and biodiversity. Urban inequalities and slum area characteristics. Urban health and emerging diseases. Urban land use planning and management in Pakistan.

ENVR 611: Carbon sequestration and Environment (3 credits)
Carbon sequestration: Introduction and concepts; Global carbon cycle; Carbon emissions; Carbon capture and storage; Soil organic matter and terrestrial C cycle; Terrestrial

biosequestration; Soil enzymes and plants in C sequestration; Role of C sequestration in the climate change mitigation; Factors influencing C accumulation; National and International adaptation and mitigation plans; Carbon foot prints; Carbon offsets; Carbon trading: Carbon credits and clean development mechanisms.

ENVR 696: Seminar (1 credit)
1 Seminar related to the research project.

ENVR 699: Research (12 credits)
MPhil research thesis based on research to be submitted to the university and evaluated by the Departmental Committee and an external examiner.

MPhill
Political Science

The Department of Political Science at Forman Christian College (A Chartered University) is one of the largest departments in Social Sciences. The Department's teaching faculty had the distinction of having scholars of national and international prominence like Dr Carl W Wheeless, Prof Mary Wheeless, Dr Kitchen, Dr Anwar M Barkat, Dr Arshad Karim Syed, Dr Shokat Ali, Dr Hamid Kizilbash, Prof Naseem Zakariya, Dr Parveen Shaukat and Dr Shafqat Hussain Chaudhary.

The quality of instructional work in the Department has been of a high standard, and research work is both required and encouraged. There is a dedicated faculty available to teach various papers and supervise research. The Department arranges extensive lectures, seminars and study tours to facilitate academic excellence in students. Alumni of this Department have contributed positively to national uplift and have excelled in numerous professions.

The Advisory Committee for the Department provides valuable links with foreign scholars who help to establish connections with foreign universities.

MPhil Political Science
FCCU's MPhil Political Science program is designed to expose graduate students to concrete and theoretical knowledge and scholarly research and to empower them with critical thinking, analytical research, and writing skills. This program in Political Science builds on training received at the Baccalaureate level. It has a strong emphasis on research skills that will be beneficial for those pursuing careers in the government or private sectors, civil society, or teaching, among others.

MPhil Political Science is a 2-year program comprising of 30 credit hours of mandatory coursework and a written thesis for 12 credits. Coursework will involve eight core courses and two optional courses offered by the Department. Teaching will be mostly in the form of lectures, seminars and colloquium. The program is designed to lead to PhD for those desiring to pursue a terminal degree in the field.

Degree Requirements
· Must complete 30 credit hours of course work including six core courses and any four electives
· Must complete an MPhil thesis proposal before the start of the second year
· Students must complete thesis worth 12 credit hours (six each in the third and four semester)

Course Descriptions
Core Courses
PLSC 502: Theories of Comparative Politics
The course is designed to introduce students to many (but not all) of the major topics of study, theories and debates in comparative politics, one of the four major fields in political science. To a certain extent, it will entail a historiography of how the field has developed intellectually over the last few decades. However, primary emphasis is on the current state of debates. Most of the assigned readings have a strong theoretical focus and draw on case evidence to support theory-derived arguments. This is **not** a course for learning about the politics of particular countries: the empirics of a particular country case are less important for our purposes than developing the skills required to evaluate theoretical propositions using the comparative method, and acquiring a grasp of the state of a variety of literatures in the field of comparative politics.

PLSC 504: Political Thought
Review of fundamental concepts of ruling parties, justice and resistance and its methods; equality and liberty in the society; examination of traditions to explain their possible normative implication for the present.

PLSC 506: Theories of International Relations
Theories of international relations; the world order; conflicting situations; imperialism; the balance of power and integration as important modes adopted to avoid disorder; basic theoretical and analytical tools developed by political scientists to understand the complexities of international politics; features of the contemporary global system.

PLSC 507/CPPG 507: Constitutional and Political Processes in Pakistan
Analysis of the political and constitutional developments in Pakistan since its creation; issues in constitution making; study of the constitutions of 1956, 1962 and 1973 and the amendments made; impact of constitution making on Pakistani politics.

PLSC 519/CPPG 519: Local Government System in Pakistan
Understanding the political discourse in Pakistan is imperative if one aspires to further decode the political fabric governing both administrative and social contours of Pakistan. Pakistan, in its federalist construct, has an intricate political and administrative system divided under political leadership, legislative authorities, bureaucratic functionaries, provincial layout and local governance mechanism. This graduate level course will be an overview of the evolution of local governance system in Pakistan, its different manifestations and also a means to examine its pros and cons and forecast efficacy.

PLSC 523: Research Techniques in Political Science
This course is designed to help students formulate their research proposals, eventually leading to their thesis proposal and MPhil thesis. First we will discuss what political science is and how it has developed over time. We will discuss the philosophical as well as methodological differences underlying quantitative, qualitative, and interpretive research methods. We will engage in practical application of various methods. And most importantly, we will engage in a detailed discussion of how to design research projects. At the end of the course, students should have constructed a blue-print for their proposals.

PLSC 699: Research Thesis (12 credits)
Students will undertake research on a topic approved by the Departmental Committee and produce a thesis of at least 25000 words. The research proposal must have appropriate design and relate to the substantive and methodological understanding developed in the first year of the program through course work. Students will conduct research under the guidance of a faculty member of the Department of Political Science with expertise in the relevant field.

Electives Courses

PLSC 508/CPPG 508: Foreign Policy Analysis
This course is designed to give students an overview of different explanations for states' foreign policy behavior. Theories of International Relations, whether realist or neo-liberal, often assume that states act rationally in their self-interest. However, we know from experience that actors in the international arena often behave in self-destructive ways, especially the decision to go to war. Readings, lectures, and discussions will focus on the

pressures of the international system, on the nature of national political regimes, societal forces such as the media and lobbyists, as well as institutional structures and processes. We will also turn our attention to the role of perceptions and misperceptions of individual leaders, their ideologies and beliefs, as well as the problem of images and biases in decision-making particularly during crises.

PLSC 509: Political Sociology
Vision of a Society as outlined by Karl Marx, Max Weber, and Talcott Parsons; nature and distribution of power; political socialization; socio-political development and change encompassing nation-building/modernization, social and political movements—political parties/culture; social change focusing on social behavior and social order.

PLSC 513: Advanced Studies in International Relations
In depth study of a particular subject matter discussed in PLSC 505, with particular emphasis on the current salience of the topic to contemporary issues and events. Topic subject to faculty interest and departmental approval.

PLSC 514: International Organizations
Emergence of international organizations; their concepts and debates; specific focus on the emergence of United Nations and its roles; regional organizations; new economic grouping; challenges of international organizations

PLSC 515: Politico-Strategic Dynamics of the Middle East
Historic antecedents and contemporary issues that have shaped the Middle East; politico-strategic issues affecting the region; politics of the Arab-Israeli conflict; the rise of Arab nationalism; Iranian revolution and its impact on the region; American intervention in Iraq; the emergence of the 'Arab Spring'

PLSC 517/CPPG 517: Politico-Strategic Dynamics of South Asia
Drive behind Muslim struggle for establishment of an independent state; dynamics of South Asian politics; terrorism, conflicts about Kashmir, Siachin and water; mutual mistrust, the arms race, nuclear weapons; politico-strategic dynamics of South Asia which damage relations between India and Pakistan. Reference also to the politics of other SAARC members, including Bangladesh, Sri Lanka, Bhutan and the Maledives.

PLSC 518: Civil Society: local and global dynamics
This course will explore the origins of the concept of civil society, modern theoretical conceptualization of civil society, civil society and social capital, composition of civil society, civil society and the state, citizenship and civil society, movements and civil society. Emphasis will be placed on the development of civil society in Pakistan within local, regional and global dynamics.

PLSC 520: Advanced Studies in Political Philosophy
In depth study of one particular topic within political philosophy introduced in PLSC 504. Could include, but not limited to, ancient, medieval or modern Western political thought, Islamic political philosophy, critical theory and subaltern studies.

PLSC 521: Women and Politics in Pakistan
This course aims to develop a comprehensive understanding among students about the dynamics of women political participation in Pakistan-rural and urban, keeping in view the deeply entrenched patriarchy and religiosity in society. The course attempts to understand

the cultural/religious perspective, constitutional guarantees as well as legislative enactments regarding women political participation. Further, another important component of this course will be a comparative analysis of Pakistani women with those in near similar environments like South Asia and Middle East. The students will also be exposed to various dimensions of feminist theory and its possible application in Pakistani context.

PLSC 522: Advanced Studies in Comparative Politics and Area Studies
A course that will focus on the politics of one particular region or neighborhood of the globe not covered in other course offerings. Dependent on faculty availability and research interests.

PLSC 648/CPPG 648: Demography, Governance, and Security
Studies the linkages between demographic changes in states in societies and how that helps in promoting security and in reducing conflict; a comparative analysis of countries where demographic transition has either led to reducing or intensifying conflict; and the lessons learnt from successful public policies.

PLSC 661/CPPG 661: Conflict Analysis and Resolution Strategies
Analyzes the context actors and dynamics of underlying conflict; the necessary peace-building strategies; tools and methodologies used for conflict analysis; issues such as stakeholder participation, ethics, gender and choice of qualitative versus quantitative research methodologies.

PLSC 663/CPPG 663: Minorities and Public Policy in Pakistan
Studies the consequences of diversity for nation building, policy-making and administrative governance; legal framework of the state, minority representation in political parties, administrative institutions and civil society advocacy groups' highlighting of minority rights; policy responses to the existing challenges; the relationship of an Islamic State with minorities and human rights and insecurity among minorities.

PLSC 664/CPPG 664: Globalization and Transformation of Religion and Politics in South Asia
Analyzes the contradictory processes that globalization unleashes such as conflict, giving new sensibility to ethnicity, extremism, nationalism, cultural wars; the impact of globalization on politics; usage of religion in South Asia; and the effect of globalization on the styles and modes of governance.

PLSC 667/CPPG 667: Radicalism and De-radicalization in Pakistan
Investigates perspectives and framework of radicalization; identify factors fueling extremism; discuss, formulate and analyze de-radicalization methodologies and strategies within the framework of socio-cultural, legal and the political economy of policy reforms in Pakistan.

MPhill Economics

POSTGRADUATE DEGREE PROGRAMS

Established in 1915, the Department of Economics at Forman Christian College (A Chartered University) has a long and distinguished history, making it one of the oldest academic departments teaching Economics in the subcontinent. The department has evolved over the years in terms of infrastructure, it holds; the student body, it hosts; and the programs, it offers. In 2004, the Department started a 4-year BSc (Hons) degree in Economics which is now one of the most popular degree programs at the University. In 2009, MPhil program was started that has produced graduates making their mark in academics, research and other professional domains. The department has launched PhD program in 2021 to cross another milestone in a journey, spread over a period of more than a century. The Department is endowed with necessary physical infrastructure, meant to provide quality education in an effective manner; and an inclusive and engaging environment, accommodating ambitions and facilitating achievements.

DEPARTMENT VISION

The vision of the Department of Economics is to develop responsible, capable, and ethical leaders in the field of Economics who can apply existing ideas and develop new ones to serve humanity in general and Pakistani society in particular

DEPARTMENT MISSION

The Department is working with the mission of creating a learning environment in the field of Economics, endowed with the best physical and human resources required for producing confident, competent, and credible professionals and sending them to seek success and serve society. The Department strives to produce and provide an atmosphere:

· Conducive to independent, critical, and creative thinking.
· Promoting competitive as well as collaborative attitudes of seeking knowledge.
· Cultivating an ability of self-motivated lifelong attitude of independent learning

GRADUATE PROGRAMS AT THE DEPARTMENT

The graduate programs, offered at the department aim to expose the students to the depth of theoretical knowledge as well as the breadth of corresponding practical applications. A highly qualified and supportive faculty, thoroughly engaging and empowering environment, effectively well-placed learning and research infrastructure and enthusiastically designed and delivered academic commitment, collectively make this Department immensely appealing and attractive for postgraduate studies. There are two post graduate programs currently offered at the department – MPhil and PhD in Applied Economics.

Areas of Specialization

There is a wide range of areas of specialization in the field of Economics. At the graduate level, the department, however, offers a limited range of specializations (list of elective courses given for both the MPhil and PhD programs) to the students that could provide them healthy prospects for future research in Economics. The specialized elective course offering depends on the availability of the instructor. The areas of specialization include:

- Population Dynamics
- Agriculture Economics
- Applied Econometrics
- Monetary Economics
- Development Economics
- Urban Economics
- Environmental Economics
- Public Sector Economics
- International Economics
- Financial Economics

Objectives of the Post Graduate Programs

The specific learning objectives of the post graduate programs are:

- To build sound theoretical foundations for major issues pertaining to the core areas of interest in the field of Economics
- To produce scholars who meet academic standards as well as market expectations with a strong commitment to follow ethical obligations in line with the 'core values'
- To engender a culture of informed and evidence based policy discussions among the faculty and the students
- To inculcate an attitude of lifelong learning among the graduates, entitling them to become future leaders and economic planners

Research Culture in the Department

Promoting the cause and culture of learning cannot be left to the classroom lectures alone; therefore, the Department takes a lot of pride in exposing its students to a wide range of activities enriching their candidature in different professional pursuits. The true contribution of a university, however, is measured by its research contributions. Effective trainings are carried out to enable students in the use of relevant and latest software applications in research. Moreover, scholarly lectures are regularly organized by the department to inform and engage students on contemporary trends in the field of Economics.

Forman Journal of Economic Studies

Forman Journal of Economic Studies is an HEC-recognized, peer reviewed research

journal of the Department, published regularly since 2005.

Research Conferences

The Department places a great deal of emphasis on creating a research culture for its students, especially at the graduate level. It takes a lot of pride in the fact that it has decided to hold a national conference every year on a leading theme of economic importance for Pakistan. Three such conferences have already been held so far.

The first national conference, held in 2017, was on the theme of "Economy of Pakistan – Vulnerabilities & Opportunities" and was very well received. The second conference was held under the theme of "Growth, Governance and Socio-Economic Gaps" on the 10th of May 2018 and was very well attended. The third conference, titled "Sustainable Economic Development: Dynamics and Prospects", was held on 2nd of May 2019 and received immense appreciation. The quality of papers presented at the conferences; and the scope of attendance, from academia, industry, research organizations, and government departments kept improving which was extremely satisfying for the department and a valuable source of inspiration and education for the students in the graduate programs. The department is keen on reviving the tradition after a break of nearly two years on account of the coronavirus pandemic.

Research Seminars and Training Workshops

The department has a rich tradition of holding research seminars, thematic lectures and training workshops for the students. Each year, students at undergraduate and graduate levels are exposed to lectures and seminars being organized on issues of contemporary significance. In 2015, when the department completed 100 years of its service, a distinguished lectures series was held where eminent scholars like Dr. Deepak Nayyer, Professor Emeritus, Jawaharlal Nehru University, New Delhi; Dr. Nadeem ul Haq, former Deputy Chairman of Planning Commission of Pakistan; Professor Dr. Sohail Jahangir Malik, former senior Economist at the World Bank and consultant to WTO, UNDP, FOA, and ADB; Professor Dr. Shaista E Khilji from George Washington University, USA; Mr. Khalid Malik, former director at United Nations Development Program; Mr. Ali Touqeer Sheikh, Program Director, LEAD, Pakistan; and Professor Dr. Akmal Hussain, Distinguished Professor of Economics at ITU delivered a series of lectures on development policy and role of institutions. Moreover, the department regularly invites eminent Pakistani economists who have held a key position in the economic management of the country. Some of the most distinguished names in this regard include former federal finance minister Dr. Hafeez Pasha and Dr. Salman Shah; former governors of State Bank of Pakistan Dr. Shahid Hafeez Kardar and Dr. Ishrat Hussain and former Deputy Chairman of Planning Commission of Pakistan Dr. Nadeem ul Haq.

The department regularly arranges training workshops for students especially aimed at enhancing their skills in using various computer software applications in the field of Economics like SPSS, EViews, and STATA. One or two workshops are held each year to benefit the students. Moreover, each year, Lucas Economics Society (LES) holds an orientation seminar for students of Economics, guiding them about the market prospects for the students graduating in the field of Economics.

Competitive Research Grants and Projects

- "Effectiveness of Criminal Justice System of Pakistan", funded by Higher Education Commission Pakistan under Thematic Research Grant Program 2017-18.
- "Crop Waste Management and Sustainable Agriculture", funded by Higher Education Commission Pakistan under Thematic Research Grant Program 2017-18.
- "Determinants of Counterfeit Products: A Case of Cotton Seed", funded by the Higher Education Commission (HEC) of Pakistan under the National Research Program for Universities.
- "Impact of Security and Criminal Justice System on Business and Investment and Economic Growth" No. PERI-PC-1/Consultants/2017/02.
- "Role of Various Characteristics in Price Determination of Goat: Implications for Production and Marketing Decisions" funded by US Pakistan Center for Advanced Studies in Agriculture and Food Security (USPCAS-AFS). The University of Agriculture Faisalabad and the University of California, Davis.
- "Economics of Crop Residue Burning in Rice-Wheat Cropping System of the Punjab, Pakistan" funded by South Asian Network for Development and Environmental Economics (SANDEE), Kathmandu, Nepal.
- An Analysis of Willingness to Pay for Pollen Allergy in Islamabad, South Asian Network for Development and Environment, Nepal (2005-2006)
- "Economic Growth and Protection of Life, Property and Contracts", International Food and Policy Research (IFPRI), Pakistan Strategic Support Program and USAID. CGP ID No. 272
- "Institutional Strategies to Abate Socio-Economic Impacts of Climate Change in Karakoram Region of Pakistan and China" (2018-2019), Grant by International Centre for Integrated Mountain Development, Nepal.
- "Climate Change and Future Climate Extremes and Rainfall Variability" (2018) research Grant by Global Change Impact Studies Centre, Islamabad and Pakistan Meteorological Department, Islamabad.

Computer Labs

The Department has established a state-of-the-art Computer Research Laboratory (CRL) with latest and licensed software versions of SPSS, Eviews and STATA. There is a

multimedia facility installed in CRL, aiding the instructor in providing a hands-on exposure to the students. There are thirty workstations available in CLR for students to benefit from this facility.

MPhil Economics

The Department of Economics at Forman Christian College (A Chartered University) has been offering MPhil in Applied Economics since 2009. This program has gained recognition, respect and repute in short span of time. The infrastructure dedicated to the MPhil program has been upgraded and enhanced over the years. Similarly, the academic foundations of the program were further strengthened by introducing new and wider range of courses, upgrading curricula and adding new scholars to bring this program at par with contemporary needs. Located in the purpose-built Social Sciences Building, it has facilities like well-equipped classrooms, lecture halls, computer labs, interactive smart classrooms and other research related aides.

Program Learning Objectives

1. To build sound theoretical foundations for major issues pertaining to the core areas of interest in the field of Economics
2. To produce scholars who meet academic standards as well as market expectations with a strong commitment to follow ethical obligations in line with the 'core values'
3. To engender a culture of informed and evidence-based policy discussions among the faculty and the students
4. To inculcate an attitude of lifelong learning among the graduates, entitling them to become future leaders and economic planners

Admission Criteria

Candidates must:
- Submit an application and two reference letters
- At least one must be from a previous teacher
- Have at least 16 years of education (BSc Hons/MSc)
- with at least 48 credit hours in Economics
- a minimum CGPA of 2.5 (out of 4) or a conventional MA/MSc in Economics with at least 60% marks
- Pass the FCCU Aptitude Test in Economics (FATE) and an interview

Selection Criteria

There will be three pronged criterion of selection for the program.
· FATE Score

- Interview score
- Past academic achievements.

Merit of students will be determined on the basis of weighted aggregation of FATE score f(30%), interview score (20%) and past academic achievements (50%).

Note
- Provisional admission can be sought by students awaiting final results. Their admission will only be confirmed once they have submitted their complete official Transcript within the due dates.
- CGPA in the last degree will be counted towards past academic achievements
- Candidates who fail in the FATE are not eligible to appear in the interview
- The Hostel facility is available only for female students for a period of two years

Degree Requirements
The students must meet the following requirements for receiving the degree of MPhil Applied Economics.
- Completion of coursework composed of core courses (15 credit hours) and elective courses (12 credit hours) with a minimum CGPA of 2.5 before starting the thesis
- Successful presentation and defence of a research proposal, on a topic of researcher's interest and contemporary significance, before the Departmental Graduate Program Committee (DGPC)
- Approval of Board of Advanced Studies and Research (BASR) for the title of research and name of the advisor, based on one-page synopsis
- Mandatory prior approval from Institutional Review Board (IRB), in case the research involves the use of unpublished primary data based on questionnaire,
- Satisfactory completion of 39 credit hours for the degree, comprising of coursework (27 credit hours) and thesis (12 credit hours) with a minimum CGPA of 2.5
- The thesis must be of publication-acceptable standards and must not be submitted for any other degree. The supervisor will check the plagiarism of the thesis document.
- Successful thesis defence before an external examiner and the Departmental Graduate Program Committee (DGPC)
- The degree is a two-year academic program. The time duration can be extended for one year after the approval from the chairperson of the Department and statutory bodies. The maximum time limit to graduate is four years.
- Compliance with all other concerned rules and regulations of the Department, FCCU and HEC

Courses Offered
Following courses (Core and elective) are being approved for the degree of MPhil in Applied

Economics.

Core Courses

ECON 501: Advanced Microeconomics (4 credits)

This course is based on the model-building approach. Students will learn rigorous theoretical modeling and decision-making behavior of consumers and firms under certainty and uncertainty. The topics include systems of consumer demands, duality and empirical demand models, various types of utility functions, properties of demand systems, Marshallian, Hicksian and Slutsky's demand functions, indirect utility function, expenditure function, Cournot and Engel aggregations. The production theory includes production functions and cost functions, firm's behavior under alternative market structures, CES and Translog production function, Income Leisure Model, Game Theory, the payoff matrix of a Game, Nash Equilibrium, Sequential Equilibrium, uncertainty, information asymmetry, moral hazards and adverse selections, welfare economic in standard neo-classical setting; strategic behaviour and collective choice; intertemporal choice under perfect foresight and uncertainty.

ECON 502: Advanced Macroeconomics (4 credits)

This graduate course looks at many macroeconomic models at considerable level of rigor to gain insight into the issues of economic growth and economic fluctuations. Its considerable portion is devoted to assessing the ability of various growth theories (Solow, infinite-time horizon and overlapping generations models, endogenous growth) to answer the central questions of growth. It also includes the models of short-run fluctuations (real-business-cycle and Keynesian models), open economy macroeconomics (Mundell-Fleming Model), effectiveness of monetary and fiscal policies under various exchange rate arrangements. This course has a strong mathematical orientation and makes extensive use of differential calculus.

ECON 505: Applied Econometrics (4 credits)

This course focuses on the theoretical and practical discourse of econometrics and provides the knowledge of issues regarding the application of various estimation techniques under different sets of information and assumptions. Topics covered in this course are regression model basic structure, assumptions, estimation of single equation model, ordinary least square, maximum likelihood estimation, use of matrix algebra in inference related to multiple regression analysis, handling econometric problems like multicollinearity, autocorrelation and heteroscedasticity, generalized least squares estimation, dummy variables and structural shifts, simultaneous equation model identification and estimation.

ECON 655: Applied Economics (3 credits)

It is one of the most useful applied and quantitative courses which is needed for every economist and social scientist. The course aims to develop research ability among students at graduate level. Students are expected to learn skills in using computer software on econometrics, spreadsheet analysis and technical writing skills for economic research. There will be a bulk of assignments that require estimation of econometric models. The computer packages recommended are: STATA, EViews (other packages can also be used if appropriate) and Excel. Students are advised to refresh their knowledge of other courses, especially statistics, econometrics, microeconomics, and macroeconomics. In addition, they will have to search and collect additional reading material and economics data as required.

Elective Courses

ECON 506: Issues in Pakistan Economy (3 credits)

An overview of major developments in Pakistan's economic history in the context of the circumstances that led to those developments as well as the consequences of those developments with major emphasis on agriculture, manufacturing and trade. Review of prospects (opportunities and challenges) of Pakistan's economy in the context of contemporary lay out of its resource endowments. Thematic review of the key issues confronting Pakistan' economy of the day.

ECON 510: Optimization Techniques (3 credits)

Introduction to various optimization techniques used in economic modeling and analysis such as geometric, linear, and convex programming and data envelopment analysis. Through a systematic approach, this course demonstrates the usefulness of these mathematical tools in quantitative and qualitative economic analysis. To demonstrate each technique's advantages and applicability as well as numerous applications of these techniques to industrial economics, regulatory economics, trade policy, economic sustainability, production planning, and environmental policy. It includes both single-objective and multi objective optimization; implementation of optimization tools to improve the accuracy of various economic models; the course cover optimization methodologies include linear programming, integer programming, and constraint programming. The ultimate goals of this course are: to improve the capacity of modelling complex optimization problems in such a way that they can be solved using standard software packages.

ECON 515: Project Analysis and Investment Decision Making (3 credits)

Investment decision feasibility and evaluating criteria for selection of suitable projects for economic development; cost and benefits analysis techniques; use of shadow pricing and

domestic resource cost analysis for tradable; problems in quantification of externalities and social returns; cost and benefit analysis of privatization of public goods/common resources; public-private partnership modeling. Designing projects by preparing feasibility for projects such as: transport; high/motorways; hydel power and drip irrigation; congestions and environmental pollution.

ECON 520: Population Dynamics (3 credits)

The key objective of this course is development of comprehensive and systematic understanding of the population dynamics and transitions, and their consequences. The main feature of the course would be the empirical investigation of underlying relationships between population change and various socio-economic variables like poverty, resource depletion, food scarcity, innovation etc. The major contents of the course include theories of population growth and economic development; dynamics of population change and its future consequences; issues of education, health and labor market outcomes; determinants of fertility, mortality, ageing, unemployment, labor force participation and youth activities. The course also aims to develop future demographers and researchers who are equipped with latest techniques and skills of data handling and economic analysis to create useful knowledge for policy formation.

ECON 525: Institutional Economics (3 credits)

Framework for analysis of linkage between choice coordinating institutions and performance of the economy. Market with alternative property and conduct rules to government enterprises and commands, role of formal and informal institutions. Institutional theory: economics beyond the market, cost and political economy; cost as a function of institutions. Demand as a function of income distribution. Overcoming market failure; the Coasian Paradigm. Domain of institutional analysis; the political economy of decentralization, corruption and decentralization, behavioral economics, rationality of self and others in an economics. Prisoners dilemma. Human choice under alternative rules, the evolution of cooperation and outcomes. Uncertainty and information processing cost. Institutional change. An evolutionary approach to law and economics. What is the best institution? Exit, voice and loyalty. Performance of alternative institutions i.e. technology institutions, political and economic institutions and their role.

ECON 530: General Equilibrium and Welfare Economics (3 credits)

Welfare Economics: society's economic problem, three condition for efficiency and social justice and the social optimum, capitalism, market failure and alternative economic system, criteria for a welfare improvement, the social welfare function and the equity-efficiency trade-off, general equilibrium: consumption without production [pure exchange], production

without consumption: one sector model production, without consumption: two sector model production and consumption, application in public finance: three general principles, a general tax, and a tax on one factor, a tax on one product (an excise tax), tax on one factor in one industry, factor taxes with variable factor supplies, applications in international trade: one country's gain from trade: world prices constant, the effect of a tariff: world prices constant, the determination of world prices, the optimum tariff: world prices variable.

ECON 535: Globalization, WTO and Economic Integration (3 credits)

Role of GATT/WTO in making trade free across nations; WTO rules and their impact on trade relations of poor and developing nations; liberalization and efficiency improvement; free trade and efficiency gains; theory and dimensions of economic integration; financial markets integration and crises contagion; macroeconomics management of global integration; demographics of integration: labor migration and productivity. Emergence of global corporations, associations and institutions; challenges of Third World development under economic integration; case study of China – the prime beneficiary.

ECON 540: Islamic Economics – Theory and Policy (3 credits)

The course is designed to introduce students with basic principles, theories and frontiers of Islamic economics. The course will cover conceptual differences between Islamic and conventional economic systems. Norms related to riba, uncertainty and time value of money will be discussed in detail to build the foundation of alternative modes of financing. The main subjects of the course will include Divine principles and guidelines for production, consumption and distribution of wealth. At micro-level, the theories of consumer and producer behavior, types of business organization, their contractual mechanism, factor pricing and ethical practices in business and economic activities will be discussed. At macro-level, this course will cover the role of welfare state, Islamic guidelines for monetary and fiscal policies. Finally, roadmap for Islamization of the economy and efforts towards Islamization of the economies in Islamic world with special reference to Pakistan will be objectively analyzed.

ECON 545: Economics of Business and Finance (3 credits)

Role and functioning of business firms; mechanism of economic control of business, government regulations and behavior of business firms, financial analysis and planning, financial leverage, financing in imperfect markets, asset pricing theory in continuous time, optimal portfolio and consumption decisions of investors including dynamic programming and martingale approaches, the pricing of contingent claims and the equilibrium asset pricing models (CAPM, ICAPM, CCAPM) and the APT.

ECON 550: Topics in Agricultural Economics (3 credits)

This course covers the importance of agricultural economics, agriculture as an industry, organization and structure of agriculture sector, agricultural production function, production elasticity of inputs, marginal rate of technical substitution, elasticity of substitution, profit maximization, input demand function, product supply function, profit maximization with multiple inputs and multiple products, risk management in agriculture, important indicators of agriculture sector in Pakistan economy, issues of agriculture sector in Pakistan, farm level and marketing problems, impact of policy on agriculture, land utilization and land use policy, land tenure systems and land reforms in Pakistan, international trade and agriculture sector of Pakistan.

ECON 555: Topics in Human Resource Development (3 credits)

A thorough examination of the role of human resource development in effective working of organizations, economies and society to manage change. Role of human resources in economic development; investment in education; rates of return to education and distribution of earnings; health, nutrition and productivity of human resources; mobility and migration of human resources; strategies of human development; women and human resource development; financing of human resource development; human development indexes. Employment and employment models determinants of employment, underemployment, returns to investment in human capital.

ECON 560: Research Methods in Economics (3 credits)

The aim of this course is to enable students to learn the art of empirical investigation. The main contents of the course would include research design, finding and reviewing the relevant literature, development of theoretical framework, model selection and writing processes. Course will particularly teach the essentials of primary research like questionnaire designs, selection of proper scale of measurement, test of validity and reliability, methods of finding and collection of data, issues of sampling, use of micro data and ethical considerations. Other than quantitative and qualitative methods, course will also cover the topics of ethnographic and experimental research in economics. From evaluation's point of view, students will be required to identify their research topics and develop a research proposal in addition to the final exam from the contents covered in the course.

ECON 599: Graduate Research Project (3 credits)

A research project completed as research associate/fellow under the supervision of PhD faculty member. The project may be funded or unfunded. The research project should be of a

publication standard of a refereed journal.

ECON 600: Topics in International Economics (3 credits)

This course deals with the issues of two main areas of economics; international trade theory and policy, and international finance. First part of the course includes the topics regarding trade such as comparative advantage by Ricardo, factor proportion theory by Hechsher-Ohlin, complementary trade theories by Helpman, Krugman, etc., factor specific model, growth and trade, and commercial policy. Main topics of the second part are theories of exchange rate determination (PPP, monetary, elasticity and absorption to the balance of payments), macroeconomic policy in an open economy, role of international financial institutions (IMF and World Bank) in developing countries.

ECON 605: Topics in Development Economics (3 credits)

Development Economics deals with measures, methods, theories, choices and challenges associated with improvements in living conditions. This course includes a quick and basic introduction to the discipline of development economics while discussing the transformation in this discipline since the end of the second world war. Moreover, evolution in the measures of economic development will be shared with a contemporary critique of some of these measures. The areas of international trade and technology transfer, on one hand; and investment and finance, on the other; contain topics of intense debate which are included in this course to share the opposite views and their corresponding justifications. Selected topics on human resource, urbanization, agriculture and income distribution will be analysed both from theoretical and empirical positions. Exposure will also be provided about the new international movement to seek global development outcomes through campaigns like MDGs and SDGs.

ECON 610: Topics in Public Sector Economics (3 credits)

The object of this course is the study of the causes and consequences of public intervention in the economic sphere. Fiscal policy perhaps is the most important economic policy with strong linkages to other policies such as monetary and trade policies. Main topics are, public goods, externality and congestion, public expenditure evaluation principles; theories of taxation; increasing returns, imperfect competition, externality, and growth; public capital, human capital and growth dynamics; resource gaps, capital flows and debt dynamics.

ECON 615: Topics in Monetary Economics (3 credits)

This course begins with historical perspective of money leading to the recent development of crypto currency. The course then moves to the theoretical framework for monetary analysis, particularly, focusing on Classical, Keynesian and Monetarists viewpoints.

Afterwards, factors affecting the monetary transmission mechanism are introduced to the students with a special focus on the economic structure of a developing country. It then studies the theories and empirics of demand for money; money supply; and comparison of different monetary regimes like monetary targeting, nominal income targeting, exchange rate targeting and inflation targeting. Coordination of monetary and fiscal policy and New-Keynesian perspective on monetary policy are then analyzed. Finally, the students are introduced to the challenges posed by globalization and asset prices in the monetary policy design.

ECON 620: Environment and Natural Resources Economics (3 credits)
An overview of environmental and resource economics; imperfect competition in natural resource markets; economics of renewable and non-renewable resources; international trade and natural resources; the economics of climate change, water use management, energy; externalities; endogenous environmental risk; standard vs. taxes in population control; tradable permits in economic theory; comparison of instruments of environmental policy; cost-benefit analysis of environmental policy and management; international environmental problems and agreements.

ECON 625: Advanced Econometric Techniques (3 credits)
This course covers advanced econometrics techniques with special emphasis on time series analysis and forecasting. To understand the characteristics and properties of time series data that must be verified for choosing the 'right' econometric modeling practice and estimation technique, the course starts with basic concepts and definitions like stochastic difference equations, tests of stationarity and order of integration. Then it moves to univariate models to study dynamic properties of conditional mean (ARMA models) and conditional variance (ARCH models) of a time series. To study the vector of conditional means of a set of dynamically interdependent variables, identification and estimation of structural vector autoregressive models will be discussed. Moreover, it includes causality, impulse response and variance decomposition analyses. To study the long-run relationship and short-run adjustment dynamics, co-integration analysis will be studied. In addition to time series data, the course also covers iterative estimation methods of nonlinear regression models and some of the topics related to pooling cross sections across time and panel data, e.g., policy analysis, difference-indifferences estimator, fixed effects models, random effects models, the correlated random effects approach, dynamic models involving panel data.

ECON 630: Topics in Urban Economics (3 credits)
This course is designed to educate and train economics student for evidence based

economic research and public policy. The discipline of urban economics is an intersection of geography and economics. Economics explores the choices people make when resources are limited. Households make choices to maximize their utility while firms maximize their profit keeping in view of geographical constraints. Urban economics puts economics and geography together, exploring the location choices of utility maximizing households and profit maximizing firms. The course is based on issues of modern urban life, for example, the causes and consequences of urban problems such as housing, health, transportation, education, agglomeration, congestion, pollution, and crime. It evaluates alternative policy responses to these problems. In addition, this course explores the efficiency and distributional effects of the policies of local governments on urban population.

ECON 635: Economic Growth Models (3 credits)
Conventional theories and models of economic growth and technological progress: overlapping generations models, optimal growth and dynamic efficiency, endogenous growth, convergence and growth externalities, capital markets imperfections, transaction costs, economic growth and the role of inter-country capital flows, empirical growth models and studies on economic growth.

ECON 640: Topics in Labor Economics (3 credits)
Classical and Keynesian theories of labor, real and nominal wages, demand and supply of labor, household production function, labor productivity and economic growth, labor market conditions and minimum wage laws patterns of wage growth and mobility decision, rates of return to education and income inequality, wage structure and income distribution, allocation of time within households, empirical aspects of female labor supply, wage discrimination and differentials, efficiency wage models

ECON 645: Production Analysis (3 credits)
Theory of production and production sets; production function, cost function; input-output relations and production functions; joints products and production externalities; dual approaches to study technology; empirical models of production, measurement of productivity growth, flexibility of production processes and technological change; alternative approaches to the measurement of technical and economic efficiency in production. Computable general equable and natural resources, natural resource accounting.

ECON 650: Independent Study (3 credits)
This can be an exploratory study providing some foundations of future research. Its research proposal needs to be approved by the Departmental Board of Studies. At least one working paper is required as an outcome of this study.

ECON 660: History of Ideas and Methodology of Economics (3 credits)

The course aims to provide an in-depth analysis of the history of ideas and methodology of economics. It will provide methodological appraisal of logical positivism, Popper's falsification, Kuhn's paradigms, Feyeraband's, scientific research program, Mill's logic, Cairn's logical method, JN Keynes, Robbin's essay, ultra-empiricism, Apriorism, Social Darwinian survival mechanism, instrumentalism, operationalism anarchism and neoclassical research paradigm. The course will provide a survey of economic history of ideas from Aristotle to modern times and to give an opportunity to study economic ideas and theories with philosophical background. The topics covered include: ancient Romans and Greeks, Aquinas; Ibn-Khaldun; mercantilism; precursors of Adam Smith; Adam Smith; David Ricardo; classical theories of value and distribution; classical monetary theory; Malthus; classical economic policy; pre-Marxian socialists; John Stuart Mill; Marx as a classical economist; Jevons; Austrian economics; Marshall on price theory; Marshall on economic methodology and economic policy; The Stockholm School; Keynes and Schumpeter. As well as a direct knowledge and understanding of major contributions to economics over a long time span, the course provides general insights into economic methodology and reasoning and helps to deepen understanding of modern economic analysis.

ECON 699 A & B: Research Thesis (12 credits)

Each MPhil student will carry out research on an approved topic of economic significance and his/her personal interest, under the guidance of an approved supervisor. The supervisor provides the necessary guidelines during the process of research. Student must submit the thesis as per approved title and MPhil Thesis Guidelines to the supervisor for internal and external evaluation within the period prescribed in the University Calendar. The FCCU and HEC plagiarism polices are strictly followed.

PhD Economics

The department offers PhD in Applied Economics after successfully running the program of MPhil in Applied Economics for twelve years. The department has a resolve to provide a high quality learning and research experience in the PhD program, capable to turn passion in to performance by transforming raw talent in to reliable human resource. The program intends to produce PhD scholars who are focussed to fathom, poised to perform and competent to contribute in the field of Economics. The graduates of the program will be given a global orientation about contemporary trends in the field of Economics as well as a local motivation to search for the solutions to some of the most challenging problems confronting Pakistan's economy.

Program Learning Objectives

The Program Learning Objectives of PhD in Applied Economics are to

1. Expose PhD scholars to the contemporary trends in the core areas of Economics

2. Build strong foundations in the application of quantitative analysis to economic theory

3. Inculcate a taste for deep and dispassionate analysis of economic events in the framework of economic models with a cognitive capacity to critically evaluate the assumptions of the models

4. Develop a problem-solving attitude deeply rooted in the valuable tradition of linking theory with policy

5. Encourage to adopt a spirit of lifelong learning by means of reliable and trusted methods and tools of analysis applied to economic issues

Entry Requirements

Eligibility Criteria

The candidate must have

- The Minimum CGPA Requirement for admission in PhD programs, is 3.0 (out of 4.0 in the semester system) or First Division (in the annual system) in the most recent degree obtained (BS/MS/MPhil) is required, whether such was degree obtained from an HEC-recognized Pakistani or accredited foreign university.

- All applicants shall be required to qualify the GAT subject test of Economics, administered by National Testing Service – Pakistan. The GAT subject test is held four times in a year and remains valid for a period of two years.

Selection Criteria

Applicants meeting the eligibility criteria will be selected on the basis of a three pronged criteria, including academic qualification, test score and interview performance. The distribution of weightage to each of these admission criteria is given below.

- Academic Qualification   30 %
- Test Score   40 %
- Interview   30 %

Duration of the Program:

The PhD degree shall be awarded for a minimum duration of three years and maximum of eight years (for normal circumstances). However, if a student is unable to complete the degree within eight years, the Board of Advanced Studies and Research (BASR) will determine whether the delay was caused by circumstances beyond the student's control, and if so, it may grant an extension for a maximum of two years in lieu of the exceptional

circumstances. Thus there is a maximum of ten years' duration to complete the degree. The duration of the degree starts with the students' enrolment and it ends on the date of notification of the award of the PhD degree, subsequent to the PhD defense.

Residency Requirement:

PhD program shall include a residence requirement for PhD students of at least two years.

Coursework

Students enrolling from the BS stream shall have to do 48 credit hours of coursework whereas entrants from MS/MPhil/PhD can avail credits up to 24 credit hours for coursework done during their MS/MPhil studies. At the time of admission, a PhD student may apply to transfer the credit hours of MS/MPhil/PhD courses after proper permission by the PhD Committee of the department of Economics. The credit transfers will only be allowed from an HEC recognized University as per HEC criteria.

Deficiency courses will be offered to students if their previous exposure will be considered insufficient. The need for deficiency courses will be determined by the PhD committee of the department of Economics. Fee will be charged for the deficiency courses.

Comprehensive Examination:

Following the completion of PhD coursework, every PhD student shall be required to pass a comprehensive examination, before formally starting the stage of research work. If a student fails to pass the comprehensive test, he or she shall be allowed one more attempt to take the comprehensive test. The comprehensive exam shall be based on the higher level courses of PhD program.

Research work

The research component of the PhD program is of 12 credit hours. Within six months of successfully completing the coursework (with a minimum GPA of 2.75) and passing the comprehensive exam (in no more than two attempts), each student is required to get the synopsis of research approved in order to register for the research work. The student should continue registering for research in every semester until the PhD degree is awarded.

Allocation of Supervisor

Each student will be assigned to an HEC approved supervisor (from the department) and a co-supervisor (if essential to the research of the PhD student, on recommendation of the supervisor, duly approved by the PhD committee and BASR) from within the

Department/University or from another University/ Research Organization. The supervisor will provide Semester-wise Report of the student to the PhD committee. In case of two consecutive adverse Reports by the Supervisor, BASR will recommend the cancellation of the candidacy of the student. In certain exceptional circumstances, a change of supervisor may be allowed on the concurrence of the current and proposed supervisor and approval of PhD committee and BASR

Synopsis

A PhD student will present a PhD synopsis before the Departmental PhD Committee within six months of successfully completing the course work. The synopsis defense will be carried out in the form of a Departmental Seminar. The synopsis is expected to establish novelty of investigation, significance of objectives and a validity of methodology to seek those objectives. After approval from the departmental Board of Studies, the synopsis will be sent to BASR for the final approval. The approval of PhD synopsis by the BASR is mandatory before registering for the research work as a PhD candidate.

Research Dissertation

Before the submission of the dissertation, the student shall present his research work in anther departmental Seminar. Thereafter, the dissertation will be sent to the expert external reviewers after conducting a plagiarism test (in accordance with the HEC's Plagiarism Policy). An open defense of the dissertation will be held after positive evaluation of the dissertation by the PhD committee and two external expert reviewers of high academic esteem. However, if the PhD candidate publishes his or her dissertation research (as first author) in a peer reviewed journal that is classified by the HEC as category X or above, the PhD dissertation will only require the evaluation by one external expert. It is mandatory for a PhD candidate to have at least one research paper (as its first author) published (during his or her doctoral studies) in an HEC approved Y category (or above) journal for the award of PhD degree.

Courses offered in the PhD program

All the courses offered in the PhD program are of three credit hours. The titles, course codes and a brief description of these course is given below.

ECON 701: Topics in Microeconomics

The focus of this course is on Consumer, Producer and Game Theory. This microeconomic theory course is divided into two parts. The first part covers topics on consumer and producer theory, choice under uncertainty, general equilibrium, and general equilibrium with

asset markets and dis-equilibrium, Welfare Economics, and CGE models. The second part focuses on game theory including normal form games, rationalizability and Nash equilibrium. It then covers extensive form games, Static Games of Complete Information, Dynamic Games of Complete Information, Static Games of Incomplete Information, Dynamic Games of Incomplete Information and a variety of refinements of Nash equilibrium, including sequential equilibrium and infinitely repeated games.

ECON 702: Topics in Macroeconomics

This course aims to provide exposure to a wide variety of theoretical models and methods that may be used by PhD research scholars. It includes dynamic stochastic general-equilibrium models of macroeconomic fluctuations with price stickiness; alternative views regarding the determinants of consumption and investment; and the imperfections in financial markets. Moreover. the impact of fluctuations in labor demand on wages and employment will be investigated with the help of traditional efficiency-wage model, contracting theories, and modern search and matching models. With regard to the macroeconomic policy, the role of monetary policy for controlling inflation and macroeconomic stabilization will be analyzed; and two baseline views (Ricardian equivalence and tax-smoothing) regarding the fiscal deficit constraints will be evaluated.

ECON 703: Topics in Advanced Econometrics

This course is about the econometric tools designed to maintain a balance between the theory and the application. The analysis framework will focus on assumptions, estimations, and limitations of econometric techniques. Topics in Advanced Econometrics will cover the structure, and challenges of linear and non-linear regression models, spline functions, endogeneity, instrumental variables, seemingly unrelated regression models, panel data approaches, limited dependent variable models, data censoring, and selectivity bias.

ECON 705: Seminar in Applied Econometrics

The emphasis of this course is on the practical applications of the econometric theory being developed in different subfields in the discipline of Economics. The student will be groomed to learn the art of discrimination between competing models on the basis of empirical tests, descriptive data analysis, estimation of econometric models, hypothesis testing, diagnostics and solutions of econometric problems, diagnostics and estimation of univariate time-series models (ARMA and ARCH models), diagnostics and estimation of multivariate time-series models (VAR models, causality, impulse response analysis, variance decomposition and co-integration), survey data analysis, analysis of macroeconomic and financial time-series data with applications in consumption, investment, budget and international trade, money, inflation, interest rate, exchange rate and stock prices.

ECON 706: Topics in Optimization Technique

The course covers the developments in advanced optimization models and solution methods for technical and economic problems in planning. The course will cover classical, linear and non-linear optimization applications in Economics; alternative approaches to dynamic optimization in continuous and discrete times; models with and without perfect foresight. Moreover, it will include the applications to the models of capital accumulation, human resource development, optimum growth and dynamic efficiency. The course will also include first order linear differential and difference equations; higher order linear difference and differential equation and solution methodology; non-linear differential equations; linear approximation and stability; and dynamic programming and solution methodology.

ECON 707: Structural Equation Modeling

This course focuses on the development of knowledge and skills related to structural equation modeling and its research applications in Economics .This course focuses on factor analysis, confirmatory factor analysis, second order factor analysis, structural equation modeling, longitudinal structural equation modeling, multi group structural equation modeling, interactions in SEM, LISREL sub-models, estimation methods of SEM, path analysis, path analysis with manifest variables, path analysis with latent variables, interaction effects, stacked models (multiple sample models), models for repeated observations (simplex models, autoregressive models)

ECON 708: Issues in Development Economics

This course will involve the themes of contemporary academic significance and policy interest in the field of Development Economics. In the beginning, a review of the analysis and the recommendations of Sarkozy Commission Report (investigating the global economic crisis of 2007) will be made. *Jobs*, *workers* and *wellbeing (individual and collective)* are deeply connected issues showing new fault lines in an age of extraordinary transformation, caused by the ongoing digital revolution; climate change and the new organizational structures of social organization; each of the three issues will be discussed in the context of the stated fault lines. The ever expanding frontiers of development policy will be reviewed in the context of private sector enterprises, human development and management of productive resources. Economic reasoning and political choices are not always aligned, creating an enigma for policymakers, which will be brought under discussion from the perspective of political economy. The choices and challenges of investigating the process of development with empirical modelling will be identified at the end of the course.

ECON 709: Issues in Globalization and Economic Integration

This course substantially concentrates on the emergence of globalization process and especially those developments in the world economic system which leads developing countries experienced towards deprivation. This course covers topics including: The historical evolution of globalization process; micro and macro dimensions of the global economy; how trade and financial integration necessitate global interdependence; the role of international corporations (MNCs/TNCs) and global production system; China as a role model of global economy; globalization in the age of technological advancement; anti-globalization movements and their sources. This course further examines the changes in the international economy and their impact on the societies/countries. It will allow the students to critically analyze: the behavior of companies in new environment; WTO rules and their implications; WTO and LDC's; liberalization and efficiency improvement; free trade and efficiency gains; theory of economic integration; theory of custom union; empirical research on the trade and welfare effects of economic integration; theory of optimum currency areas and the mechanisms of the European monetary system; regional policy perspectives with reference to NAFTA, ASEAN, APEC, SAARC and ECO.

ECON 711: Issues in Public Sector Economics

This course provides an in-depth understanding of government policy through the lens of economic efficiency and equity. Current theories and analytical tools of Public Economics will be thoroughly studied and policy applications will be discussed. Rationales for policy intervention will be critically examined from the welfare perspective. It focuses on the relationship between the government and the market, and arguments for and against government involvement. The course covers a wide range of the many critical decisions which policymakers face regarding the expenditure and financing of the public sector, besides implications of these on individuals and firms' behavior and the overall economy. Special emphasis will be placed on issues and challenges facing Pakistan in public sector policy. Additional topics would include, among other things, market failures, provision of public goods, externalities, income distribution, social and public choice, fiscal federalism, optimal taxation theory and the trade-off between efficient and equitable taxation, tax incidence and the political economy of taxation. Critical evaluation of tax reforms, NFC award and fiscal implication of 18th amendments in Pakistan will also be discussed.

ECON 714: Topics in Population Economics

This course is designed to develop the critical ability among students to systematically analyze population dynamics, its transitions and consequences. The course also aims to develop future demographers and researchers who are equipped with the latest techniques

and skills of data handling and economic analysis to produce useful knowledge for policy formation. The main feature of this course would be an empirical investigation of the underlying relationship between population change and various socio-economic variables like poverty, resource depletion, food availability and innovation. The main contents of the course include socio-economic consequences of population aging, determinants of fertility, mortality, morbidity and migration. Critical analysis of optimists' and pessimists' theories of population and economic development through historical trends would be the main feature of this course.

ECON 716: Financial Economics
The objective of this course is to inculcate a challenging view towards theoretical foundations of modern Financial Economics. It provides a rigorous introduction to the fundamentals of modern financial analysis and their applications to business challenges in capital budgeting, project evaluation, corporate investment and financing decisions, and basic security analysis and investment management. The course will cover the central themes of modern finance such as individual investment decisions under uncertainty; stochastic dominance; mean-variance theory; capital market equilibrium and asset valuation; arbitrage pricing theory; option pricing and their potential application. In addition to individuals' consumption and portfolio decisions under uncertainty with their implications for the valuations of securities, the path-breaking advances in finance theory and practice over the past decades that have profoundly changed the financial world through extensive globalization of financial markets will also be the part of discussion.

ECON 717: Topics in Health Economics
The course provides an economic approach to the analysis of health and medical care markets. Theoretical and empirical tools of Economics will be applied to the problems of health and medical care delivery. The course will concentrate on decision-making under conditions of uncertainty, cost-benefit analysis, health insurance, government regulation and health care systems of developing countries. Topics covered include the production of health; the production and consumption of medical care; the role of health in human capital formation; the relation between health and wealth, health insurance and the problems of adverse selection and moral hazard; the health workforce and the training of health professionals.

ECON 722: Seminar in Urban Economics
The main focus of this course is to address the major contemporary issues confronting urban areas, and exploring the possible economic solutions to the problems of housing, transportation, education, employment, poverty, and crime. It involves both Economics and Geography to investigate the location choices of utility-maximizing households and profit-

maximizing firms. The course will focus both on the theory and the empirics to analyse the spatial dimensions of urban areas, including the modelling and estimation of the housing market, labour market, transportation costs, migration between cities, local government decisions, and segregation. The emphasis of the course will be on the evaluation of the factors and public policy alternatives that have influenced urban growth, land development, and price dynamics. It will also explore the causes and consequences of urban problems such as congestion, pollution, and crime while evaluating the alternative policy responses to these problems.

ECON 723: Topics in Law and Economics

This course connects the techniques of microeconomics to the analysis of Law. The course employs price theory - rational maximization, the law of demand, opportunity costs and the idea that voluntary exchange allows resources to gravitate to predict the consequences of legal rules. The course makes analysis that how the legal rules affect the decision-making behavior of individuals and groups; and uses welfare economics to evaluate legal rules, especially their efficiency effects. Legal issues, being examined in the course, include property rights, tort law, contract law, criminal law, law enforcement and punishment, litigation and settlement, principal-agent liability, and regulation and tort law as ways to control externalities. The course focuses the logic and underlying economic intuition rather than just the results. Empirical research on Law and Economics will be part of the course.

ECON 725: Agricultural Economics and Food Security

This course is about the economics of the agricultural sector and food security. Topics covered in this course will be agricultural labor force and mechanization, taxation and credit in the agricultural sector, integration of farm enterprises, agricultural marketing, land markets and land use, foreign trade and agriculture, economic policies for food security, interlinkages between agriculture and food security.

ECON 727: Topics in Environmental Economics

Topics in Environmental Economics is designed to provide advanced knowledge of the principles and conceptual foundations of Environmental Economics. It includes the sources of inefficiency, policy paradigms, private bargaining, command and control policy, incentive-based mechanisms, non-uniformly mixed pollutants, market power in permits and price vs. quantity controls of emissions. The crucial issue of policy formulation in the absence of traditional markets for environmental goods will be addressed by application of non-marketed valuation methods. To provide analytical overview of optimization for scarce environmental resources, dynamic optimization methods will be applied along with critical analyses of intertemporal choices and discounting and risk and uncertainty. For sustainable

development and management of environmental resources, the pivotal role of international agreements and their consequences will be evaluated.

ECON 728: Advanced Monetary Economics (3 credits)
This course theoretically and empirically covers the fiscal theory of the price level, endogeneity of money supply, central bank independence, views of different schools of thought, different monetary policy regimes, and the impact of monetary policy on the informal economy. Furthermore, the course will also analyze the influence of globalization on monetary policy effectiveness and the interaction between monetary policy & financial instability. The emphasis will typically be placed on developing countries, especially Pakistan, to contextualize the knowledge.

MPhil Education

Vision

The Faculty of Education aims to contribute to academia and industry by preparing individuals who contribute to the development of education, education structure, policy, curriculum, teachers' development, and classroom teaching. The faculty aspires to promote and nurture concepts and ideas impacting the development of critical thinking leading to the advancement of the well-being of all involved in the education process.

Mission

To develop well-informed learners, independent and critical thinkers, and innovative researchers who understand the ethical consequences of their own actions and can take responsibility for devising novel plans for the country's prosperity.

Learning Objectives

1. To enable aspiring educationists to make informed decisions about the solutions to the major economic, social, and cultural problems of the country that concern education.
2. To promote the integration of philosophical thoughts and educational practices and be cognizant of curriculum planning and development models and processes.
3. To develop committed educational leaders to take leadership roles at both micro and macro administration levels.
4. To enable students to abreast themselves with the use of information and communication technology (ICT) in developing massive open online courses (MOOCS) and ICT-driven face-to-face, blended learning, and online programs.
5. To develop critical thinkers and reflective practitioners who can improve educational conditions by identifying and solving problems in various educational situations.
6. To develop educational researchers who have strong intellectual and conceptual skills which will enable them to undertake various educational research projects using a wide range of research methodologies.

Degree Requirements

The MPhil (Education) program will have a combination of core courses, specialized courses, and a thesis. The following scheme of study will be used:

	Credit Hours
Core Courses (04 courses)	12
Elective Courses/Area of Specialization (04 electives)	12
Thesis	6
Total Credit Hours	**30**

Specializations

The MPhil (Education) program will initially offer three specializations. Specialization will appear on the successful candidates' transcripts only. Further specializations may be added in the list at later stages.

Core Courses

Course Code	Course Title	Credit Hours
EDCU 505	Theoretical Perspectives of Education	3
EDCU 510	Educational Policy Studies	3
EDCU 515	Quantitative Research Methods	3
EDCU 520	Qualitative Research Methods	3
EDCU 699	Thesis	6
	Total Credit Hours	**18**

Specialization Courses: Educational Technology

Course Code	Course Title	Credit Hours
EDCU 530	Trends and Issues in Instructional Technology	3
EDCU 535	Theories and Models of Instructional Design	3
EDCU 630	Implementation and Evaluation of Educational Technology	3
EDCU 635	Digital leadership	3
	Total Credit Hours	**12**

Specialization Courses: Educational Administration

Course Code	Course Title	Credit Hours
EDCU 540	Leadership Theories & Practices in Education	3
EDCU 545	Organizational Theory in Education	3
EDCU 640	Human Resource Management	3
EDCU 645	Creative Approaches to Educational Leadership	3
	Total Credit Hours	**12**

Specialization Courses: Curriculum Studies

Course Code	Course Title	Credit Hours
EDCU 550	Curriculum Theory and Practice	3
EDCU 555	Curriculum Foundation and Principles	3
EDCU 650	Designing Effective Curricula	3
EDCU 655	Curriculum Development and Evaluation	3
	Total Credit Hours	**12**

Core Courses

EDUC 505: Theoretical Perspectives of Education
Type of Course: Core
Theoretical perspectives of education are well-developed positions about various aspects of educational phenomena. This course is designed to develop conceptual understanding of the historical, philosophical, psychological and sociological perspectives of education. The students will develop critical awareness of the implications of theoretical perspectives at various levels of teaching and learning.

EDUC 510: Educational Policy Studies
Type of Course: Core
This course will enable students to explore how educational policy contributes to the process of educational reforms, that is, what factors or forces inform, shape impact the designing, implementation, and evaluation process of the educational policy. This course will also enable students to examine the educational policy making evaluation process from ethical, sociological, cultural, international, comparative and historical perspectives.

EDUC 515: Quantitative Research
Type of Course: Core
The purpose of this course is to develop students' quantitative research skills. Through a number of hands-on-activities, students will identify a research problem and by using a quantitative research design, prepare a proposal for conducting a quantitative research.

EDUC 520: Qualitative Research
Type of Course: Core
The purpose of this course is to develop students' qualitative research skills. Through a number of hands-on-activities, students will identify a research problem and by using a qualitative research design, prepare a proposal for conducting a qualitative research.

Specialization: Educational Administration

EDUC 540: Leadership Theories and Practices in Education
Type of Course: Elective
The main objective of this course is to bridge the gap between the theory and practice of educational leadership. The course will emphasize on how various leadership theories are applied in real-world educational organizations. A range of leadership theories will include trait, skills, style and situation approaches; contingency theories, transformational leadership, authentic leadership, team leadership and psychometric approach.

EDUC 545: Organizational Theory in Education
Type of Course: Elective
This course introduces central concepts in Organization Theory in the context of Education. The main objective of this course is to draw from the full range of literature on organizations, theories of organizational development and leadership practices as well as ecology of organization.

EDUC 640: Human Resource Management
Type of Course: Elective
This course is designed to enable students to develop skills that are involved in the effective use of human capital in a school organization through the management of people-related

activities. This encompasses leadership, values, employment planning, recruiting and selecting employees, training and compensating them and evaluating their performance.

EDUC 645: Creative Approaches to Educational Leadership
Type of Course: Elective
The course will promote critical thinking, metacognition and reflective learning experiences through which students will develop unique leadership skills. The course will enable students to explore concepts such as human behavior, leadership, creativity, and social relationships.

Specialization: Curriculum Studies

EDUC 550: Curriculum Theory and Practice
Type of Course: Elective
This course will introduce to students different curriculum theories and practices and their history. Students will also be introduced to framework/models to analyze and evaluate different curriculum theories and practices.

EDUC 555: Curriculum Foundations and Principles
Type of Course: Elective
This course will enable students to understand, analyze curriculum foundations and principles and how different foundations and principles contribute to the development of school curriculum development and evaluation designs and models.

EDUC 650: Designing Effective Curricula
Type of Course: Elective
This course will introduce to students the characteristics of effective curricula and examine techniques and methods of designing an effective curricula and implementation. The course will also enable students to design the process to design an effective curriculum.

EDUC 655: Curriculum Development and Evaluation
Type of Course: Elective
This course will introduce the ideas of curriculum development, innovation and evaluation to the students. This course will enable students explore various models of curriculum design and their implications for approaches to learning, teaching and assessment.

Specialization: Educational Technology

EDUC 530: Trends and Issues in Instructional Technology
Type of Course: Elective
The course is designed to prepare students to identify, explore, analyze instructional technology and how it fits in educational settings to support and strengthen the teaching and learning practices and processes at an educational institute. The course will prepare students to be ready to design and plan a well-researched and thought-out technology embedded instructional plan for an educational institute that support all stakeholders, parents, teachers, students and educational administration.

EDUC 535: Theories and Models of Instructional Design
Type of Course: Elective
The course will enable students to develop an understanding of various theories and models of instructional designs and their components as well as their core function in designing

eLearning courses and programs.

EDUC 630: Implementation and Evaluation of Educational Technology
Type of Course: Elective
This course will prepare students to recognize the potential of educational technology for an educational institute's improvement plan. Students will identify, analyze and choose appropriate instructional technology in an educational setting and evaluate the efficacy of educational technology used in an educational institute.

EDUC 635: Digital Leadership
Type of Course: Elective
This course will introduce to students the theories and practices of leadership shaped by the fast-changing educational settings and technology. In this course, the students will navigate and evaluate competing concerns of digitalization which will guide in designing and planning for the digital innovation processes in educational institutes.

MPhil Histroy

With more than 150 years of history of its own, Forman Christian College (A Chartered University) has been prominent in the teaching of history as a discipline. It had a strong department with teachers of repute like professors H.D. Griswold, Brush, and Z. H. Zaidi teaching at different points in time. With the 'nationalization' of the education sector in the 1970s, Forman Christian College University (FCCU) lost its vigor and vitality and fell prey to the loss of motivation, standards, and goals, as was the case with so many other nationalized educational institutions in the country. The emphasis on excellence was replaced with control and authority common to generic public education institutions. Eventually, in 2003, FCCU was able to regain its autonomous status, and since becoming a chartered university in 2004, is moving forward with its commitment to promote and pursue modern quality education for the benefit of all. Opting for a Liberal Arts Education, a four years baccalaureate program (BA Hons) was launched for a broad-based education complimenting the growth of humanities and social sciences, in addition to natural sciences. This welcome change brought in breadth and depth to the teaching of history as a discipline and the growth and development of History Department as such. More than a decade of the dedicated efforts to consolidate and strengthen the undergraduate degree program has brought us to this ripe moment to propose a graduate study program in history, M. Phil in History.

The pursuit of a higher degree in history is opportune. Historically defined as the mother of all disciplines, the higher education in history can be beneficial in many ways, from allowing us to learn from our past in a meaningful way to preparing us for the future critically and knowledgably. No wonder, M. Phil, a research-based degree, has gained currency among students all over the country.

Learning Objectives:

1. To produce graduates at the M. Phil level with academic excellence in the subject.

2. To enable the students to examine the past through a critical analytical approach.

3. To equip students with methodological tools and techniques for historical analysis.

4. To prepare students for careers as teachers, researchers, scholars, and professionals.

Admission Requirements

Students seeking admission to the M. Phil in History program at FCCU must meet the following requirements:

· Students must have completed 4 years Bachelors Studies or MA 2 years in History, Political Science, Archaeology, Sociology, Anthropology, Philosophy, Gender Studies, Development Studies, and Literature.
· Must have a CGPA of at least 2.5

- Must have 16 years of schooling or 4yeas of education after F.A/FSC./ Grade 12 equivalent (minimum 124 credit hours).
- Must submit a written statement of 500 words in English as the statement of interest in the program.
- Additionally, the students must include a 500-word written statement about an issue in history.
- Acceptance is based on the evaluation of the candidate including academic merit, statement of interest, and English Language Proficiency.

Degree Requirements:
1. A total of 24 Credit Hours course work to be completed inclusive of 4 Core Courses.
2. Completion of 24 Credit Hours course work in the first year maintaining 2.5 CGPA.
3. Approval of an M. Phil research Proposal at the start of second year.
4. A 6 Credit Hour M. Phil thesis must be submitted and defended before the External Examiner, within the stipulated duration according to FCCU/HEC policy.
5. GPA 2.5 to maintain for the completion of an M. Phil program.

Table: Distribution of Total Credit Hours

Time Duration	Category	Credit Hours
Year – 1	Semester-I	4 courses of 3Cr.Hrs = 12
	Semester-II	4 courses of 3Cr.Hrs = 12
Year – 2	**Research & Thesis** HIST.699 A: Formulate and Present the Research Proposal HIST. 699 B: Thesis write -up	Cr. Hrs =6
Total	-------	**30**

LIST OF COURSES
Following courses will be offered in the M. Phil in History program:

A.   Core Courses (Each course is of 3 credit hours)
1. HIST 501: Philosophy of History
2. HIST 502: Research Methodology
3. HIST 503: Historiography
4. HIST 504: History and Archives

B.   Elective Courses (Each course is of 3 credit hours)
SOUTH ASIA
1. HIST 505: Indus valley Civilization
2. HIST 506: Ancient History of the Indian Subcontinent

3. HIST 507: Sultanate Period
4. HIST 508: Mughal Rule
5. HIST 509: British Colonial Rule
6. HIST 510: State and Religion in Pakistan
7. HIST 511: Biographical History of South Asia

MIDDLE EAST
1. HIST 512: Pre-Islamic Arabia
2. HIST 513: Early Muslim History: From Umayyad to the Abbasid Dynasty
3. HIST 514: Ancient Middle East Civilizations
4. HIST 515: Religion and Politics in Contemporary Middle East

EUROPE
5. HIST 516: Renaissance and Early Modern Europe
6. HIST 517: British History: Restoration to Modern Period

USA
7. HIST 518: American History
8. HIST 519: Socio-Cultural History of the USA

C. Research & Thesis
1. HIST 699 A
2. HIST 699 B

DESCRIPTION OF COURSES

CORE COURSES

HIST 501: Philosophy of History (3 Credits)
In this course we consider the nature of historical explanation, focusing on narrative and twentieth-century alternatives. In particular, we examine the nature of temporality in historical accounts, the relation between narrative and the "problem-oriented" history, structure and agency in historical explanation, and the rhetoric and poetics of history. This is nota course on research methods but on how historians structure their accounts based on their research. The course is structured around two sets of questions: (1) What characterizes historical narrative? Are all historical accounts narrative in nature? How can concepts from the social sciences be applied to historical narrative? (2) Regardless of their method, do historians represent the past or explain it? Is there a difference between the two? Does the distinction reflect two different kinds of historical practices?

HIST 502: Research Methodology (3 Credits)
This course concentrates upon both theory and practice of historical research to help the students to write their research papers and particularly thesis in a proper, systematic manner. The course examines empirical foundations of history, its major approaches, concepts, and categories of analysis. In the process, it deals with issues and concerns of objectivity and, of course, ethics in research. On the practical side, the course introduces students to the formulation of Research Proposal and research process, with all the necessary steps, from Statement of the Problem to Research Questions to Review of the

Literature to Research Methods to Select Bibliography to Data Collection, especially of Primary Sources, including Archival. This is followed up by exposing the students to interpretive (qualitative) and analytical (quantitative) techniques to evaluate and assess the material. Finally, the course dwells upon the Write-up, Style and Form of the thesis (Turabian/Chicago Manual of Style), especially for citations, and avoiding Plagiarism. Though the course is primarily aimed at the students of history, it draws upon the basic concepts of social sciences research.

HIST 503: Historiography: Mapping the Past (3 Credits)
This course essentially focuses on methods and approaches in history writing. Historiography is a study to sense the past, a history of the history. It focuses on what historians have thought and written about a certain time. This course provides an insight in the development of historical thinking on a particular subject at a particular time. It takes into account a broad survey of various genealogies of historiography in South Asia. The development of this new genre has many shades from travelogues, memoirs and chronicles that form the basic concerns for reflection and Documentation.

HIST 504: History and Archives (3 Credits)
The course emphasizes a solid grounding in historical scholarship, intense engagement with extraordinary archival and public history institutions to equip historical researchers with the skills they need to find and gain access to all the primary source materials for their projects. Students are to understand the nature of archival documents, as recorded information, and the institutions responsible for preserving them. This course also enables the students to understand principles of archival science and explore methods of retrieving information from archival records, bearing in mind their organization and preservation.

ELECTIVE COURSES

South Asia

HIST 505: Indus Valley Civilization (3 Credits)
This course introduces the fascinating world of the proto-historic period (2600 BC-1900 BC) known as Indus Valley Civilization/Harappan Civilization. Being the largest of the ancient contemporary civilizations of its day, including Egypt, Mesopotamia, or Chinese Bronze Age Civilizations, the Indus Valley Civilization occupies a unique position in the world. This course provides an opportunity for students to understand the geographical extent, trans-regional interactions, and the cultural patrimony and legacy of the world's earliest civilization. Additionally, the students are made familiar with the story of the discovery of the Indus Civilization, theory of indigenous origin and basic features and theories related to decline of Indus Civilization.

HIST 506: Ancient History of the Indian Subcontinent (3 Credits)
The Indian subcontinent has been under the influence of various cultures since prehistoric times which have played a direct and indirect impact on the current cultures in the region. Primary cultures of the subcontinent are very diverse regarding social, political, economic, and religious practices. The present course introduces the emergence of ancient cultures and early cities, developed in the third millennium BC in a diverse and fertile subcontinent and covers the broad sweep of the sub-continental history to the fall of the Gupta Empire in the fourth century AD. In addition to the literary sources interdisciplinary approach will be

incorporated to reconstruct and understand the ancient history, emphasizing the study of material culture such as monuments, art history, epigraphy and numismatic.

HIST 507: Sultanate Period (3 Credits)
The Delhi Sultanate refers to the five short-lived Muslim kingdoms of Turkic and Afghan origin that ruled the territory of Delhi between 1206 and 1526 CE. The course includes the detail about historical background of the Delhi Sultanate and discusses different structures and processes that shaped the period of the Delhi Sultanate over time. This course highlights the major achievements of the Sultanate era with special emphasis on their military, judicial, revenue and administrative systems and discuses economy, architectural and cultural developments. This course also examines the difficulties and the causes of the downfall of the Delhi Sultanate and evaluates the reasons behind the downfall and the rise of the new kingdoms.

HIST 508: Mughal Rule (3 Credits)
This course explores the Mughal Rule in India spread over three centuries, creating an empire which in its heydays, from 1556 to 1707, covered almost the whole of India. Six of its early rulers, Babar, Humayun, Akbar, Jahangir, Shah Jahan and Aurangzeb ruled for almost two centuries. This course concentrates upon all aspects of the state and society, politics, economics, religion, gender and creativity in the context of one of the most elegant, sophisticated and culturally vibrant times. Mughal culture left a permanent mark on the culture of the region.

HIST 509: British Colonial Rule (3 Credits)
The course covers the advent of British rule which came to be established in India in the nineteenth century, the myriad ways in which the colonial state administered the colonized people and displayed its power, theories of governance and their relations to reigning ideologies in England itself, and the conquest of knowledge achieved under colonial rule. This conquest of knowledge entailed the initiation of new epistemological projects by overthrowing the indigenous knowledge systems. It probes into the encounter between the colonized and the colonizers, bringing to bear upon this discussion considerations of race, class, and gender, 'communalism', 'nationalism', partition of India, and independence of India and Pakistan.

HIST 510: State and Religion in Pakistan (3 Credits)
This course introduces students to institutional history to include religion in the working of the state of Pakistan. It brings forward the continuity of colonial and post-colonial administrative policies. It focuses on political compulsion of the state of Pakistan maintaining strong engagement with religious issues. It further specializes on the concept of Waqf and sufi shrines in order to highlight the working of the Auqaf department. Using documentaries, primary texts, secondary reading, and visit to the shrines, the course aims to enable students understand in a first hand critical ways not only the phenomenon of the religion but also its appropriation by the state of Pakistan.

HIST 511: Biographical History of South Asia (3 Credits)
Biography is a history of a person that involves more than just the personal details of individual life. It is a kaleidoscope portrayal of a personal experience through the prism of time and its events. The course focuses on the appraisal of biographies as a major contribution to the history. It highlights the role and relevance of political history augmented by socio-cultural history, and brings new issues to historical debates for analysis. This

course will dispel the impression that by focusing on the life of an individual the broader historical angle or perspective is compromised.

Middle East

HIST 512: Pre-Islamic Arabia (3 Credits)
Birthplace of monotheisms to crucible of empires from ancient to Modern times, the "Arabia" is the world region spanning three continents. This course explores the pre-modern making of an amorphous region which refuses to be defined by geographical territories or borders. Beginning with archeological ages, moving from Mesopotamian to Egyptian, and then from Byzantium to Sassanid Persia, the course deals with the rise of new empires and fusion of civilizations, imperial traditions, and mercantile networks.

HIST 513: Early Muslim History: From Umayyad to the Abbasid Dynasty (3 Credits)
This course introduces students to the main themes, problems and debates in the history of the Middle Eastern region providing them with an empirical foundation for more in-depth study of the region. It concentrates upon the emergence and spread of Islam, the development of Islamic institutions and their evolution over time and geographical diffusion. The course analyzes the political, social and cultural changes in the wake of the dominance of Islamic tribes. The course moves through the Umayyad and Abbasid period to show the way these empires made an impact on social, cultural and political life of the region.

HIST 514: Ancient Middle East Civilizations (3 Credits)
The Middle East has seen many of the world's oldest cultures and civilizations beginning from the Neolithic Revolution (c. the 10th millennium BC) to Iron Age (c. 1200–500 BC). The oldest known urban and literate culture in the Middle East was developed by the Sumerians in the late 4th millennium BC and thereafter, this region remained under Akkadian, Babylonians, Assyrians, Chaldeans and finally under the Medes. In the 6th century the Iranian Persians under Cyrus the Great conquered their Median cousins and established the Achaemenian state. This course examines the political, religious, and cultural history of the region, with particular attention paid to the development of art, architecture and various technologies in the chronological sequence of the region.

HIST 515: Religion and Politics in Contemporary Middle East (3 Credits)
Historically the role of religion is embodied in the politics of the Middle East. The course will examine the phenomena where religion is a critical issue and a pervasive force in shaping the political mindset and implementation of policies. Three major religions have their roots in the Middle East. Their interplay with politics has led to perennial conflict in the region. Religious sentiment tends to define politics. This course will discuss and debate the employment of religion for political ends.

Europe

HIST 516: Renaissance and Early Modern Europe (3 Credits)
This course offers a broad survey of modern European history, from the Renaissance, through the end of the Thirty Years' War to the aftermath of French Revolution. Along with the consideration of major events and figures such as the Black Death, Renaissance, Reformation and Scientific Revolution, the attention is also paid to those aspects of the

period which do not seem that modern, like the witch hunts. The course will focus upon the experience of ordinary people in times of upheaval and transition and what constitutes 'modern' and 'medieval' thought and practice. The period is thus viewed neither in terms of historical inevitability nor as a procession of great men, but rather through the lens of the complex interrelations between demographic change, political revolution, and cultural development.

HIST. 517: British History: Restoration to Modern Period (3 Credits)
The course traces the progress of Britain's history as it helped shape the modern world and brought Britain to a unique position of world leadership for well over a century. As such, the course examines a host of developments such as the British Reformation, the Elizabethan period's cultural flourishing and the formation of National Identity, The English Civil War and the Glorious Revolution, Scientific Revolution and the Enlightenment, the Industrial Revolution and its deep social consequences, expansion as an Empire, the "welfare state," Britian's place in the First World War, the Interwar economic, social and political struggle, the British experience of World War II, Britain's struggles in the Postwar era, from Decolonization to Thatcherism to the rise of New Labor.

USA

HIST. 518: American History (3 Credits)
This course traces the development of American history from 1492 to the present. It examines major political, social, cultural and economic developments and processes in the United States of America through significant events and developments. It concentrates upon developments such as, growth of colonies, struggle for independence, constitution-making, civil war, reconstruction, progressive reforms, great depression, new deal, civil rights movements, conservative revolution, end of cold war, till the present era. The course also provides an insight into ideas, social mores, creative expression and education that played a role in shaping the identities of people and how they have affected or impeded upon various cultures and values in the society. This comparatively young account of history provides an insight in the potential of human experience and strength to engage with it.

HIST. 519: Socio-Cultural History of USA (3 Credits)
This course explores those aspects of social relations and cultural practices that have both divided and united America. The Civil War leads the process of inclusion and exclusion in the "American Dream". The tenor of multiethnic America is seen through events that reflected its history. The course suggests how people influenced structural changes that both promised and limited their liberty and equality. In this context, an effort is made define American Dream, emergence of new educational and social institutions, rise of the consumer culture, immigration, ethnicity, gender, sexual norms, and the role of technology in America.

MPhil
Mass
Communication

VISION:
The department aims to be a competitive platform within Pakistan's academic circles, and consequently, be one of the best communication schools in the sub-continent.

MISSION:
To create empowered, informed, and responsible graduates of communication.

LEARNING OBJECTIVES:
·   To build scholarly aptitude in students for the field of Mass Communication
·   To prepare academics for the expanding university job market
·   To assist students for higher studies (doctoral) in the trajectory of Mass Communication learning
·   To harness the students' abilities toward critical and creative thinking processes

Admission criteria (students' qualifications for admission in this program)
•   16 years of education in the discipline of Mass Communication (if Conventional MA then 60%if semester system (BA Hons) then CGPA 2.50).
•   NOTE: Acceptance is based upon the 1) departmental test, 2) interview and 3) an overall evaluation of the candidate, including: academic achievement, and English language proficiency.
•   Provisional admission can be sought by students awaiting results. Their admission will only be confirmed once they have submitted their complete official Transcript within the due dates.

Degree / Graduation requirements:
•   Successful completion of course work, seminars, and thesis (24+ = 30credits)
•   Comprehensive Examination, right after finishing the coursework, to be passed before starting proposal writing for thesis.
•   Successful defense of the thesis before an external examiner and the departmental committee.
•   To graduate, a student should have a CGPA of 2.75 or more.

COURSES OFFERED

Semester 1			
Course Code	**Course Title**	**Credit Hours**	
MCOM 510	**Communication Research Methods I**	3	Core
MCOM 515	**Rhetorical Approaches in Communication**	3	Core
MCOM 520	**Mass Communication Theory I**	3	Core
	Elective(s)*	3	Elective

Semester II			
Course Code	Course Title	Credit Hours	
MCOM 512	Communication Research Methods II	3	Core
MCOM 517	Media Debates: Issues in Mass Communication	3	Core
MCOM 525	Mass Communication Theory II	3	Core
	Elective (s) *	3	Elective

List of Elective Courses
1. MCOM 521: Media and Technology: Communication Theories
2. MCOM 522: International Journalism
3. MCOM 523: Communication and Development
4. MCOM 524: Gender and Communication
5. MCOM 526: Media and Climate Change
6. MCOM 527: New Media: Theoretical implications and ethical considerations
7. MCOM 529: Peace Journalism
8. MCOM 531: Semiotics in Communication
9. MCOM 532: Cultural Critiques in Communication artefacts
10. MCOM 533: Political Communication
11. MCOM 534: Media Ethics

Semester III & IV			
Course Code	Course Title	Credit Hours	
MCOM 699	Thesis	6	Core

COURSE DESCRIPTIONS

MCOM 510: Communication Research Methods I (CORE, SEMESTER 1)
This is a basic course which gives a detailed understanding of communication research methods. As an MPhil scholar there is a need to get into an in depth understanding of mass communication research methods, therefore, it is a standard practice to offer this course, because of its relevance at graduate level. This need is even more severe in case of Pakistan where research traditions are weak in mass communication research.

MCOM 515: Rhetorical Approaches in Communication (CORE, SEMESTER 1)
This course encompasses a critical/cultural dimension for research methodologies in communication. In other words, the emphasis is on qualitative and humanities-oriented methodological approaches for communication related research questions. Given the rhetorical nature of critical/cultural research paradigm, the course will have a macro-analytic outlook and will help students examine concepts such as ideology, culture, and social structure. Considering ethos, pathos, and logos in communication, students in this course will learn rhetorical criticism and debate in media and communication.

MCOM 520: Mass Communication Theory I (CORE, SEMESTER 1)
This is a cornerstone course. It fulfils the very first step in mass communication research, namely knowing the medium/media. From the normative debate to theories of power, interdependency, and interpenetration the course is meant to develop an understanding of the emergence, development, growth, and conflict and contexts of mass media. One can understand the mass media systems from a social perspective and that of power.

MCOM 512: Communication Research Methods II (CORE, SEMESTER 2)
Pre-requisite: MCOM 510
Present day research into mass communication is mostly focused on an analysis of the effects of mass media, and the new media. This research tends to be qualitative. An added course into qualitative research will be helpful in developing a greater understanding of the methods and problems of qualitative research. Qualitative research will also be helpful in ensuring interdisciplinary aspect in the field of humanities and social sciences.

MCOM 525: Mass Communication Theory II (CORE, SEMESTER 2)
Pre-requisite: MCOM 520
This course caters to the highest and the most important aspect of mass communication research, namely, how media could be made better. The critical perspective is based on analysis of the media in a symbolic, interactive context, among others.

MCOM 517: Media Debates: Issues in Mass Communication (CORE, SEMESTER 2)
This course focuses on the different standpoints within the academia regarding specific issues in mass media research. Most of these differences, controversies, perspectives develop within the dominant Western paradigm. This difference is more of a perspective than of any basic thematic differences. The course aims at developing an understanding of the nature and scope of media debate as well as identifying certain important areas of debate and conflict. More than that, this course aims at avoiding/dispelling the view that takes these debates as serious differences within the scientific community. The best way to approach the course is a historical, teleological approach that is holistic and inclusive at the same time.

MCOM 521: Media and Technology: Communication Theories (ELECTIVE)
Technology is getting increasing importance in understanding the functioning of media, the inter media struggle for dominance, and media economy and management. This course is meant to understand the technological concepts ranging from McLuhan' media determinism to going back into Marxist models of production. It is a range of theoretical concepts that put the technological boom and its effects into context.
MCOM 527: New Media - Theoretical Implications and Ethical Considerations

(ELECTIVE)
Besides the regular ethical and theoretical understanding, the internet has developed its own sphere of understanding. There is a philosophy of social media in the offing. This is taking precedence over all other media, including the audiovisual TV and film. Ethical considerations within the context of fake news, alternative truth, and other factors that are responsible for the rise of populism are worth debating. Naturally, there are all the possible positive impacts of the new media.

MCOM 522: International Journalism (ELECTIVE)
International journalism has taken a global turn. Its dynamics are now controlling the world and there are rapid changes in this area whose understanding is an imperative. From imbalance in flow of information to the New World Information and Communication Order (NWICO) to the plight of journalists working in zones of conflict, to the dominance of Western media and the response from the developing world media to religious extremism, racism, and Islamophobia (including naturally the fear of the other), it is important to bring these significant debates in the academic discourse.

MCOM 532: Cultural Critiques in Communication Artifacts (ELECTIVE)
This course will develop students' understanding toward analyzing communication artifacts—artwork, textual message, video content, and web-based content, etc.—from a cultural standpoint. Considering the influence of Marxism in Cultural studies, the objective of this course is to familiarize students with the writings and works of cultural theorists in the Frankfurt School of Thought and the Birmingham School of Thought. The learning in this course would further enable students to incorporate the scholarly/philosophical works in the critiques of Mechanical reproductions (as Walter Benjamin would argue) in this thriving age of digital mass media.

MCOM 531: Semiotics in Communication (ELECTIVE)
This course will enable students to develop understanding of symbols and signs in messages and incorporate their learning in the interpretation of symbolic messages in mass media content. Here, students will essentially learn how signs and codes in media messages are historically and culturally specific, and how they enable human beings to interpret and comprehend their surroundings. The class discussions and activities in this course will revolve around the phenomenon of production of meaning. For this purpose, there will be a detailed focus on structuralism, semiology, and ideologies.

MCOM 533: Political Communication (ELECTIVE)
This course provides a detailed overview of research on political communication and its role in informing and influencing decisions related to national and international democratic debates. Here, students will essentially learn how information spreads, and affects policy makers, politics, national and international landscapes, the news media, and citizens. The overall focus, in this course, will be on the modes of persuasion employed by political figures. Additionally, students will learn the analysis of political debates by considering the parameters of ethos, pathos, and logos.

MCOM 524: Gender and Communication (ELECTIVE)
This course will discuss how gendered images of media are related to the people's perceptions of social reality. It will introduce students to a rich body of research that informs about the intricate connections among gender, media, and culture. Issues related to identity,

sexuality, representation, intersectionality, and power will be discussed in the light of media theories pertinent to gender and culture.

MCOM 523: Communication and Development: (ELECTIVE)
The course focuses on the roles of development communication and social change, broadly covering the role and importance of communication in human development. There is a growing realization that effective communication strategies form a cornerstone of any development model. We will critically explore various approaches, models and strategies of development communication. A special emphasis will be given to the communication strategies for social development in South Asia. This course also discusses the impact and possibilities of the use of new technology in communication for development.

MCOM 526: Media and Climate Change: (ELECTIVE)
Media and Climate Change is a course that will help students recognize the importance of the role of media in climate change communication. The course will help enhance students' knowledge regarding climate change and global warming. This course primarily aims at training students in utilizing media's potential in creating climate literacy, promoting climate mitigation and preparing public for climate adaptation. This course will also focus on the research aspect of analyzing and scrutinizing media content to explore how global and local climate debates are mediated and translated to the public. The course will also encourage students to carry out scientific research in Media and Climate Change.

MCOM 534: Media Ethics (ELECTIVE)
This course will focus on the interplay of responsibility between the media system and the other social systems. The most powerful among these is the political system with the authority to control media. A general concept of ethics will be drawn from a global perspective. This will be then weighed in the specific context of the country. Media system will be understood from the perspective of responsibility within differing power structures, both socio cultural, political, and financial. As a graduate level course, it will encourage students to develop models to solve the problems of ethics within Pakistan.

MCOM 529: Peace Journalism (ELECTIVE)
Peace journalism is the need of the hour, especially in conflict ridden societies like Pakistan where conflict offers a better career, but the capacity threshold is low. The course aims at a theoretical understanding of peace journalism by giving a proper context and definition. This achieved, it will offer insights into the relevant debates rooted in ideas of objectivity and advocacy. Another important issue is the difference between peace journalism and conflict sensitive journalism. It will ensure that peace journalism has a rightful place within the day-to-day journalism reporting structure.

MCOM 699: Thesis (CORE) 6 credits
Pre-requisite: Completion of coursework
Research is a full one-year project under faculty supervision. The submitted thesis is evaluated by external examiners upon completion.

MPhil Urdu

It is a known fact that Urdu is the *Lingua Franca* of Pakistan which has a powerful role in the region and internationally along with the English Language. In the near future, Urdu will be a symbol of progress, integrity and uprightness through its growing usage in mainstream media and possible incorporation in prestigious CSS (Central Superior Service) examinations. Within the context of Pakistan, Urdu is a language that helps bridge the gap between the needs of employment with knowledge based economy within our country.

FCCU has uniquely introduced compulsory Urdu courses in its general education curriculum to make sure that every student attains proficiency in their national language. As Urdu is the First Language (L1) of our country, we are giving due importance to the national language which is the demand of the context. Keeping in view the futuristic values of the Urdu language, it is necessary to open new avenues based on Urdu language and literature and our MPhil Urdu program is a step in that direction.

Learning Objectives:
The student learning objectives of this program broadly include:
·   Create reliable and quality Urdu writers, scholars and academics.
·   Enhance the skills of creative writing like play writing, script writing, criticism, etc.
·   Develop critical thinking through critical approaches.
·   Enhance practices in literary criticism, research and creative writing in Urdu.
·   Offer better environment for the implementation of Urdu as the national language.
·   Advance the level of Urdu communication and fluency skills.
·   Develop well trained leadership for research and publication in Urdu Language and Literature.
·   Enhance ethical values by ensuring original research work based on Urdu Literature.

Admission Criteria

Mandatory Requirements to apply for Admission:
· The students must have successfully completed sixteen years of education in the discipline of Urdu (conventional MA 45%, Baccalaureate, credits completed with at least CGPA 2.5) from HEC recognized university or institution.
· We will be following HEC admission policy of passing GAT with 50% cumulative or FCCU Entry test and interviews with 50% marks.

Merit Criteria
The merit shall be determined on the basis of the following criteria:

Academic Qualification	40 Marks
Discipline based entry test to be conducted by NTS or by the department of Urdu	50 Marks (Mandatory to pass: the minimum passing score shall be 25 out of 50)
Interview	10 Marks

Duration of the program
2 years and 4 semesters

The courses in MPhil Urdu degree program have been exclusively compiled to cater to the needs of the competitive, self- driven and inquisitive students. In total the students will study 8 core courses and two electives (total r program offers 24 credit hours for course work and 6 credit hours for thesis write-up. In total, this degree will constitute 30 credit hours which in itself is unique from other universities that have currently an MPhil programs running in their department. The scholars enrolled in our program will have a variety of subjects to choose from as we have put together a diverse assortment of courses that the students will not only find useful in selecting their topic for dissertation but also gain insight in their chosen field of interest.

Graduation Requirements:
The student will be eligible for graduating if she/he has fulfilled the following criteria:

· Comprehensive examination to be passed before the thesis is submitted in 4th semester.

· Successful Defense of thesis before the departmental committee and external examiners after successful completion of the course work, seminars and submission of the thesis (24+6= 30 credit hours).

The students will not be awarded any degree or transcript if:

· They dropped out of the course at any time during the two years of the coursework, due to any reason.

· They fail to submit their thesis.

# of Semesters	Declaration	Activity	Class Interaction	Per Week	Credit Hours/ Semester
1	15 Weeks	Course Work	3 hours a day	4 Courses x Days/Week	12
2	15 Weeks	Course Work	3 hours a day	4 courses x Days/Week	12
3 and 4	30 Weeks	Thesis	Supervision	Thesis Write up	6
					Total: 30

1ˢᵗ Semester Compulsory Core Course

Course code	credits	Course Title
1. URDU 501	(3 credit hours)	Principles & Application of Research and Editing
2. URDU 502	(3 credit hours)	Principles and Application of Criticism
3. URDU 503	(3 credit hours)	Translation: Theory and Practice
4. URDU 504	(3 credit hours)	Literature of the Minorities or Minority Literature

2nd Semester Compulsory Core courses

5. URDU 505   (3 credit hours)   Principles and Applications of Critical Theory
6. URDU 506   (3 credit hours)   Research Seminar

Any 2 Elective Courses from the following

7. URDU 507   (3 credit hours)   Art of Creative Writing
8. URDU 508   (3 credit hours)   Comparative Literature (Principles and Application)
9. URDU 509   (3 credit hours)   Translation Studies
10. URDU 510   (3 credit hours)   Linguistic and Literary Services of Orientals
11. URDU 511   (3 credit hours)   Significant Literary Trends
12. URDU 512   (3 credit hours)   Modern Poetry
13. URDU 513   (3 credit hours)   Feminism and Literature of Women Writers of Pakistan
14. URDU 514   (3 credit hours)   Linguistics, Modern Linguistic and Stylistics
15. URDU 515   (3 credit hours)   A Study of Dictionary in Urdu
16. URDU 516   (3 credit hours)   Literary Journals
17. URDU 517   (3 credit hours)   Urdu Novel
18. URDU 518   (3 credit hours)   Urdu Short Stories
19. URDU 519   (3 credit hours)   Teaching of Urdu Language and Literature
20. URDU 520   (3 credit hours) World Classics
21. URDU 521   (3 credit hours) Iqbal Studies

Course Descriptions

URDU 501: Principles & Application of Research and Editing (3 Credits)

The fundamental objective of this course is to improve the proficiency of the students to plan their research accordingly, select their topic correctly, write accurate abstracts, and skillfully write their thesis by informing them about the current trends and principles of research. Furthermore, it is essential for students to be exposed to different types of research methodologies so that they can opt for the correct research methodology corresponding to their research area. The chief responsibility of research in Urdu is to create a link between gaps of literature and to build a bridge from unknown to known. A lot of work has yet to be done in this area, therefore, workshops, seminars and symposiums will be a part of this course.

URDU 502: Principles and Application of Criticism (3 Credits)

In order to get adequate results in criticism, it is important to have tremendous analytical ability. This is the reason that excellent research work is always a result of high quality criticism. Research scholars should not only know the pros and cons of research but also be fully equipped to know about the principles of criticism, devices of criticism and other disciplines of studies within the Arts and Humanities. The tradition of criticism in literature is two thousand five hundred years old, its roots going back to ancient Greeks. This connectivity still continues in the contemporary times. If we want to know the historical changes in Urdu literature, it is indispensible to know the tradition of criticism prevailing in

East and West. The present course also takes this into consideration so that scholars are informed about the principles and theories of criticism as well as functions and treatment of applied criticism.

URDU 503: Translation: Theory and Practice (3 Credits)

For the development of knowledge in public and private institutions, the encouragement of translation is now indispensable. Translation is excessively responsible for the development of language which enhances its value. In fact, the process of translation is a political, social and an economic need. Apparently, in future, computer based translation will take over. Thus, the need will arise to enhance the value in computer based translation. However, at this moment, it is essential to invest in the training and development of human translators. During the study of this course, the theoretical application and practice of the art of translation will be covered so that students can gain critical and analytical skills regarding the theories of translation. In this regard, the students will be introduced to the skill of translation and will be able to practice this skill through translating various texts over the course of this subject.

URDU 504: Literature of the Minorities (3 Credits)

Muslim men of letters and poets of subcontinent have contributed a major share in the tradition and history of Urdu literature. Apart from Muslim writers, Hindu, Christian, and Sikh writers have also played a major role in the development of Urdu Literature. In fact, they have continuously created good quality and highly valuable literature. The subcontinent has a mix of civilizations due to the people of its region being the followers of different religions and customs since a millennium. This is the reason that Urdu literature has always expressed secularism in itself. At a cultural level, it has contributed towards tolerance, acceptance and respect. The study of Literature of minorities is also important from the perspective of forming collective understanding. Generally, less attention has been given towards literature of minorities in curriculum of Urdu and so, this course will also encourage and appreciate the efforts of minorities towards creating of art and literature.

URDU 505: Principles and Applications of Critical Theory (3 Credits)

Critical theory is a philosophical approach to culture, and especially to literature, that considers the social, historical, and ideological forces and structures which produce and constrain it. The ideas or more specifically, the theories originate from specific literary movements, trends, demands and sociopolitical needs of society and then are applied to contemporary literature. The proposed course includes such critical theories which have been introduced in the 20th century. These theories play an important part in understanding research and criticism. Amongst these theories, most are concerned with colonial and postcolonial scenarios. Through the understanding of these theories, the students will not only comprehend literature but also fine. Moreover, in today's world, all topics of language and culture are connected with these critical theories and so, this course will help develop useful skill for research students.

URDU 506: Research Seminar (3 Credits)

The purpose of research seminar is to introduce the principles of practical research to the scholars, before achieving ABD (All but dissertation) status. In this seminar, the scholar will get the training regarding literature review, selecting the title of the thesis, development of research questions, preparation of outline, methodology and inclusion of bibliography. The goal of research seminar is to make scholars capable to be able to do research on their own.

For this purpose, 3 credit hours worth of seminars will be held every week. In this seminar, renowned researchers, subject experts and senior professors will be invited to deliver lectures keeping to the relevance of students' topics. Course instructors will organize the seminars with subject experts that coincide with the research topics of the scholars so that scholar may be able to get satisfactory information regarding the preparation of their research framework. During the semester, the scholars will create at least two research proposals on their topic of interest and will collect primary and secondary resources for research.

URDU 507: Art of Creative Writing (3 Credits)

Art of Creative Writing is a distinctive course being offered in our program which is being taught in universities of developed countries but not in any of our national universities. In today's world, the need of literature raises questions on its relevance. The most important question to engage is why should literature be studied in this time of extraordinary development of scientific knowledge and technology? The objectivity of scientific knowledge is correct but study of human motivation is also important as it creates a balance through its subjectivity. Thus, it is necessary, that in these changing times, we not only revive previous literature in new styles, but also, create modern creative literature. Through this subject, students will get their creative juices flowing and would experience the study of literature through a different lens.

URDU 508: Comparative Literature (Principles and Application) (3 Credits)

The worldwide influence of language and literature on each other due to rapid translation is exemplary. The cognitive experience, creative thinking and global cultural diversities are integrating day by day. Our times are significant for making dialogues between civilizations and cultures. Through these dialogues extremism can be minimized and thus it is essential to not only to talk about creative similarities between works of literature having universal value but there is also a need to talk on their separate identities. Through comparative study of various texts, students will be able to explore and create a theoretical framework for the differing literature trends in the world.

URDU 509: Translation Studies (3 Credits)

The basic purpose of this course is to establish the importance of translation studies in the educational context in order to impart the basic education in translation. During the course of study, research, criticism and analytical development will be examined intensely, keeping in view the historical, ideological and cultural aspects. In the perspective of cultural similarities and dissimilarities, the special study of basis of translation will be the highlight of this course. In fact, in modern world, translation is considered the heart of knowledge. As language is a medium to transfer knowledge, translation centers are being established in universities all over the world. In addition, the field of translation has become a profession due to increasing political, cultural, educational, economical, and trade related needs of current times. Moreover, in this era of information and technology, only those languages will survive which not only have the potential for translation, but also, are able to utilize this potential. The Urdu world is quite aware of the importance of translation. That is why, one benefit of teaching translation studies as part of the syllabus in our program is that our university will be able to prepare experts in this emerging field.

URDU 510: Linguistic and Literary Services of Orientals (3 Credits)

The Orientals play a major role in development of Urdu language and literature, particularly,

in grammar, syntax, structure and compilation of dictionaries. The known tradition of Urdu poetry goes back seven hundred years. Before 19th century, only few writings of literature were prevalent. Despite Subras; an allegorical story, being written in 17th century, it was not discovered until the 20th century. At the end of 18th century, the translations of the Holy Quran marked the beginning of prose writing in north subcontinent. In 1801, Ford William College was established in Calcutta, where a lot of stories, tales, fables and narratives have been written as a result of printing press. Dr. John Gilchrist, the head of the department at the Indian languages at Ford William College at the time, compiled grammar and dictionaries of Urdu language. In this proposed course, the history of Urdu language and literature of this era has been addressed to educate the students on its substance.

URDU 511: Significant Literary Trends (3 Credits)

It is vital for the student to know about literary context if they are to understand significant literary trends in literature. The literary trend is something by which an author adheres to (in regards to form, ideologies, themes, and expressions) which mirrors the general course (or prevailing idea) of the time period in which they are writing. It is not only a combination of traditions, history, knowledge and individual experience, but also, an approach to produce new trends, forms and stylistics. In proposed course we have tried to understand classical trends in the context of modern traditions, particularly, in the scenario of natural poetry. Symbolism, imagery, dramatic soliloquy and linguistic reforms in the context of western poetry and modern literature are some of the features that the students will closely study. Moreover, modernism, postmodernism, stream of consciousness, surrealism, realism, humanism, existentialism, revival of storyline, science fiction, colonialism, and post colonialism context and techniques are also the part of the course. The significant literary trends taught alongside literature will give the power of perspective to the students that are essential to the study of literature and to research.

URDU 512: Modern Poetry (3 Credits)

Ghalib's philosophical imagination is the beginning point of modern poetry in Urdu literature. After him, Hadi came up with the concept of difference between old and new literary trends. Urdu literature went through a change in Twentieth century. Urdu literature came under the influence of Karl Marx and Sigmund Freud. The movement of modernism also created an impact on literature. In particular, philosophy of existentialism and humanism were the most favorite trends of literature prevailing during this time. After two world wars, humanism was terribly shattered and isolation, alienation, emotional crises emerged as popular themes. Under Freud's influence, Yong and Alfred Adler came forth with the concept of subconscious which resulted in psychological trends concerned with human psyche to be a part of Urdu literature as well. While on the other hand, Karl Marx's theory paved the way for communist ideology to be introduced in Urdu literature. In this context the proposed course deals with modern Urdu Ghazel and Nazm. Since, the meaning of Ghazel or Nazm is the differing interpretation of different readers; therefore, there can be no single and fixed meaning. This no fixed meaning policy by the modern poets will give the opportunity to the students of this course to recognize first hand on how modernist poets have violated all the known conventions and established rules of the past.

URDU 513: Feminism and Literature of Women Writers of Pakistan (3 Credits)

Feminism is the fastest emerging ideology among the discourse of postmodernism. Feminism is a popular trend, ideology and movement in Urdu literature today. In present times, the study of women has started in connection with religion, philosophy, psychology, sociology and economic conditions of particular eras in Urdu literature. It is the need of the

day that we should give a rightful share to women in education, politics, employment, literature and social life, therefore, the proposed course deals with the literature produced by women writers of Pakistan. Students will become acquainted with the works of women writer, their view of life, their history and their role in shaping modernism.

URDU 514: Linguistics, Modern Linguistic and Stylistics (3 Credits)

Linguistics is science as a matter of fact, which has gained its own importance in the modern world. Linguistics is an essential part of culture and postmodern theory. In this particular context, study of linguistics is mandatory for every student of language and literature in order to form a real understanding of postmodern concepts. From the old concept of linguistics to new, and from historical linguistics to general linguistics, we see tradition of both current and old shifts of literary trends. Linguistics has a natural relationship with style and stylistics. Therefore, students looking to delve into stylistics or style of writing of a particular piece of work would find this course highly useful.

URDU 515: A Study of Dictionary in Urdu (3 Credits)

Dictionary is an essential part of study of language. The glossary of language is the basic tool which shows the depth, wideness and universality of the meaning system of a particular language. The number of people who express themselves in any language shows the strength of that language. Moreover, grammar books of literature, newspapers, journals, computer acceptance, and number of channels airing in a certain language are also parameters to know the importance of that language. Urdu has now become an international language. This can be determined by not only the number of dictionaries that have been compiled in Urdu-to-English or English-to-Urdu, but also through the compilation of dictionaries that are; Urdu-to-Mandarin, Mandarin-to-Urdu, Urdu-to-Turkish, Urdu-to-Russian, Urdu-to-Persian, Persian-to-Urdu, Urdu-to-Arabic, Arabic–to-Urdu. So, the study of dictionaries in Urdu has been made the part of proposed MPhil Urdu curriculum as a unique way for students to become well informed about the Urdu language.

URDU 516: Literary Journals (3 Credits)

The purpose of this course is to introduce Urdu literary journals to the students of our MPhil program. These journals will include those which have been publishing since last two centuries. These journals are an important source of reference in Urdu literature and language research. These journals will be the primary way through which the scholars will explore their study further in the field of poetry, fiction and linguistics.

URDU 517: Urdu Novel (3 Credits)

Urdu novel is a strong form of Urdu fiction. The study of Urdu novel is essential with regards to human life and its reality. Though fiction is a form of imagination, but it relates reality of human behavior through creative means. Urdu novel has much variety in subject matter, form, style, and technique. There are a lot of diverse and strong characters that find a place in Urdu novels for their stories to unfold. Urdu novel has adapted to the different trends in different eras. Nowadays, Urdu is introducing postmodern trends successfully. In this proposed course, not only the techniques and form will be discussed but also some selected Urdu novels will be analyzed as a means of special study.

URDU 518: Urdu Short Stories (3 Credits)

Urdu short story is the most popular form of fiction. Urdu short story was introduced at the

end of 19th century and it became popular in the early twentieth century. It overlapped other forms of fiction under the influence of progressive writers' movement. Later on, Urdu short story was influenced by Freud's theories and addressed issues related to human psyche and human nature. In 1947, Urdu short story depicted the Indo-Pak partition riots and their impact on the lives of people in India and Pakistan. In the 70s and 80s, psychology and abstractionism was the more popular trend but later on revival of story was seen. The proposed course deals with different trends of short stories in detail.

URDU 519: Teaching of Urdu Language and Literature (3 Credits)
The teaching of Urdu language and literature is an art in the modern world. Teaching is a creative activity which produces creative dialogue between teacher and students. Teaching of poetry or fiction is different from other studies and needs particular skills and art. This proposed course addresses the problems and demands of teaching of Urdu literature in particular. Students who want to improve their skill of teaching Urdu literature and language will be able to benefit from this course. Since, teachers in Pakistan are rarely trained to teach their specific subject, this course is valuable to newcomers in the field of teaching.

URDU 520: World Classics (3 Credits)
Urdu language now has access to the international work being produced through its capability of translated world classics into Urdu. Classics have been called hermetic literature. So it is necessary that great literature of other languages should be translated into Urdu and subsequently, significant works of Urdu literature should also be translated into other languages. The scholars of Urdu must be aware of the different trends in the world literature so that they are able to do comparative study of Urdu literature with the literature written in other languages.

URDU 521: Iqbal Studies (3 Credits)
Iqbal is in fact the greatest poet of the 20th century in Urdu literature. His philosophy and poetry not only influenced Asia but also created an impact in Europe and the Middle East though his work being translated and read in significant languages like English, Arabic, Turkish, Mandarin, French and Dutch. Iqbal's poetry is altogether different from the traditional poetry. He introduced philosophy in creative form. His thoughts are everlasting. He gave a message to Asia and was known as 'The Poet of the East.' Iqbal's study is an exclusive course which will motivate the scholars who are interested to do research in Iqbaliyat in the future.

MPhil Physics

Physics has been taught at Forman Christian College (A Chartered University) since it was established in 1864. The Physics Department was instituted in 1907 with Prof DJ Fleming, who was its first Head. A long line of distinguished professors and prominent scientists have served at this Department, including Nobel Laureate Dr Arthur Compton, Prof JM Benade and Dr Piara Singh Gill. Dr Compton conducted most of his research on cosmic rays while a faculty member at FCC, which led to his receiving the Nobel Prize for Physics in 1927. Prof JM Benade was one of the longest serving professors in the Department, eventually retiring as its Head in 1970. He was an active researcher and the Asian representative in Dr Compton's international research team. Dr Compton's student Dr Piara Singh Gill was a faculty member at FCC from 1940 to 1947 and active in research. He was associated with the University of Chicago and the Georgia Institute of Technology. All these scientists and professors have made significant contributions to the field of Physics.

Today, the well-qualified and experienced faculty is involved in various research programs. The last few years have been busy and productive for the Department. At the undergraduate level, we have established 4-year degrees in Physics and Environmental Sciences. The Department has now launched an MPhil Physics program, keeping in view the needs of Pakistan to upgrade the state of its industries, educational institutions and other services sectors, to compete in the modern world and meet new challenges.

The students of Physics Department, besides continuing with PhD studies, can find employment prospects in the Atomic Energy Commission, defense production units and laboratories, PCSIR, PIA, telecom, power industries, and educational institutions in the private and public sectors. Important employment fields are nuclear medicine, diagnostics, radiotherapy and imaging, energy, environment and climate change.

The Physics Department is located in the Armacost Science Building, having four undergraduate teaching labs, three research labs, a darkroom, a workshop, a research library, and experimental equipment. This includes 4K cryogenic vacuum chamber with temperature monitors and controllers, ellipsometer, digital optical microscope for surface morphology studies, lock-in amplifiers, Tesla meters, laser interferometer with optoelectronic coupling, high temperature three-stage programmable furnace, UV visible spectrophotometer and centrifuge, etc.

Mission Statement
The mission of MPhil Physics program is to build responsible Physicists who are lifelong learners and able to disseminate knowledge in different areas of physics. Our program emphasizes on learning, development of problem-solving skills, valuing empathy and community service and real-life experience through independent research projects preparing students for academia and industry.

Vision
The department will be highly teaching and research-oriented to train our undergraduate and graduate students. It will be engaged in interdisciplinary activities of teaching and research with other departments at FCCU, and other universities in Pakistan. It will have taken a lead in international research collaboration, and significant industrial partnership for mutual benefit and career opportunities for our students.

Learning Objectives

1. To impart comprehensive knowledge in different fields of physics
2. To prepare the students to plan, design and conduct individual research projects, thesis writing and presentation
3. To enable students to implement physics skills for solving scientific problems
4. To produce competent future researchers and physicists

MPhil Physics
Degree Requirements
The MPhil Physics is a two-year program consisting of 2 semesters of coursework followed by 2 semesters of research. Coursework includes core courses and electives. Research will be conducted in the following fields:
· Experimental Material Science, Nanophysics and Nanotechnology
· Theoretical Physics

A total of 40 credit hours: 24 credit hours of coursework in first two semesters' Students must maintain a minimum of (2.5) CGPA in coursework. The last two semesters will be dedicated to research on a theme chosen in consultation with the research supervisor.
The minimum admission criteria in MPhil Physics is 2.5 CGPA and passing out criteria is 2.5 CGPA.

Semesters 1 & 2 (24 credits): Course Work
8 courses of 3 credit each from the following mentioned list of courses.

Note: Candidates may be required to take a number of non-credit undergraduate courses if the research supervisor so desires, in consultation with the faculty advisor and chair of the concerned department.

Course Descriptions
PHYS 501: Methods of Mathematical Physics (3 credits)
Linear differential equations and special functions; separation of coordinates; series solution; Wronskian; two regular singular points; three regular singular points; hypergeometric series; asymptotic series; one regular and one irregular singular point; integral representations; Green's functions; types of boundary conditions; differential equations and Green's functions; source points and boundary points; Green's functions for steady waves; wave equation; diffusion equation.

PHYS 504: Advanced Condensed Matter Physics (3 credits)
Symmetry and physical properties of crystals; point groups; band theory of solids; hartree approximation; nearly free electron model; tight binding methods; cellular methods; augmented plane waves; orthogonalised plane wave; pseudo-potential technique and model potentials; Fermi surface studies; superconductors; BCS theory; quantum hall effect; high magnetic fields; cyclotron resonance; high-field magneto-resistance; open orbits; magneto-acoustic oscillations; De-Haas Van Alphen effect.

PHYS 505: Advanced Electrodynamics (3 credits)
Maxwell's equations; gauge transformation; Poynting vector; conservation laws; plane electromagnetic waves in a nonconducting and conducting medium; polarization; propagation in a dispersive medium; reflection and refraction; total internal reflection;

radiation by moving charges; Lienard-Wiechert potentials and fields; general angular and frequency distributions of radiation from accelerated charges; Thompson scattering; Cherenkov radiation; fields and radiation of localized oscillating sources; electric dipole fields and radiation; magnetic dipole and electric quadrapole fields; multi-pole fields; multi-pole expansion of the electromagnetic fields; angular distributions; sources of multi-pole radiation; spherical wave expansion of a vector plane wave; scattering of electromagnetic wave by a conducting sphere.

PHYS 502: Advanced Quantum Physics (3 credits)

Approximate Methods*:* Time independent perturbation theory for non degenerate and degenerate levels; variational method; WKB approximation; time dependent perturbation theory. ***Identical Particles and Second Quantization****:* Indistinguishability of identical particles; systems of identical particles; quantum dynamics of identical particle systems; statistics; symmetry of states; fermions; bosons. ***Theory of Scattering****:* Scattering experiments and cross sections; potential scattering; method of partial waves; Born's approximation. ***The Interaction of Quantum Systems with Radiation****:* Electromagnetic field and its interaction with one electron system; transition rates; spontaneous emission; selection rules for electric dipole transitions; spin of photon and its helicity. ***Relativistic Quantum Mechanics****:* Schrödinger relativistic equation; probability and current densities; Klein-Gordon equation and hydrogen atom; Dirac relativistic equation.

PHYS 509: Nanophysics and Nanotechnology (3 credits)

Introduction to Nanotechnology (0, 1, 2 and 3 D Nanostructures, Physics at Nanoscale: Material properties, surface, electrical, optical, magnetic and mechanical properties, Nanoparticles and Quantum dots: properties and application: solar cells, fuel cells, nanomadeicine and magnetic memory system, Nanowires (applications) Carbon nanotubes, Fulleren (applications), Metal Oxide Based Nanostructures and Applications, Polymer Based Nanostructures and Applications, Nanoelectronics, MOSFET, single electron transition, Spintronics, spin Polarized currents, Giant Magneto-resistance, (GMR), Magnetic Tunnel Junctions, Magnetic memory, Nanophotovoltaics, Nanomagnetism, Nanomedicine.

PHYS 510: Experimental Techniques (3 credits)

High vacuum techniques; physical principles of diffusion and rotary pumps; ultra high vacuum by ionization; sorption and cryogenics; measurement of pressure; leak detection; X-ray; electron and neutron diffraction techniques; methods of recording diffraction patterns; examples of structure determination; analysis of results' characterization techniques.

PHYS 511: Plasma Physics I (3 credits)

Introduction; occurrence of plasma; concept of temperature; Debye shielding; plasma parameter. criteria for plasma; applications of plasma physics; single-particle motion in electromagnetic field; uniform and non-uniform E and B fields; time-variant E and B fields. fluid description of plasma; wave propagation in plasma; derivation of dispersion relations for simple electrostatic and electromagnetic modes; introduction to controlled fusion; basic nuclear fusion reactions; reaction rates and power density; radiation losses from plasma; operational conditions.

PHYS 512: Plasma Physics II (3 credits)

Introduction to Inertial Confinement Fusion (ICF): Basic requirements of ICF; laser plasma interaction; ablation physics; hydrodynamic compression; energy transport. *Nonlinear Plasma Theory:* Introduction; quasilinear theory; conservation of particles, momentum and energy; coherent three waves interaction; three waves interaction with random phase; nonlinear landau damping. *Fluctuation, Correlations and Radiations:* Shielding of a moving test charge; electric field fluctuations in maxwellian and nonmaxwellian plasmas; emission of electrostatic waves; electromagnetic fluctuations and radiations; scattering of incoherent radiation from plasma density fluctuations; emission of radiation from a plasma; blackbody radiation; cyclotron radiation; source theory of radiation from a plasma.

PHYS 514: Laser Physics (3 credits)

Review of quantum mechanics; interaction of radiation and atomic systems; density matrix; homogeneous and inhomogeneous broadening of atomic transitions; gain and saturation effects; hole burning; optical resonators; gaussian beams; laser oscillation; rate equations for a laser oscillator; amplitude fluctuations and spiking; some specific laser system; Q-switching and mode locking; focusing of laser beams.

PHYS 517: Applied Nuclear Physics (3 credits)

Neutron Physics: Interaction of neutrons with matter in bulk; thermal neutrons; cross-section (measurement of total cross-section); diffusion theory; Fermi age equation. *Nuclear Energy Sources*: Nuclear fission as a source of energy; four factor formula; chain reacting system; neutron cycle; critical dimensions of a thermal nuclear reactor; calculation of multiplication constant for a homogeneous thermal reactor; heterogeneous thermal reactor; energy production in stars; thermonuclear reactions; CNO and P-P cycle in detailed, controlled thermonuclear reactions and fusion reactor; age of galaxy. *Radioactive Measurement and Tracer Techniques*: Energy measurement; coincidence measurements; time resolution; measurement of nuclear lifetimes; trace element analysis; mass spectrometry with accelerators.

PHYS 518: Quantum Electrodynamics (3 credits)

Collisions between charged particles; energy loss and scattering.; Bremsstrahlung method of virtual quanta; radiative beta process; radiation damping; self fields of a particle; scattering and absorption of radiation by a bound system; wave guides, guided waves, resonant cavities impediment and admittance; scattering.

PHYS 519: Atomic and Molecular Physics (3 credits)

Introduction of structure of atom; Stern Gerach experiment; Schrödinger equation; approximate methods; solution of Schrödinger equation for the hydrogen spectrum; Einstein's coefficients; transition probabilities; hydrogen fine structure; two-electron system; ground and excited states of helium; rotational spectrum of diatomic molecule; rational and vibrational spectra of diatomic molecule; Franck-Condon principle; Born Oppenheimer approximation; resume of concepts of collision phenomena in ionized gases and surfaces; total collision cross-section, its analysis and measurement; momentum transfer cross-section; diffusion swarm of electrons; mean energy and drift velocity; theory and experimental methods for measurements; elastic scattering in a central force field; ionization and excitation of atoms and molecules by electron impact; inelastic collisions between heavy particles at low energies and at high energies; theory and experimental

description.

PHYS 520: Physics of Materials (3 credits)
Definition and classification of materials, Material Selection Criteria, Types of materials, Electronic Configurations, Bonding in Solids, Structure of Crystalline Solids, Space Lattice, Unit and Primitive Cell, Coordination Number, Solid Classes. Metallic Crystal Structures (SC, BCC, FCC, HCP), Polymorphism and Allotropy, Crystal Systems, Crystallographic directions, Crystallographic planes, Miller indices, Single and Poly crystals, Anisotropy, Isotropic measurements, X-Ray diffraction. Imperfections in Solids: Imperfection Types (Point, Line, Area), Solid Solutions, Defects in Polycrystalline materials. Diffusion in Solids, Diffusion types. Steady state diffusion, Non-Steady state diffusion, Factors that influence diffusion, Deformation types, Ductility, Resilience, toughness, Hardness. Dislocations and Strengthening mechanisms, Failure: Fracture types, Fracture mechanisms, Fatigue and creep, Introduction to Phase Diagrams, One component (or unary) phase Diagrams.

PHYS 524: Non Linear Physics (3 credits)
Approximate solutions to nonlinear differential equations; Resonance producing secular terms; Van der Pol oscillator; Doffing oscillator; Driven damped oscillators; Introduction to Chaos - One dimensional model, Dynamical systems in two dimensions, Dynamical system; Jacobian Matrix; Characteristic Equation; Stability Criteria; Dissipative and Conservative systems; Attractors and phase space volume contraction; Non intersection of trajectories and Determinism; Sensitivity to Initial Conditions (SIC) ; Brusselator Model; Introduction to Lorentz equations; Strange attractor Solitons Dispersion and Non Linearity; KdV equation, solitary limit; Relation between amplitude, speed and width; Sagdiyev Potential; Conservation Laws; Non Linear Schrodinger equation; Evolution equation for envelope function.

PHYS 696: Seminar (2 credits)
2 seminars related to the research project.

PHYS 699: Research Project (14 credits)
MPhil research thesis based on research to be submitted to the university and evaluated by the Departmental Committee and an external examiner

PhD Physics
The Physics PhD program offers students with opportunities to perform independent research in both theoretical and experimental disciplines. The department has excellent PhD faculty who are HEC approved supervisors as well. The department of Physics follows, in general, the admission and qualification criteria as recommended by Higher Education Commission (HEC) of Pakistan.

Mission Statement
The mission of PhD Physics is to produce knowledgeable professionals, capable of addressing societal and socio-economic challenges by using Physics approaches. The program strengthens the capabilities of students as academicians, researchers, physics-entrepreneurs and human resource for industries through research of international standards. The mission of PhD Physics is to produce knowledgeable professionals, capable of addressing societal and socio-economic challenges by using Physics approaches. The program strengthens the capabilities of students as academicians, researchers, physics-

entrepreneurs and human resource for industries through research of international standards.

Vision
The department will be highly teaching and research-oriented to train our undergraduate and graduate students. It will be engaged in interdisciplinary activities of teaching and research with other departments at FCCU, and other universities in Pakistan. It will have taken a lead in international research collaboration, and significant industrial partnership for mutual benefit and career opportunities for our students.

Learning Objectives
1. To provide comprehensive practical knowledge in selected field of study in Physics.
2. To develop independent researchers capable of identifying research questions, developing hypothesis, and conducting research.
3. To prepare students for communication across the scientific community.
4. To prepare students to apply physics techniques and skills for addressing the current challenges of the society.
5. To produce competent trained human resource for academia and industry.

Admission Criteria
· M. Phil /MS (with research) from a recognized university in any area related to Physical Sciences or Mathematics with a CGPA 3.00 or First Division (in the annual system) as prescribed by HEC criteria.
· Passing a subject test conducted by NTS or ETS (USA) in the area of specialization chosen at the PhD level, or the test conducted by Department of Physics at par with GRE (Subject) with 50% score
· In the case of GAT subject test a minimum of 60% marks are required
· In the case of GRE subject test, 60th percentile score is required

Degree Requirements
Total credit hours
The student is required to successfully complete a minimum of 30 credit hours for the degree. The details are as follows:

Course Work:
Course work of 24 credit hours preferably in the first year is required to be completed and followed by a comprehensive examination for granting candidacy as a PhD researcher. A minimum of 70% score is required to pass the comprehensive exam.

Comprehensive Exam:
After completion of Course work of 18 credit hours, comprehensive exam is conducted any time prior to submission of PhD thesis .

Research:
After the successful completion of course work students are required to register for 12 credits of research work

Foreign Expert Evaluation:
The Ph.D. Dissertation must be approved by at least two Ph.D. experts from technologically/academically advanced foreign countries in addition to the local Committee comprised of internal and external examiners.

Plagiarism Test:
The Plagiarism Test must be conducted on the Dissertation before its submission to the two foreign experts, as described below.

Open defense:
An open defense of Dissertation is an essential part of PhD Program after positive evaluation.

Research Paper:
Acceptance/publication of at least one research paper in an HEC approved "X" category journal is a requirement for the award of Ph.D. degree ("Y" in case of Social Sciences only). *Or at least one publication in an ISI indexed impact factor carrying journal.*

Copy of PhD Dissertation to HEC:
A copy of Ph.D. Dissertation (both hard and soft) must be submitted to the HEC for record in the Ph.D. Country Directory.

Conduct of PhD Program:
According to the HEC, initially there should be **at least 3 relevant full time Ph.D. Faculty members** in a department to launch the Ph.D. The department of Physics has currently 9 PhDs out of which 8 are HEC approved PhD supervisors.

The maximum number of Ph.D. students under the supervision of a full time faculty member is three.

Program of Studies:
·   Minimum period of completion: Three Years
·   Maximum period of completion: Eight years
·   Students must register for courses during the first year.
·   The Comprehensive exam will be conducted after completion of course work. A maximum of three attempts can be made to pass the exam.

Admission to PhD program will only be made in the research areas which are supported through research projects. In case of non availability of research funding/grant, student may be registered with the approval of Rector.

Course Descriptions
PHYS 701: Advanced nonlinear physics (3 credits)
Prerequisites: Nonlinear Physics –I; Plasma Physics
Chaos in Three Dimensions; Lorentz model and Galerkin Truncation; Three Dimensional dynamical systems; Fixed points; Nonlinear Schrodinger Equation; Pondermotive force; Derivation of the nonlinear Schrodinger equation; Solution of nonlinear Schrodinger equation; Modulational instability; Multidimensional Solitons; Kadomsteev-Petviashvilli equation; Solution and behaviour ; Drift waves ; Vortices and piece wise linear solutions;

PHYS 702: Instabilities and quasilinear theory in plasmas (3 credits)
Prerequisites: Plasma Physics 1 and Plasma Physics2
Introduction; Classification of Turbulence States; Methods of Approach; Weak Particle Turbulence; Quasilinear Theory; Quasilinear Equation for Changes in a Plasma Distribution; Conservation of Particles; Momentum, and Energy in Quasilinear Theory;

Landau Damping in Quasilinear Theory; The Gentle-Bump Instability in Quasilinear Theory; Plasma Wave Echoes; Initial value problem and perturbed distribution function; Coherent wave theory; Nonlinear Landau Damping;
Literature

PHYS 703: Optics and Photonics (3 credits)
Pre-requisites: Undergraduate Electricity and magnetism; Quantum Mechanics
Postulates of waves optics, Gaussian beam and its properties, Interferences and diffraction of light, Bragg gratings, Optical Fourier transform, Polarization of light, Optics of liquid crystal, Fiber Optics, Maxwell wave equation in material with instantaneous and impulse response, polarization response of a material, Kramers-Kronig relations, Classical Lorentz oscillator and dispersion, Drude model for the free electron gas, Drude conductivity and skin depth, Microscopic theory of refractive index, Zeeman Splitting, Faraday rotation, Stimulated absorption and emission, Rate equations, Laser oscillation, C.W Laser and Optimum output coupling, Nonlinear Optical materials, Second harmonic generation, Laser cooling, Photonics switches and optical computing Nonlinear refraction and observation.

PHYS 704: Plasmonics: Theory and its Applications   (3 credits)
Pre-requisites: PHYS 705 or Electrodynamics
Electromagnetics of metals, Introduction to plasmonics; Surface Plasmon Polariton (SPP) waves; Localized surface plasmons; Techniques for exciting surface plasmons using Kretschmann and Otto configuration; Wood's Anomalies; Nanoplasmonics; Quasi-State approximation; Mie Theory; Long wave plasmonics on novel materials such as heavily doped semiconductors, semi-metals and conducting polymers; Fluorescence and near field microscopy for imaging of SPP waves; Nanofabrication and characterization techniques utilized in plasmonics applications in biosensors; plasmonics metamaterials

PHYS 705: Advanced Microscopy and Image Analysis (3 credit)
Prerequisites – Quantum mechanics, Solid State Physics / Condensed Matter Physics / Materials Science
Develop an understanding of advanced microscopy, electron microscopies; scanning probe microscopy. The course has been designed to develop an interest and improve understanding in nano-science and nanotechnology. Students will learn broad applications of advanced microscopy in several research fields including nanomaterials, nanotechnology and nano-devices. To develop creative and critical thinking skills of the use of advanced microscopy in solving real world problems in research and material engineering.

PHYS 706: Band structure theory in solids (3 credits)
An introduction to semiconductors and insulators, Drude and Sommerfeld models for metals, quantum mechanics of particles in a periodic potential, Bloch's theorem, Nearly free electron and tight binding models, Measurement of band structure, Lorentz force and orbits, Landau levels, Application of Bohr's correspondence principle, Quantum oscillatory phenomena, The de Haas-van Alphen effect, Interband magneto-optics in semicondcutors. Magneto-resistance in three- and two-dimensional systems and quantum hall effect.

PHYS 707: Optical properties of solids (3 credits)
Maxwell's Equations and dielectric function, Analysis of Charge and Current densities, Properties of medium, Interaction of Light with medium, Absorption and dispersion, The Lorentz Oscillator, The Drude Model for metals, Quantum Theory of absorption and dispersion, Direct and indirect inter band transitions, joint density of states and critical

points, excitons, quantum confined structures, quantum well absorption and exciton.

PHYS 708: Journal Club (2 credits)
The course will be comprised of at least one presentation by each student on critical analysis of a recently published research article in international journals. The research article will be assigned to each student in the beginning of the semester. In addition student will be required to attend all presentations and actively participate in the weekly journal club.

PHYS 710: Biomaterials (3 Credits)
This Biomaterials course will discuss the uses of artificial materials in the human body for the purposes of aiding healing, correcting deformities, and restoring lost function. The course will emphasize the fundamentals of materials science, structure-property relationships and biological responses as a foundation for a wide array of biomaterials applications.

PHYS 711: Tomography and Applications (3 credits)
Physics principles relevant to computed tomography. The Physics of radiation interaction, image formation, acquisition and application. Reconstruction techniques, analytical methods of filtered back-projection for reconstruction as well as iterative methods. Artifacts in tomography, dual and multi-modality Imaging, phase contrast microtomography, applications in various fields of advanced material characterization in the fields of energy, materials science and biophysics.

PHYS 712: Mechanics of Materials (3 credits)
Structure and deformation in materials, different types of mechanical testing, stress strain behavior and relationships, yielding, necking and fracture mechanics, Irwin's Fracture Analysis, the J Integral, crack propagation, residual stresses, Bauschinger Effect, creep, deformation mechanism maps, fatigue, strength, cyclic loading, stress-strain analysis, elastic, plastic and visco-elastic behavior, rheological models, finite element analysis, experimental techniques to investigate the mechanical behavior of materials, visualize and analyze a crack.

PHYS 713: Advanced Composite Materials (3 credits)
Classifications of composites, advances in processing, fabrication, design and applications of composites. Microstructure and properties, important reinforcements: particles, fibers, continuous, unidirectional, short and their impact on behavior and properties. Three dimensional textile structures. High temperature performance, failure behavior, performance in different environments, testing, evaluation and inspection methods for advanced composite materials of the future. Understanding how advanced composites achieve unique properties like density, thermal stability, strength, and durability that give a clear advantage over conventional materials like metals, ceramics, etc. Techniques of testing and evaluation, especially by non-destructive methods. Analysis of applications, both structural and functional in various fields including biomedical, energy (fuel cells, fusion, fission), aeronautics, aerospace, etc.

PHYS 714: Advanced Topics in Applied Physics (3 credits)
Special topics covered in detail according to the recent innovations in the field of applied physics.

PHYS 715: Advanced Space Plasma Physics (3 credits)

Introduction to Plasma Physics, Single Particle Motion, MHD model, KINETIC model, Vlasov set of equations, Electrostatic and Electromagnetic waves in magnetized and unmagnetized plasmas with Vlasov theory, Landau damping, Distribution Function, Vlasov Theory for electrostatic Waves in inhomogeneous plasmas, Instabilities in kinetic model, Rayleigh-Taylor Instability, Flow Instability, Resistive Instability, Convective Instability and Other Instabilities, Review of Solar Physics, Heating of Solar Upper Atmosphere, Acoustic Wave Heating, Magnetic Heating and Coronal Loops.

PHYS 716: Photovoltaic Devices (3 credits)
Renewable Energy, Solar energy, Solar Spectrum, Solar cells, Three generations of solar cells, Life cycle analysis, Solar Cell Fundamentals, I-V Characteristic, Conversion Efficiency Limitations, Active Layer, Materials in the Active Layer, Thin Film Semiconductors, Silicon Thin Film Solar Cells, Silicon thin film Solar Cell Operation, Multi-junctions, Heterojunctions solar cells, Organic solar cells (OPV), Comparison of OPV with other technologies, Working Principles of OPV , Interpreting the results for OPV, Environmental impacts of OPV, Dye sensitized solar cells (DSSC), Polymer solar cells, quantum dots sensitized solar cells (QDSSC), Working principle of QDSSC, Perovskite solar cell, Conjugated polymers, Tandem Solar Cells, Degradation and stability.

PHYS 717: Advanced Fluid Dynamics (3 credits)
Introduction: Fluid Mechanics; Scalar and Vectors; Invariance of vector equations; Multiplying vectors; Tensors; Properties of tensors; Repeated operations with grad; Curvilinear Coordinates; Gauss's theorem; Stokes theorem; The Helmholtz theorem; Hydrodynamics: Principal laws of fluid hydrodynamics; The Continuum; Description Methods of Fluid motion; System of hydrodynamics equations; Initial and boundary conditions; Hydrostatics: Basic equations; Hydrostatic equilibrium condition- Brunt-Vaisala frequency; Conservation Laws: Conservation of mass; Bernoulli theorem and energy conservation law; Momentum Conservation law; Boussinesq approximation Vortex Dynamics: Vortical Motion of fluid; Vortex lines and vortex tubes; Stream function; Kelvin's circulation theorem; Vorticity equation in a nonrotating and rotating fluid Flow of fluid: Potential flow of fluid; Flow of sphere by potential stream; Flow of viscous fluid; Equation of hydrodynamics of viscous fluid; Examples of viscous fluid flow Waves: Gravity Waves; Harmonics waves, Approximation of shallow and deep water; Energy of waves; Surface Waves in fluids; Kelvin waves; Rossby waves Geophysical Fluid Dynamics: Introduction; Vertical Variation of density in atmosphere and ocean; equation of motion; Approximate equations for a thin layer on a rotating sphere; Shallow-water equations; Barotropic Instability; Baroclinic Instability; Geostrophic Turbulence – 46th AC

PHYS 799: Research (12 credits)
After the successful completion of course work, students are required to register for research work. A CGPA of 2.75 is required to be eligible for Research. Students have the option of choosing from three specializations: Theoretical Plasma Physics, Condensed Matter Physics, and Optical Physics under the supervision of faculty member.

Collaborations
- Pakistan Council of Scientific and Industrial Research (PCSIR), Lahore
- Pakistan Institute of Nuclear Science and Technology (PINSTECH), Islamabad
- Pakistan Institute of Engineering and Applied Sciences (PIEAS), Islamabad
- Center for Advanced Studies in Physics (CASP), Government College University (GCU), Lahore
- Physics Department, Government College University, Lahore

- Center for Solid State Physics (CSSP), Punjab University (PU), Lahore
- Physics Department, Punjab University, Lahore
- Physics Department, University of Engineering and Technology (UET), Lahore
- Shaukat Khanum Memorial Hospital and Research Center, Lahore

MPhil
Biblical Studies

The MPhil. in Biblical Studies is a two-year degree (one year class work and one year thesis) designed to prepare teachers of Biblical Studies for positions in universities, seminaries and educational institutions teaching biblical Hebrew or New Testament Greek, Old or New Testament courses or to enter into PhD. programs in Biblical Studies. Students will specialize in one of two tracks, Old Testament Theology or New Testament Theology. Students will enter the program already proficient in either New Testament Greek or Old Testament Hebrew, enabling them to study the Bible in its original languages. In addition, through an emphasis on critical thinking skills and the principles of sound biblical exegesis, students will gain skills in applying the biblical theological themes within the Bible to the present day needs of the Christian Community within Pakistan.

Learning Objectives
· Demonstrate proficiency in translating Biblical texts, which enables students to interpret these texts with sensitivity to semantics, syntax, context, genre and manuscript evidence.
· Demonstrate critical thinking skills by the application of principles of good biblical exegesis with special attention to genre and context; priority of the original languages, clear passages governing unclear passages, etc.
· Using biblical theological principles,
· Trace the progressive revelation of major themes of the Old and New Testaments, including gaining skills in finding such themes for themselves
· Analyze the distinctives and emphases by the authors in specific books of the Old and New Testament
· Demonstrate skill in researching and formulating appropriate principles and their application to relevant issues in the student's context within the Christian Community and the larger community of Pakistan.
· In accordance with FCC's core values, demonstrate spiritual maturity through:
· Evidencing maturity and holistic growth in Christian character and Christian disciplines.
· Exemplifying maturing faith in relationship with God and in commitment to reconciled relationships and restored communities.
· Demonstrate the ability to perform research in biblical theology and write research projects using clear writing and giving attention to the relevant primary and secondary sources.

Degree requirements
• 30 credits in biblical theology, biblical language exegesis and reading courses, Research Methods
• 6 credits in research and writing

Dissertation
• The second year of the program is dedicated to writing a Masters level dissertation which demonstrates critical thinking, in-depth research, command of the field of knowledge and clarity of expression.
• Students are required to write a research paper on an approved topic.

Areas of specialization
1. M.Phil. in Biblical Studies: Old Testament Theology. This covers the first half of Christian scripture, written in the Hebrew language before the birth of Jesus Christ. Students will deepen their knowledge of biblical Hebrew, study the content, key themes, progressive revelation and develop skills in interpreting and applying Old Testament teachings to contemporary life.

2. M.Phil. in Biblical Studies: New Testament Theology. This covers the last half of Christian scripture, written in Greek between A.D. 30 to A.D. 100.

Students will deepen their knowledge of Koine Greek, the teachings of Jesus Christ and his apostles, key theological themes, introductory textual criticism. They will develop skills in interpreting and applying New Testament teachings to contemporary life.

Distribution of Credits for M.Phil in Biblical Studies

Credits	Requirement	Course Numbers
6	Any 2 language reading courses	CRST 525(a-e): Biblical Hebrew Reading: Select OT Book(s) CRST 555(a-e): New Testament Greek Reading: Select New Testament Book(s)
9	Any 3 language exegesis courses	CRST 535(a-e): Biblical Hebrew Exegesis: Select OT Book(s)CRST 575(a-e): NT Greek Exegesis: Select NT Book(s)
12	Biblical Theology	CRST 541, plus 9 credits, including both at least 1 Old Testament CRST 545(a-e): OT Theology Theme(s) & at least 1 New Testament CRST 585(a-e): Biblical Theology: Theme(s)
3	Research Methods	CRST 691
30	Total Coursework	
6	Dissertation	CRST 699

Semester	Credits	Courses
1st Fall	12 credits	Core courses + electives
1st Spring	12 credits	Core courses + electives
Year 2	6 credits	Dissertation

Courses

CRST 545 (a-e): OT Theology Theme(s) (3 Credits)
Prerequisite: CRST 541
Biblical theological study of a selected theme in Old Testament theology, with application to our own context today. May be taken multiple times for different Old Testament theological themes.

CRST 565(a-e): New Testament Theology: Theme(s) (3 Credits)
Prerequisite: CRST 541
A biblical theological study of a selected theme in New Testament theology, with application to our own context today. May be taken multiple times for different New Testament

theological themes.

CRST 585(a-e): Biblical Theology: Theme(s) (3 Credits)
Prerequisite: CRST 541
A biblical theological study of a select theme in biblical theology of a scope which embraces both the Old and New Testaments, with application to our own context today. May be taken multiple times for different biblical theological themes.

CRST 525(a-e) Biblical Hebrew Reading: Select Old Testament Book(s): (3 Credits)
Accelerated and guided reading, translation, and grammatical analysis in selected Old Testament book or books to develop facility with Hebrew vocabulary and modes of expression, provide continued review of phonology, morphology, syntax, and semantics, and improve reading comprehension. May be taken multiple times for different Old Testament books.

CRST 535(a-e) Biblical Hebrew Exegesis: Select Old Testament Book(s): (3 Credits)
Exegetical study of a selected Old Testament book or books, using with discernment various exegetical methods, critical tools, and Bible software as part of an exegetical method. May be taken multiple times for different Old Testament books.

CRST 555(a-e): New Testament Greek Reading: Select New Testament Book(s) (3 Credits)
Accelerated and guided reading, translation, and grammatical analysis in selected New Testament book or books to develop facility with Greek vocabulary and modes of expression, provide continued review of phonology, morphology, syntax, and semantics, and improve reading comprehension. May be taken multiple times for different New Testament books.

CRST 575(a-e): New Testament Greek Exegesis: Select New Testament Book(s) (3 Credits)
Exegetical study of a selected New Testament book or books, using with discernment various exegetical methods, critical tools, and Bible software as part of an exegetical method. May be taken multiple times for different New Testament books.

CRST 541: Biblical Theology Introduction (3 credits)
An introduction to the practice of biblical theology, with an emphasis on the foundations of biblical theology, key biblical theological methodologies and the primary biblical theological themes of both Old and New Testaments. Students projects will include teaching or preaching on a biblical theological topic.

CRST 691: Research Methods (3 credits)
An introduction to the sources, methods and communication of research. The course focuses on research skills, the integration and synthesis of sources, and the presentation of material through a significant research paper.

CRST 699: Research Dissertation (6 credits)
Prerequisite: CRST 691
Each MPhil student will carry out research on an approved topic of biblical and theological significance, under the guidance of an approved supervisor. The supervisor will provide the necessary guidelines during the process of research. The student will submit the thesis as per approved title and MPhil Thesis Guidelines to the supervisor for internal and external

evaluation within the time period prescribed in the University Calendar.

MPhil
Biotechnology

Kauser Abdulla Malik School of Life Sciences (KAM-SLS) has its origin in the Department of Biological Sciences which has a history of nearly 100 years. However, since the up gradation of FCC to a University, the Department has developed on modern lines focusing on teaching and research while meeting all the requirements of liberal arts education. Efforts have also been made to encourage multidisciplinary and interdisciplinary approach to research. With these objectives in view, we have been able to attract internationally renowned faculty with expertise in various disciplines of science namely biochemistry, genetics, molecular biology, microbiology, bioinformatics etc. Research activities relate to health, agriculture, food, environment, and industry. Availability of such an expertise enabled us to initiate different graduate and postgraduate programs. Our faculty has been able to win competitive research grants worth nearly 150 million rupees over the last seven years.

This has enabled us to equip the laboratories with state of the art, facilities and to support graduate and postgraduate students. In addition, liberal funding by the University for providing infrastructural support has been crucial for the development. Several funded projects have been successfully completed resulting in several publications. Efforts are continuously being made to develop linkages with the end user industry may it be in agriculture, food, pharmaceutical or medical institutions. Several MoU in this regard has been signed.

In view of the expansion in the research and educational activities in Life Sciences, we envisage additional laboratory space and lecture rooms in the coming years for which Corporate Support from the industry and from national and international philanthropists is being solicited.

In 2009, the MPhil Biotechnology program was launched and in 2013, PhD Biotechnology program was started. This has been possible due to the highly qualified faculty, recognized by the HEC. The Department has several ongoing research programs, and the faculty has been able to win competitive research grants worth more than Rs 150 million for conducting goal-oriented research. Based on the availability of project funds, many MPhil students are offered Research Assistantships during the second year of Mphil.

Program Mission Statement
The mission of MPhil Biotechnology is to produce responsible biotechnologists who are lifelong learners and able to disseminate knowledge in different areas of biotechnology. Our program emphasizes on learning, development of problem-solving skill, valuing empathy and community service and real-life experience through independent research projects preparing students for academia and industry

Learning objectives
1. To provide comprehensive knowledge in various fields of biotechnology
2. To prepare the students to design and conduct individual research projects, thesis
writing and presentation
3. To prepare students to apply biotechnology skills for solving scientific problems

4. To produce competent future researchers and biotechnologists

Conferences Organized (2015-2021)

1. Webinar- " Covid 19 an opportunity to reform the agricultural system of Pakistan" May 24th, 2021, PABIC FCCU, Lahore
2. Virtual Launch of booklet on Current Status of Agricultural Biotechnology in Pakistan, March 11, 2021, PABIC FCCU, Lahore
3. Webinar on "Global Impacts of GM Crops (economical & Environmental) effects Focused on Pakistan" November 17, 2020, PABIC FCCU, Lahore
4. Conference "Microbes for sustainable agriculture" March 25th-28th, 2019 FCCU, Lahore
5. Workshop, Advances in Agricultural Biotechnology and Regulatory Affairs September 25th-27th, 2017, FCCU, Lahore
6. A two-day workshop "Plant Biotechnology for food security" November 27th-28th, 2018, FCCU, Lahore.
7. 1st Iran-Pakistan International Training Workshop, "Probiotics: Research to Production" FCCU, March 27th -29th, 2017.
8. 2nd International Biotechnology Advisory Committee meeting of ISESCO FCCU, February 27th -28th, 2017.
9. Second International workshop on X-ray Crystallography, October 15th to 19th, 2016, FCCU, Lahore.
10. Workshop "Preparing Biological Laboratories for ISO35001 (CWA 15793) Laboratory Biorisk Management", July 17th to 19th, 2016, FCCU, Lahore.
11. International workshop "Genomics and Genome Editing", May 24th to 27th, 2016 FCCU, Lahore.
12. International Conference, "Food Security and Nutrition" on November 5th – 7th, 2015 FCCU, Lahore.
13. One day conference "Status of the progress of Wheat Biotechnology in Pakistan" October 2nd, 2015, FCCU, Lahore.

Competitive Research Grants
A: On Going

1. Dr. Kauser Abdulla Malik, Microbiome profiling of the cotton plant under cotton leaf curl disease attack. Pakistan Academy of Sciences. (2020-2022)
2. Dr. Kauser Abdulla Malik, The microbiome of Cotton Leaf Curl Disease. AvH Research Linkage Program. (2020-2023)
3. Dr. Muhammad Zubair Yousaf, Development & Evaluation of Lab Scale Integrated Biotech Refinery to convert poultrywastes into industriallyimportant, safe & useful products. NRPU-HEC (2019-2022)
4. Dr. Samina Mehnaz, Environmentally safe polyhydroxybutyrate (PHB) based

biodegradable packing film as an alternative to conventional plastic. NRPU-HEC (2022-2025)

5. Dr. Muhammad Irfan, Enhancement of omega-3 fatty acids in maize. NRPU-HEC (2022-2025)

6. Dr. Muhammad Irfan, Development of climate smart cotton by editing arginase (*GhArg*) genes using genome editing (CRISPR/Cas) tools. LCF-HEC. (2022-2024)

7. Dr. Syed Farhat Ali. Production enhancement and PCR application of an archaeal DNA polymerase – an important diagnostic enzyme. NRPU-HEC (2022-2025)

8. Dr. Muhammad Imran, Isolation, identification, and characterization of novel microbial s-triazine and dicamba degrading proteins. NRPU-HEC (2022-2025)

B: Completed
1. Dr. Samina Mehnaz, Development of pyrrolnitrin (antifungal compound) producing recombinant bacterial strain. Alexander von Humboldt Foundation, Germany (2020-2021)

2. Dr. Aftab Bashir, Utilization of multi transcription factor genes for enhancing wheat yield PARC-ALP (2018-2021).

3. Dr. Kausar A Malik, "Development of a new herbicide trait and its transformation into wheat and cotton", (2017-20).

4. Dr. Asma Maqbool "Development of Vitamin B6 Enriched Wheat "HEC (2017-2020).

5. Dr. Asma Maqbool, "Evaluation of selected phytase transgenic wheat lines in soil under contained environment" PSF (2018-2020).

6. Dr. Kauser A Malik, "Enhancing fertilizer use efficiency in wheat by using transgenic approach" ALP/PARC (2014-18).

7. Dr. Zaffar Mehmood, "Food grade shelf stable and surfactant free nano-emulsions as vehicle for bioactives to enhance their bioavailability. HEC (2017-2020).

Program Structure
· Four regular semesters
· 30 credit hours
· Course work of 24 credit hours (Semesters 1 & 2)
· Research of 6 credit hours (Semesters 3 & 4)
· Students must have a minimum of 2.5 CGPA at completion of coursework to qualify for research

Semester 1
BIOT 502: Advanced Microbial Biotechnology (3 credits)
This course deals with microbial diversity, identification and classification of microorganisms, Development, and maintenance of pure cultures, use of microbial diversity in biotechnology, Nucleic acid based (16S rRNA) methods for screening and identification,

Selection of microorganisms of industrial importance, Bioprocessing; Industrial microorganisms, Fermentation Systems, Downstream processing; Product development, regulation, and safety. Applications of Microbial Technology in Human Therapeutics, production of proteins in bacteria and yeasts, Application of Microbial Technology in Agriculture, Plant-Microbe Interactions, Biological Nitrogen Fixation, Role of Plant Growth Promoting Rhizobacteria (PGPR), Food Microbiology, Microbial Polysaccharides and Polyesters, Degradation of lignocellulosic biomass Bioenergy production, Methanogenesis, Ethanol, Environmental applications; Waste water treatment, Bioremediation, Intellectual Property Regulations; Biosafety Rules and guidelines.

BIOT 504: Techniques in Biotechnology (3 credits)
Isolation of DNA, RNA, and protein; Estimation techniques for DNA, RNA, and proteins. Electrophoresis, Spectrophotometry, Mass spectrometry, Chromatography, Protein crystallization, Molecular imaging, Microscopy, PCR types and their applications, Techniques for gene identification, Transformation, Antibody protein detection, ELIZA, and SNP identification.

BIOT 506: Biostatistics (3 credits)
An Introduction to Applied Biostatistics Introduces selected topics in biostatistics. This course covers the tools for the collection, analysis, and presentation in biological sciences. Central to these skills is assessing the impact of chance and variability on the interpretation of research findings. Topics covered includes Sampling Techniques; tools for describing central tendency and variability in data; methods for performing inference on population means and proportions via sample data; statistical hypothesis testing and its application to group comparisons; Design of experiments and concepts of statistical quality control; finding and interpreting relationship with Binary outcomes, Continuous outcomes using simple methods and regression methods. While there are some formulae and computational elements to the course, the emphasis is on interpretation and concepts.

BIOT511: Journal Club (2 credit)
The course will comprise of at least one presentation by each student on critical analysis of recently published research article in international journals. Besides that, every student will be required to attend all presentations and actively participate in the weekly journal club.

BIOT 605: Business Entrepreneurship (1 credit)
Introduction, global biotechnology industry, business development, how to pick winning technology, the art of the deal and legal perspective, biosafety, bio business, raising a company, marketing a product/service, financing new ventures, career development overview.

<div align="center">Semester II</div>

BIOT 601: Bioinformatics (3 credits)
Nucleotide analysis, alignments, phylogenetic trees, search for open reading frames, translation, database search (NCBI, UniPort), dot plots, RNA analysis, structure prediction, graphical representation of structures, prediction of protein secondary structure, signal peptides and trans-membrane helixes, 3D molecule analysis, Pfam domain search, antigenicity and hydrophobicity, proteolytic cleavage, motif search and pattern discovery

and finally, primer designing and evaluation.

BIOT 608: Advances in Agriculture Biotechnology (3 credits)

An overview of agriculture in Pakistan, Problems of agriculture in Pakistan, Issues of food security, conventional breeding Vs Molecular breeding, Marker assisted selection, plant tissue culture and its application in agriculture, micro propagation, techniques for plant transformation, *Agrobacterium* and plant transformation, transgenic tomato, yam transformation through Agrobacterium, Super *Agrobacterium,* Molecular markers, marker free transgenic plants, Biofortification, Golden rice, Genetic Engineering and GM crops, molecular diagnostic tools, Biopesticides, *Bacillus thuringiensis* as biopesticide, Bt cotton, disease resistance and salt tolerance through genetic manipulation, Questions and concerns of food safety and environmental issues related to GM crops, Soil microbiology, Biofertilizer.

BIOT 609: Advances in Health Biotechnology (3 credits)

Introduction to Biotechnology in Medical Sciences, Human diseases: Causes and reasons; Bacteriology and antibiotics, Virology and vaccines, Immunological disorders and immunotherapy, Recombinant DNA technology and therapeutic proteins, Stem cell technology Cell and tissue engineering, Molecular diagnostics and forensic science, Genetic disorders and gene therapy, Synthetic biology and nanomedicine, Pharmacogenomics and predictive medicine, Bioethics.

BIOT 611: Omics (3 credits)

The course is divided into several parts covering the different areas of OMICS. In the first part it will focus on the advancement of cloning vectors for higher plants, the Ti plasmid, binary vectors, Promoters, gateway technology, transcription factors and genome editing techniques. The genomics section covers the structural and functional genomics with an insight into reverse genetics. The other OMICS areas include Transcriptomics, Metagenomics, and Proteomics. The covered topics include the technologies and developments in the given areas and their applications.

Semester III & IV

BIOT 699: Research (6 credits)
Students will work on an ongoing project or an independent problem in close cooperation with a faculty member (Research Supervisor).

MPhil Chemistry

The Department of Chemistry is one of the oldest at Forman Christian College (A Chartered University). It enjoys a rich heritage of eminent scholars, three especially being worthy of mention. Dr Carter Speers was Head of the Chemistry Department and Professor of Technical Chemistry, University of the Punjab. Dr Robert F Tebbe, a prominent Organic Chemist and teacher, spent 12 years at FCCU as Professor of Chemistry and also served as the Principal of the College. Dr Khairat M Ibne-Rasa, a scientist of international repute, served as Professor of Organic Chemistry and Head of the Department.

At present, the faculty is committed to continuing these rich traditions. Most of the faculty members are Higher Education Commission (HEC)-approved PhD supervisors. They are meticulous teachers and active researchers.

The Department has state-of-the-art facilities available for research in several significant areas, including natural products, organic synthesis, organometallics, nano and composite materials, and pharmaceutical chemistry. It also provides opportunities for students to work on projects funded by organizations like the Pakistan Science Foundation (PSF), and the HEC.

The Department of Chemistry makes efforts to prepare its students to play a productive role in different capacities, such as educators, researchers, and chemists. It also lays a strong foundation for students who plan further education in Pakistan or abroad.

Program Mission
The mission of MPhil Chemistry degree program is to educate students as successful researchers and professionals in the field of chemical sciences by equipping them with advanced concepts, research techniques and skills, and ethical and service sensibilities.

Program Objectives
1. To educate students in chemistry at an advanced level covering advanced concepts so that they have an adequate foundation in chemistry in general and sufficient mastery on a specialized field of chemistry (inorganic, organic, physical, analytical, applied or bio).
2. Through the curriculum and pedagogy, to train students in critical thinking so that they can explain results, draw meaningful conclusions, explain mechanisms, and interpret data.
3. To educate students how to design and conduct experiments and handle laboratory instruments effectively.
4. To educate students in ethical aspects of chemistry practices and products so that they are aware of the potential hazards associated with chemicals and lab activities, keeping high-level of safety in view.
5. To train students so that they have effective scientific written and oral communication skills through assignments and class presentations.
6. To educate students in chemistry in a manner that they have an adequate command on the subject and have acquired skills and abilities to serve community.
7. To train students to search scientific literature and conduct literature survey on a given topic being aware of various search engines and databases such as SciFinder, Chemical Abstracts, Scopus, Web of Knowledge, Google Scholar, etc.

Research Facilities

The Department has four dedicated teaching laboratories and six postgraduate research laboratories. The research and teaching instruments available include:

Atomic Spectroscopy
Flame Emission Spectrophotometer
Atomic Absorption Spectrophotometer (AAS)

Molecular Spectroscopy
UV-VIS Spectrophotometers
FT-IR Spectrophotometer
60 MHz Benchtop NMR Spectrometer (^{1}H, ^{13}C, ^{1}H-^{1}H COSY)

Chromatography
Gas Chromatography-Mass Spectrometer (GC-MS)
Gas Chromatograph
HPLC
Flash Chromatography

Thermal Analysis
Thermal Analyzer (TGA-DSC)

Electrochemical Instruments
Potentiostat/ Cyclic Voltammetry

Other Instruments and Apparatus
CHNS/O Analyzer
Digital Polarimeter
Digital Magnetic Susceptibility Balance
Hand-held Digital Densimeter
DSA 5000 (Density, Sound velocity and Viscometer)
Karl Fischer Titrator
Plate Reader
Tablet Dissolution Apparatus
Freeze Dryers
Spray Dryer
Centrifuge
Shaking Incubator
Thermostat (oil bath)

Muffle Furnace
Laboratory Ovens
Digital Melting Point Apparatus
Ice making machine
Rotary Evaporators
Schlenk Line
Ultrasonic baths and ultrasound probe

Conferences & Workshops Organized by the Department of Chemistry
1. Three Day Workshop on "Computational Chemistry", January 7-9, 2014.
2. Two-day workshop on "Chemo-metrics & Chemical Data Handling Tools", October 16-17, 2014.
3. Three-day international conference, "Exploring New Avenues in Medicinal Chemistry: Opportunities & Challenges", January 21-23, 2015.
4. Three-day Workshop on "Computational Chemistry Workshop: A New Approach to Understanding & Solving Chemical Problems", January 20-22, 2016.
5. Three-day international conference, "Current Research in Chemical & Pharmaceutical Sciences", January 18-20, 2017.
6. Three-day international conference, "Chemical and Pharmaceutical Sciences: Recent Approaches in Research & Applications", January 17-19, 2018.
7. Three-day conference on "Nanomaterials: New Trends in Development & Applications" held at Department of Chemistry, Forman Christian College (A Chartered University), Lahore, Pakistan from 29-31st January 2019.
8. Three-day international conference, "3rd International Conference on Chemical & Pharmaceutical Sciences: New Trends in Chemical & Pharmaceutical Chemistry", held at the Department of Chemistry, Forman Christian College (A Chartered University), Lahore, Pakistan from 29-31st January 2020.
9. The Department of Chemistry organized a workshop on Lab Safety.
10. The Department of Chemistry organized a webinar on "Asymmetric Catalysis" on November 25, 2022 where Dr. Wesley Moran from University of Huddersfield gave his talk.
11. The Department of Chemistry organized a Chemistry & Drug Discovery Symposium on June 21, 2022.
12. The Department of Chemistry organized a Two-day workshop on "Drug Delivery and Design" in collaboration with HEC, held at FCCU, July 24-25, 2023.

Funded (HEC and PSF) Research Projects

Completed Projects

1. Project# PSF/NSLP/P-FCCU (179). **Isolation of natural products from a medicinal plant of Pakistan and their Chemical and Biotechnological studies**.

    PI: Dr Dildar Ahmed

    Co-PI: Dr Kauser Abdulla Malik

2. Project# 20-1986/R&D/11. **The assay-guided isolation of chemical constituents from a medicinal plant (Carissa opaca), and the study of their bio activities**.

    PI: Dr Dildar Ahmed

3. Project# 20-3133/NRPU/R&D/HEC/13/675. **Synthesis of novel sulfonamide derivatives as inhibitors of ectonucleotidases**.

    PI: Dr Mariya al-Rashida

    Co-PI: Dr Jamshed Iqbal

4. Project # 20-3775/NRPU/R&D/HEC/14//220. **Substitution of synthetic polymers with highly biocompatible and inexpensive polymers from renewable sources in formulation of pharmaceuticals**. (Year Awarded: 2016)

    PI: Dr M Saeed Iqbal

    Co-PI: Dr Shazma Azeem

5. Project # 5475 (Approved by HEC) **Drug Delivery Using Choline Based Green Surfactants** (Year Awarded: 2016)

    PI: Dr Hafiz Muhammad Abd ur Rahman

    Co-PI: Dr Muhammad Nadeem Asghar

6. Project # 5676 (Approved by HEC) **Interaction, Dynamics and Speciation in Binary Solution of Choline Based green Ionic Liquids with Molecular Solvents**. (Year Awarded: 2016)

    PI: Dr Athar Yasin Khan

    Co-PI: Dr Hafiz Muhammad Abd ur Rahman

7. Dr. Muhammad Tariq Qamar (HEC) Start-up research grant of PKR 415000/- funded by HEC against concept paper titled **Photocatalytic Efficacy of CeO2 based Materials for the Abatement of organic Toxins.** (Year Awarded: 2017)

8. Project # 7676. Project Title, "**Ionic Liquid Mediated Multicomponent Reactions (MCRs) for Synthesis of Biologically Active Heterocyclic Compounds: Synthesis, Structural Elucidation and Evaluation of Biological Activities Targeting Neurodegenerative Diseases**". (Year Awarded: 2018)

    PI: Dr. Mariya al Rashida

    Co-PI: Dr. Jamshed Iqbal

Ongoing HEC Funded Project

1. NRPU Project # 15423 "**Green Surface-Active Ionic Liquid-based Drug Delivery Systems**"

    PI: Dr Muhammad Nadeem Asghar

    Co-PI: Dr. Asad M. Khan

Research Patents

The Department of Chemistry has following US patents to its credit.

1. Amin, M Saeed Iqbal. Solvent-free synthesis of acetaminophen. US 9,006, 488 B1, Apr 14, 2015.

2. Abdul Hameed, Nafees Iqbal, Jamshed Hashim, Khalid Mohammed Khan, Syed Tarique Moin, Shakeel Ahmad, Syed Abid Ali, Fatima Zahra Basha, Mariya al-Rashida, Rima D Alharthy, Shahnaz Perveen. Process for the preparation of quinoline-based ionic fluoride salts (QUFS). US-Patent No. 9643169, Application No 15.158,867, Patent Date 09/05/2017.

3. Ghumro, S. A., Alharthy, R. D., Saleem, S., Al-Rashida, M., Iqbal, N., Ahmed, S. A., Syed A., Moin, S. T., Hameed, A. Pyridine Based Ionic Fluoride for Catalyzing Indole and Tetrazole Formation. United States Patent Application 20190375711 (2019).

Collaboration with Other Institutions and MoU

In order for our students to avail facilities available at other institutions, collaboration has been established with institutions like HEJ Research Institute of Chemistry, PCSIR Laboratories, NovaMed Pharmaceuticals and Pharmagen Ltd., Lahore.

The Department of Chemistry has signed MoUs with following institutions and organizations:

National MOU

1. All Cure International, Lahore (signed/ renewed January 2022)

2. Hydromech Corporation, Lahore (Signed December 2018)

3. NovaMed Pharmaceuticals Pvt. Ltd. (Signed May 2013)

International MOU

1. TUBE Pharmaceuticals GmBH - Vienna, Austria (signed September 2021)

2. University of Bengkulu, Indonesia (Signed January 2020)

MPhil Chemistry Program

The MPhil Chemistry program is a two-year, four- semester degree program. The first year, which comprises of two semesters, is dedicated to course work, at the end of which, each student must pass a Comprehensive Examination. In the second year, the students conduct research under the supervision of a faculty member of the department. A full year of research

activities plays a crucial role in training and preparing the students for further learning, or to pursue a career. Fields of specialization available include Inorganic-Analytical, Organic-Biochemistry, Physical and Applied chemistry. A faculty member acts as a program coordinator and assists students in all matters related to learning and research.

Individual Educational Development Plan
After declaring their major area of interest, the students prepare personal statements of learning goals and expected accomplishments during the MPhil program. Students are encouraged to interact with all faculty members before making the final selection.

Requirements for the program:

Year 1: Course Work

Semester I: Students have to take two core courses and 2 electives of 3 credits each (total 12 credits) from the following (elective courses offered may change):
Core Courses (Mandatory Courses):
Chem 563: Mathematics for Chemists
Chem 542: Advanced Spectroscopy of Organic Compounds
Elective Courses (Register any two courses)
Chem 506: Advanced Polymer Chemistry
Chem 520: Thermal Methods of Analysis
Chem 524: Inorganic Electronic Spectroscopy
Chem 546: Natural Product Chemistry Techniques

Chem 543: Synthetic Applications of Name Reactions

Semester II: Students have to take two core courses and 2 electives of 3 credits each (total 12 credits) from the following:
Core Courses (Mandatory Courses):
Chem 526: Analytical Techniques
Chem 566: Advanced Topics in Physical Chemistry
Elective Courses (Register any two courses)
Chem 525: Bio-Inorganic Chemistry
Chem 549: Biomolecules: Structure and Function
Chem 501: Advanced Electrochemistry
Chem 562: Chemistry of Advanced Materials

Year 2: Research Work
Semesters III & IV

CHEM 696 Seminar related to the research project (2 credit hours)

CHEM 699 Research thesis (14 credit hours)

Total: 40 credits
Course Descriptions
CHEM 501: Advanced Electrochemistry (3 credits)

Industrial electrolytic chemistry, Electro kinetic processes, Interfaces between two immiscible electrolyte solutions, Electrochemical interactions, Electrochemical reactors, Conductive polymers, Electro catalysis, Bio-electrochemistry, Photo electrochemistry, Electrochemistry and environment.

CHEM 506: Advanced Polymer Chemistry (3 credits)

Nature, types and structures of polymers; synthesis and characterization techniques; properties, applications and processing; advances in polymer chemistry; glass and conducting polymers, degradable polymers and recycling strategies.

CHEM 520: Thermal Methods of Analysis (3 credits)

Thermoanalytical techniques; theory, instrumentation and applications of thermogravimetric analysis, differential thermal analysis and differential scanning calorimetry; determination of thermodynamic and kinetic parameters by model-based and model-independent methods; residue and evolved gas analysis.

CHEM 524: Inorganic Electronic Spectroscopy (3 credits)

Brief introduction of Group Theory; Term symbols; Russel Saunders coupling scheme; development of correlation and Tanabe-Sugano diagrams; Crystal field and Ligand field diagrams. Energy level calculations; Selection rules; Band Intensities and Band assignments; Interpretation of Crystal Field and Charge Transfer spectra; Spectra of low symmetry complexes; Application of group theory to vibrational spectra of simple and coordination compounds.

CHEM 525: Bioinorganic Chemistry (3 credits)

Basics of bioinorganic chemistry; essential and non-essential elements and their roles; extra- and intra-cellular electrolytes; sodium-potassium pump; biochemistry of selenium; biological role of Zn and Fe, Co, Ni, Cu and Mn, structural and active role of transition elements in metallo-proteins and metallo-enzymes; inorganic ions as enzyme inhibitors; chelates in medicine; metal-based drugs.

CHEM 526: Analytical Techniques (3 credits)

Sampling, sample handling and preparation; quality control of analytical data; analytical spectroscopy, atomic spectroscopy, spectrophotometry, spectrofluorimetry, mass spectrometry and -spectrometry; chromatography; electrophoresis and electroanalytical techniques.

CHEM 529: Organometallic Chemistry (3 credits)
Introduction to organometallic compounds; Grignard reagents; metal-olefin, -polyene and allyl compounds; metal-sandwich compounds; bonding and reactivity of organometallic compounds; synthetic applications and catalytic role of organometallic compounds.

CHEM 541: Chemistry of Isoprenoids and Polyphenols (3 credits)

Natural products and their importance; distribution and synthesis of terpenoids, steroids and polyphenols in living organisms; isolation, structure, reactivity and medicinal activities of terpenoids; total synthesis of some representative terpenoids; structure and reactivity of flavonoids and isoflavonoids, coumarins, saponins and glycosides; isolation techniques; medicinal applications of polyphenols and flavonoids.

CHEM 542: Advanced Spectroscopy of Organic Compounds (3 credits)

1D proton and C-13 NMR; chemical shifts, spin-spin couplings, NOE, DEPT and structure elucidation; basic concepts of 2D NMR, homo- and hetero-nuclear correlation spectroscopic techniques; electron impact and chemical ionization, field ionization, field desorption, HRMS; fast atom bombardment (FAB), plasma desorption, thermospray, electrospray mass spectra; fragmentation pattern of common functional groups; structure elucidation using mass spectrometry and other spectroscopic techniques.

CHEM 546: Natural Product Chemistry Techniques (3 credits) – 48th AC

To equip students with necessary skills to enter into food, medicine and entrepreneurship careers and contribute to the emerging field of natural products and their rapidly growing demands. To train students in various techniques used in the field of natural products, such as separation and isolation techniques, extraction techniques, optimization, and modelling techniques. To provide learning opportunities to students to equip themselves with an in-depth conceptual background of natural products.

CHEM 549: Biomolecules: Structure and Function (3 credits)

Forces determining structure and function of different types of proteins; thermodynamics of globular protein denaturation and re-naturation; chemistry of specific amino acids and co-factors in enzymatic catalysis; hemoglobin and myoglobin as examples of enzyme structure and biological function; role of inorganic ions in structure and function; multi-protein complexes; structure-function of lipids and membranes.

CHEM 560: Surface Chemistry (3 credits)

Physical and chemical properties of solid surfaces; thermodynamics and kinetics of gas chemisorption; chemical bonding at surfaces; applications to catalysis and electronic materials, differentiation between physical absorption and chemisorption. Adsorption of gases on solids and influence of temperature and pressure on gaseous adsorption. Types of van der Waals adsorption, BET adsorption isotherm and its interpretation. Other industrial applications of adsorption of gases and solutions on solids (such as gas masks and silica gel as drying agents etc.) Adsorption isotherm of dilute solution of solids. Gibbs equation, its verification, Gibbs isotherm and the interpretation of adsorption data. Ionic and non-ionic surfactants, flotation reagents, and their mechanism for the removal of dirt particles from fabrics. Surfactants, flocculating and dispersing agents.

CHEM 563: Mathematics for Chemists (3 credits)

Basic algebra, trigonometry and graphic methods, logarithms and exponentials, combinatorial functions, complex numbers and complex functions, vectors, differentiation,

concepts of maxima and minima, method of undetermined multipliers, integration, definite and indefinite integrals, Cartesian and polar coordinates and their transformations, power series and Taylor expansion, convergence tests and radius of convergence, matrices and matrix arithmetic, solution of simultaneous linear equations, including determinants, introduction to basic statistical techniques and measures for describing quantitative data, measures of central tendency and measures of dispersion, linear regression, line- and curve-fitting, correlation and tests of significance.

Chem 562: Chemistry of Advanced Materials (Approved in 51st Academic Council Meeting)

This optional course is designed for MPhil students while keeping in mind the importance of advanced materials in our lives. This course provides a detailed insight into the synthesis and characterizations of advanced materials such as metal-organic frameworks, nanomaterials and polymer and ceramic matrix nanocomposites. It also provides sufficient information about the analyses and tuning of their electronic, structural, optical, thermal, magnetic, and mechanical properties for environment, energy, and medical applications.

CHEM 566: Advanced Topics in Physical Chemistry (3 credits)

Special topics covered in detail according to the recent innovations in the field of physical chemistry.

CHEM 696: Research Seminars (2 credits)

This comprises of two research seminars during the research period.

CHEM 699: Research Thesis (14 credits)

Research is a full one-year project, the submitted thesis is evaluated by external examiners upon completion.

· Research projects are assigned and approved by the department in consultation with the students and their supervisors.
· Before starting the research, students must prepare synopses of their proposed research projects.
· The research project has to be completed within the specified period of time.
· At the end of the research work, students are required to write comprehensive theses explaining their research findings.
· Research theses, which must represent original discovery fulfilling the university's integrity criteria, are accepted only when they meet all the formatting and writing standards of the department.
· Research theses are evaluated by external examiners appointed by the university, after which viva voce is arranged.
· Students are expected to work in the laboratory/library for at least 35 hours a week during the research year. Group discussions among students are also encouraged.
· Seminars are held during which students present their work before a committee of faculty members for evaluation.

MPhil
Food Safety
and
Quality
Management

<p style="text-align:center">(Evening Program)</p>

Access to safe, wholesome, and nutritious food is a fundamental human right. Nevertheless, food systems in developing countries continue to be stressed due to lack of capacity to deal with pre- and post-harvest losses. Wide-spread stunting and food insecurity issues are of paramount importance in Pakistan, this situation is further aggravated by the fact that food safety issues are also rampant. Furthermore, increase in population, migration, urbanization, lack of resources and problems of environmental and food hygiene, adversely affect quality and safety of food supplies in most parts of Pakistan. In view of the above and 18th amendment provinces are given mandate to establish food authorities and laydown standards of food safety at provincial levels. The government of Punjab has recently enacted new food regulations and food safety standards to take in to account the concerns of consumers. The rapidly expanding food industry is also aware of these laws and is in need to technically sound human resource to cater for these emerging needs of the society in general and food industry. FCCU's resources and expertise in the fields of Biotechnology, Chemistry and Business make it an ideal institution to initiate an MPhil in Food Safety and Quality Management (FSQM) to cater to the needs of the food industry and other sectors. As an evening program, MPhil FSQM allows in-service professionals to benefit from this cross-disciplinary degree. FCCU's MoU with PCSIR Laboratories, Lahore, means that PCSIR expertise can also be used by students to help with research and internships.

Mission statement

The mission of the MPhil Food Safety and Quality Management program is to develop professionals with comprehensive food safety knowledge and skills to cater the needs of all the stakeholders in food sector by imparting superior knowledge of food production, processing, handling, transport and distribution while ensuring food safety and quality management along the food supply chain.

Learning objectives:

- To provide knowledge, training, and expertise for developing professionals equipped with comprehensive knowledge of national and international food safety regulations, scientific and technical skills.
- To provide graduates with entrepreneurship skills to run fair food businesses, consultancy services and advisory firms
- To prepare future researchers and food safety and quality experts

Program Structure

- Four regular semesters
- 30 credit hours
- Course work of 24 credit hours (Semesters 1 and 2)
- Research of 6 credit hours (Semesters 3 and 4)
- Students must have a minimum of 2.5 CGPA for research allocation and degree completion

Admission Criteria

· A 4-year BS (Hons) degree or equivalent from an HEC-recognized university in any of the life sciences including: Food Technology, Agriculture and Nutrition Sciences, Biosciences, Biotechnology, Biochemistry, and Doctor of Veterinary Medicine (DVM).

· Minimum CGPA of 2.0 or a 1st division (60% marks) in the last awarded degree.

· A structured Entry Test and Interview are conducted for selection of potential candidates for the admission to FSQM degree program.

Semester I

FSQM 501: Food Safety and Quality Management (3 credits)

Nature of Food Hazards, Physical, Microbial and Chemicals hazards. Toxicity by extraneous chemicals: agricultural chemicals, food processing, packaging, additives, adulterants. Toxicity from water. Microbial toxins: mycotoxins – moulds, mushrooms. Bacterial food intoxication; bacterial food infections. Food allergy and intolerance. Systems for food safety surveillance – GMP, TQM, HACCP and FSMS-ISO22000:2005. Understanding the importance, impact, issues, management skills and role of food safety and quality on local and world trade.

FSQM 502: Food Microbiology and Toxicology (3 credits)

Different microbial threats related to food safety; epidemiology of different food-borne illnesses; understanding international microbial limits for safe foods; toxicological aspect of foods and their impact. Food allergies, microbiological examination of foods, air and biofilms etc.

FSQM 504: Public Health and Nutrition (3 credits)

Role of public health in overall healthcare system; understanding importance of nutrition in relation to a healthy population to promote a healthier population; focus on prevention rather than treatment of diseases through sound interventions, understanding of nutrition through all life cycles, community nutrition and epidemiology.

FSQM 505: Safe Food Supply Chain Management (3 credits)

Concept, principles, scope, applications, and future of food supply chain management: its importance, objectives, principles, evolution, applications in agri-food industry. It also covers the Scope and structure of food supply chain. Furthermore, it gives fundamental concepts on FSCM, supply chain design and planning. It also management; reviews the existing food supply chain regimes and case studies related to different agricultural food commodities.

FSQM 506: Research Methodology and Biostatistics (3 credits)

Research methodology and Biostatistics introduces selected topics in research methodology and biostatistics. This course represents an introduction to the field and provides a survey of data and data types. Specific topics include tools for describing central tendency and variability in data; methods for performing inference on population means and proportions via sample data; statistical hypothesis testing and its application to group comparisons; issues of power and sample size in study designs; and random sample and

other study types. While there are some formulae and computational elements to the course, the emphasis is on interpretation and concepts.

Semester II

FSQM 602: Food Technology and Packaging (3 credits)
Technical and processing aspect of food technology; importance of food packaging; resultant safety concerns and their remedial strategies. Interaction of Food Packaging with Food and its health implications. Food packaging regulations, emerging trends in food technology, processing of various food commodities, issues of food packaging materials, safety of packaging materials, advancement in packaging materials.

FSQM 603: Consumer Behavior and Preferences (3 credits)
This course will deal with the consumer behavior with special reference to food choices in addition to consumer psychology and microeconomics of consumer behavior in respect to food choices. Role of Consumer behavior and its business effect. Consumer perception of quality, safe and healthy food. Importance of consumer behavior for new product development.

FSQM 605: Global issues in food Security and Safety (3 credits)
This course provides an overview of world food situation based on situation analysis. Furthermore, it provides insights on the global food security and safety situation, challenges, and possible outcomes. It also gives insights on food safety and security with special reference to population, hunger, obesity terrorism as a food issues, worldwide post-harvest losses, global malnutrition, worldwide food price fluctuations. Importance of per capita earning, consumption and purchase power and food policies.

FSQM 606: Advanced analytical Techniques for food safety and Quality (3 credits)
The Dean explained the course content and said that to understand key issues relating food sampling and importance of sampling to ensure food safety. Use of modern food analysis techniques for food safety, authenticity, quality, and traceability. Food analysis techniques for different food commodities, quality assurance of food analytical techniques and interpretations of results. Technical and processing aspect of food technology; importance of food packaging; resultant safety concerns and their remedial strategies. Emerging trends in food technology, processing of various food commodities, advancement in packaging materials.

FSQM 607: Food Laws, Authenticity and Traceability (3 credits)
This course comprehensively covers food safety standards, and food regulations applicable to food industry in Pakistan and covers international regulatory framework governing food systems. Food safety standards and regulations of provincial food authorities and national food standards by PSQCA will be included as national regulations. Global food regulatory frameworks such as FDA, USDA, and EU food standards and Codex Alimentarius commission guidelines will be discussed. Importance of food traceability systems and their role in authentication for food supply chain will be covered.

FSQM 699: Research Thesis (6 credits)
The thesis project provides students detailed exposure to a practical problem in food safety and quality management. Students can join an ongoing project or work on an independent problem in close cooperation with a faculty member (Research Supervisor). In all research projects an active participation of food industry will be ensured.

MPhil
Molecular Pathology
and
Genomics

(Evening Program)

Molecular pathology is a rapidly expanding discipline that connects pathology and molecular biology. The future of medicine and clinical diagnostics is molecular based. Therefore, theoretical and practical applications of molecular diagnostics must be knowledge that is available. This program will provide training in the application and interpretation of advanced molecular technologies and their use in pathology and clinical diagnostics. This specialist training will enable physicians, scientists and technologists to validate, use and develop molecular assays for improved management of patients.

As an evening program the MPhil MPGN allows in-service persons to benefit from this cross-disciplinary degree. Our partner organization, Chughtai Lahore Labs, is one of the largest private clinical diagnostic laboratories in Pakistan and will provide clinical and practical expertise.

MPhil MPGN Mission statement

The mission of the Molecular Pathology and Genomics program is to nurture confident researchers who are effective contributors towards the growth of the nation through the problem-solving research for the benefit of our patients and the community at large, by providing holistic student-centered education, skills for innovation and research opportunities.

Learning Objectives:

1. To provide comprehensive knowledge in various fields of molecular pathology and genomics
2. To prepare students to apply Molecular Pathology and Genomics related Knowledge and skills for solving scientific problems
3. To train the students in Biorisk management and the use of principal methods of statistical inference

Requirements for the Program:

· Four regular semesters

· 30 credit hours in total

· 24 credit hours of coursework in first two semesters

· Students must maintain a minimum of 2.5 CGPA in coursework in order to qualify for research

· 3rd and 4th semesters (6 credit hours) will be dedicated to research on a theme chosen by the research supervisor.

Admission Criteria

· A 4-year BS/BSc (Hons) degree or equivalent in any of the life sciences including: Biosciences, Biotechnology, Biochemistry, Nutrition Sciences, Medical Lab Technology.

· MBBS students who have completed six years of medical school and are currently engaged in a pathology residency program may also apply.

· Minimum CGPA of 2.0 or a 1st division in the last awarded degree.

· Passing the Department Written Test in Molecular Pathology and Genomics

· Cumulative score of FEAT, Written test and Interview

Semester I
MPGN 501: Advanced Molecular Biology (3 credits)
Molecular biology emphasizes the study of molecules that make up an organism and the forces operating among these molecules. Increasingly, molecular biologists can explore the genetic control of these molecules and thus define the developmental, cellular, and sub-cellular changes that occur during the dynamic processes of life. Virtually every question, whether in biochemistry, cell biology, developmental biology, or some other biological discipline, applies molecular biology, often as the prime approach, in its solution. Biochemical and molecular developments have revolutionized biological research, fuelling the explosive growth in the biotechnology industry and rapid increase of molecular medicine. Students will cover the structure and biochemistry of nucleic acids, DNA and RNA structure, the physical chemistry of nucleic acids, DNA and RNA hybridization, DNA replication and repair, gene organization and expression, gene structure, transcription, RNA processing, translation, post-translational modification, regulation of gene expression including epigenetics.

MPGN 503: Basic Pathology (3 credits)
Pathology is the study of disease. It deals with the etiology, pathogenesis, physiology, and structural and functional alterations that result from disease. The course will cover the study of basic pathologic processes that underlie all diseases, such as cellular pathology, inflammation and repair, fluid and hemodynamic derangements, and neoplasias. In addition basic information will be provided regarding diseases affecting specific organs and their systems such as cardiovascular, blood, hematopoietic and lymphoreticular, respiratory, gastrointestinal, hepatobiliary, genitourinary, pancreas, male reproductive, breast and female reproductive, endocrine, musculoskeletal, neural and specialized neural, and skin.

MPGN 504: Professional Standards – Biosafety, Bioethics and Quality Assurance (3 credits)
Professionalism embraces rules of conduct, standards of practice, and support for professional associations. Required competencies necessary to be professional in the field of health care, and the lab in particular, will be identified. We will cover the following topics, among others: professional practice, project management, regulations, laboratory and clinical research, professional ethics, standards and good laboratory practices (GLP), sample management and data handling, information management systems, and quality assurance systems and processes

MPGN 507: Clinical Research Design and Statistics (3 credits)
This course is designed for the postgraduate students who aimed to get themselves at par with clinical trials management. It provides training in line with the relevant Drug Regulatory Authority of Pakistan, European Union Directives, International Conference for Harmonization Good Clinical Practice Guideline, the applicable UK regulations and the NHS Research Governance Framework. Moreover, this course focuses on the field of clinical research and its integrated processes by incorporating biostatistical and epidemiologic methods, protocol preparation, study design, patient monitoring, quality assurance, and ethical issues. It offers an opportunity for the students to gain an understanding of the principles of planning and managing clinical trials.

Semester II
MPGN 505: Genetic Basis of Human Diseases (3 credits)
  Human genome and genomic organization; chromatin and chromosome structure; human

genetic variation, polymorphisms; molecular basis of inherited disease; deletion, duplication, and insertion mutations; Missense, nonsense, null, and frameshift mutations; mutations affecting RNA splicing and stability; mutations altering transcription; patterns of inheritance; autosomal dominant and recessive disorders; De novo mutations; consanguinity; sex-linked disorders; X inactivation; multifactorial inheritance; mitochondrial inheritance; nonclassical patterns of single gene inheritance; Mosiacism; imprinting; uniparental disomy; trinucleotide repeat disorders; expression of phenotypes; penetrance and variable expressivity; anticipation; genetic, allelic, and locus heterogeneity.

MPGN 603: Cellular Signal Transduction (3 credits)

For the past half century, our understanding of metabolic and signaling pathways has been built from in vitro measurements of the activities of individual components isolated from homogenized cells, the behavior of the entire pathway being inferred mathematically by summation. Recently, however, modern techniques increasingly allow whole pathways to be monitored in single living cells. The 21st century is likely to be dominated by the study of the cell physiological functions of protein-to-protein interactions as they occur in whole cells. Both metabolic and signal transduction research are in a sense coming full circle to the realization that one only really gets a true picture of how pathways work by looking at them in their entirety and in their natural environment: the complex, crowded and elastic milieu of the living cell

MPGN 604: Bioinformatics (3 credits)

In recent years advances in molecular biology together with reference data from the human genome project have made it possible to record the full expression profile of cells (i.e. all genes), high density maps of chromosome gain and loss (using SNP), and now even the full sequence of all transcribed genes (with next-generation sequencing). Such methods are referred to as Genomics as they give a full genome level view of cancer cell activity, whilst the process whereby we analyse and interpret these vast and complex datasets has come to be known as Bioinformatics. During this module students will learn about and analyse gene expression microarrays-GEM datasets and several other types of cancer genomic data (SNP microarray, RNA-seq).

MPGN 613: Molecular Pathology and Diagnostics (3 credits)

Molecular pathology is the study and diagnosis of disease through the examination of molecules within organs, tissues or bodily fluids. Molecular pathology shares some aspects of practice with both anatomic pathology and clinical pathology, molecular biology, biochemistry, proteomics and genetics, and is sometimes considered a "crossover" discipline. Moreover, the principles behind molecular diagnostics are presented in detail. It encompasses the use of ELISA, DNA hybridization, PCR, RAPD and DNA fingerprinting, PCR/OLA, and restriction digest, in molecular diagnostics. Moreover, this course look into the clonal origin of neoplasms and the phenomenon of clonal evolution, the multistep pathogenesis of neoplasia involving, inherited predisposition, activation of oncogenes, inactivation of tumor suppressor genes, alterations of genes regulating apoptosis, mutations of DNA repair genes. Understanding molecular genetics of solid tumors; inherited alterations in tumor suppressor genes and genes encoding proteins responsible for DNA repair and their association with neoplasms will also be discussed.

MPGN 699: Research (6 credits)

Students can join an ongoing project or work on an independent problem in close cooperation with a faculty member (Research Supervisor).

MPhil Sociology

Introduction

Sociology is the systematic study of human society. It looks at social behavior, culture, social institutions, group dynamics, and the relationships between different groups in society. Sociology helps us to identify social issues by giving us conceptual tools for better understanding of those issues that generates research and informs policies. Students who study Sociology will learn to look at their own society and other societies in new ways, to question assumptions, to understand the society from the research of others, to record observations from a neutral position and to analyze them objectively, and to interpret their findings, all within an ethical framework. Sociology helps orient students in terms of their future life, so that they learn skills helpful in many areas of business, government, and non-governmental organizations, as well as their personal lives. Our goal is to have students understand themselves and society at the family, group, local, regional, national, and global level.

The Sociology department is part of the Faculty of the Social Sciences.

MPhil Sociology

MPhil program in Sociology is designed to expose graduate students to concrete and theoretical knowledge and scholarly research in Sociology. The objective is to empower students with critical thinking, analytical reasoning, social research, and writing skills. This program in Sociology builds on foundational training at the baccalaureate level, and strengthens and develops those skills further. We are committed to providing our students with both sound theoretical knowledge as well as practical skills. This program has a strong emphasis on research skills that will be beneficial for those pursuing careers in government, the private sector, civil society, or teaching, and they are critical for anyone desiring to pursue a PhD in Sociology or related fields. Participation in departmental field research studies will be important to integrate what is learned in coursework as well as independent research for the thesis.

MPhil Sociology is a 2-Year program comprising 24 credit hours of mandatory course work and a thesis for 06 credits (total of 30 credits). Course work will involve four core courses and four optional courses in addition to the thesis seminar. Teaching will be in the form of lectures, seminars, group projects, individual presentations and research papers, and field work.

Mission

The Mission of the Department of Sociology, MPhil Sociology degree programme, is to facilitate students achieve mastery in concepts, theories, methods, skills, and professional ethics of Sociology and ethics in general, enabling them to secure admissions in Doctoral programs and find employment in competitive organizations

Learning Objectives

1. To master the theoretical underpinnings of Sociology and related social sciences by providing indepth understanding of classical and modern sociological theories
2. To broaden students' understanding of quantitative, qualitative, and/or mixed research methods and skills used in Sociology and related social science**s**

3. To develop the communication skills of students in the field of sociology

4. To broaden students' understanding of professional ethics in Sociology and general values in Society

5. To prepare students to identify career and educational opportunities in Sociology

Admission Requirements
· Must have a CGPA of at least 2.50
· Must pass a department test and interview with department faculty
· Must provide two academic letters of recommendation
· Acceptance is based upon an overall evaluation of the candidate, including: academic achievement, statement of purpose, practical experience in Sociology, English language proficiency, demonstrated social service, representation of a particular culture, religion, or ethnicity in Pakistan.

Degree Requirements
· Completion of 24 credit hours of course work including four core courses
· Completion of 24 credits in the first year with a CGPA of 2.50 or better. Students who do not have this CGPA or better will not be allowed to continue to the thesis. They would be allowed to take additional course work to improve their grade point average.
· Completion of an MPhil thesis proposal by the end of the third semester after the start of the program, with necessary approval from the Department Faculty, the FCCU Institutional Review Board (IRB), and the FCCU Board of Advanced Studies and Research (BAS&R). Also, if there are changes in the thesis proposals they would be reviewed and approved by the three bodies.
· A 06 credit hour MPhil thesis must be submitted, defended and approved by the thesis defense committee (including one local external reviewer) by the end of the fourth semester.
· The MPhil degree will be awarded based on the completion of a total of 30 credit hours.
· A cumulative grade point average of at least 2.50 must be maintained for the totality of MPhil course work.
· The degree is a two-year academic program. The time duration can be extended based on reasonable grounds for one year after approval from the Chairperson of the Department and statutory bodies. The maximum time limit to graduate is four years.

Course Descriptions
CORE COURSES
SOCL 501: Quantitative Research Methods in Sociology
SOCL 502: Qualitative Research Methods in Sociology
SOCL 503: Classical and Modern Sociological Theory
SOCL 504: Sociology of Development
SOCL 505: Social Statistics (Students who believe they are already strong in Statistics may take a test. If they pass, they may exempt this course and take an extra elective.)
SOCL 506: Sociology of South Asia
SOCL 598: Master's seminar on the Thesis
SOCL 699: Research Thesis

Elective Courses (These will alternate)
SOCL 507: Demography
SOCL 508: Urban Sociology

SOCL 509: Advanced Readings in Gender
SOCL 510: Political Sociology (will be cross-listed with PLSC509)
SOCL 511: Inequality in South Asia
SOCL 512: Environmental Sociology
SOCL 513: Aging and Gender
SOCL 514: Gerontology
SOCL 515: Sociology of Organizations and NGO Management
SOCL 516: Social Psychology
SOCL 517: Advanced Readings in Criminology
SOCL 518: Aging and Health
SOCL 519: Aging and Public Policy
SOCL 520: Advanced readings in Health and Health Systems
SOCL 521: Comparative Criminal Justice Systems
SOCL 522: Religion in the Postmodern World

Course Description:
SOCL 501: Quantitative Research in Sociology (3 credits)
This course provides students with a rigorous introduction to quantitative methods for Sociology. Topics include various types of quantitative research design such as experimental, survey, observational, analysis of secondary data, and basic mathematical tools used in social science modeling and statistics. The course is open to students outside Sociology.

SOCL 502: **Qualitative Research in Sociology (3 credits)**
The course aims to familiarize students with the techniques and tools for research in social sciences, particularly in Sociology. The course will attempt to teach students how to gather qualitative evidence through the use of established social science research methods and how to analyze that data logically. The students will learn to various methods such as case studies, ethnographic research, interviews, and data-gathering from both published and archival resources.

SOCL 503: Classical and Modern Sociological Theory (3 credits)
This course is designed to refine your understanding of key theoretical ideas, problems, and debates within classical and modern sociology. In addition to developing a more in-depth understanding of the theories of influential social researchers, we will explore the ways that sociological thinking can help us engage more incisively with the "big" social and political issues of our time. Tensions between theory and practice, power and knowledge, structure and agency, oppression and resistance, will be recurring topics we'll explore throughout the semester, as will the emphasis on cultivating a "reflexive" understanding of sociological inquiry itself.

SOCL 504: Sociology of Development (3 credits)
This course will provide students with a solid understanding of the social, political, cultural, and economic processes that shape development. The course examines key ideas, theories, and actors (institutions, social movements, NGOs, governments, etc.) that have shaped mainstream and alternative development processes and practices. The course historicizes 'development,' looking at the ways in which its discursive and political economic aspects mutually reinforce power structures that determine which peoples do and do not count as 'developed' and which perspectives on change become part of development practice. The course allows an exploration of the multilayered theoretical and experiential aspects of development as it takes place on the ground in recent times.

SOCL 505: Social Statistics (3 credits)
Because an understanding of Statistics is a critical skill for Sociology, this course begins with probability theory, and continues with the theory of estimation and inference. It discusses several statistical methods, especially correlation, regression, and other statistical tests.

SOCL 506: Sociology of South Asia (3 credits)
An exploration of the cultures and societies in South Asia is essential to develop a broad understanding of the social problems in Pakistan. This required a worldview that focuses on the commonalities in cultural heritage, colonial legacy, interaction with global and transnational forces and their influence on the social, political, social and economic structures and processes in contemporary South Asian societies. The worldview must also appreciate and look to learn from differences, with the overall aim of proposing culture-specific solutions to region-specific problems. The aim of this course is to facilitate students to understand their society from the south Asian perspectives. In other words, students will learn to make sense of the local social trends and social problems from a comparative regional perspective.

SOCL 507: Demography (3 credits)
Demography is an important subspecialty in Sociology that tracks populations and their dynamics. The course will present methods in measuring populations and estimating and forecasting methods, with special reference to techniques to measure and compare major life events. Census and other data will be used from Pakistan and many other countries.
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SOCL 508: Urban Sociology (3 credits)
This course will examine the processes, policies, and programs that have shaped and impacted cities and urban spaces across the world. State policies targeting urban planning, organization and reform will also be addressed. The main theories of urban sociology will be analyzed, including postmodern theories. The nature of the community, social inequality, and political power will be assessed in context to the built environment and urban development. The aim will be to understand the influence of human intervention, housing and settlement, building and architecture, environment and climate change, and socio-political and economic events on urban transformations. There will be detailed discussion of urban case-studies and urban policies to investigate differences in settlements in order to assess optimal solutions for survival and development in urban zones.

SOCL 509: Advanced Readings in Gender (3 credits)
This course offers advanced knowledge in the social construction of gender, as a phenomenon that can change across time, region and cultures. There will be critical examination of gender (including women, men and the third gender) and the cross-sectioning of race, class and ethnicity. Gender theories and case-studies will be used to show realities and the organization of society into gender hierarchies and gender-based inequalities. Structures influenced by gender classifications will be investigated, including the family, education system, the economy, health and illness, the legal system, and the political system. Contemporary issues of South Asian women will be examined, including cultural challenges, education and job segregation, and reproductive burdens and health. From a global perspective the discrimination against middle-aged women, single mothers and women immigrants will also be explored.

SOCL 510: Political Sociology (3 credits)
The course has been designed to study various strands of political behavior constituting

political sociology. An attempt has been made to emphasize the importance of sociology in the study of political process and the relationship between society and its groups and politics. The course will use theories of political sociology from Marx, Weber, Parson, Merton, and Foucault, among others. The course will focus on the nature and distribution of power in many societies, political socialization to gain insight into how societies prepare their members to function in that society through their educational system and other mechanisms, gender power relations, and the process of modernization, development and social change in many societies. The course will look especially at democracies and the role of social status, ethnicity, religion, and caste in terms of voter behavior and power blocs and social movements.

SOCL 511: Inequality in South Asia (3 credits)
This course is designed to introduce students of sociology to their own region with emphasis on social stratification and inequality trends in South Asian countries. The course intends to explore various dimensions of inequality in South Asia namely Pakistan, India, China, Sri Lanka, Nepal, Maldives, Bhutan, and Bangladesh.

SOCL 512: Environmental Sociology (3 credits)
There exists a dialectic relationship between society and our natural environment. The course will be an attempt to introduce the field of environmental sociology enabling students to see environment in the light of sociological perspectives. A central aim of this course is to illuminate the students about the relationship that they have with their environment highlighting how ecological issues are social problems.

SOCL 513: Aging and Gender (3 credits)
The aim of this course is to explore aging from a gender lens, in terms of recognizing different levels of stratification the elderly face as not just women, but also men and as the third gender. Theories of aging and gender will be examined with attention given to the ethnic and class belonging of each gender. The changing roles and challenges of the aging genders in the modern world will be the focus, including issues of body, economic participation, marital status, care-work and abuse. Implications for a gender focus on policies for aging will also be covered. Specific aging and gender research from the developing regions, Muslim world and South Asia will also be studied.

SOCL 514: Gerontology (3 credits)
Gerontology is the study of aging and older people in terms of their sociological, psychological, economic, and medical development. In the last half century, both the number and proportion of older persons has risen in almost all societies. It is estimated that older people will comprise 30% of many societies by 2050, and it is estimated that they will make up 15% of Pakistani society by that time. The course will address theories of aging, policies, and systems as well as many of the practical issues and opportunities involved with an aging population.

SOCL 515: Sociology of Organizations and NGO Management (3 credits)
This course is designed to study formal organizations, business and economics through the work of theorists and empirical case studies. The nature of organizations will be investigated, but importance will be given to the sociological nature of organizations. The aim will be to study organization theory, barriers of bureaucracies, the influence of the environment and culture on organizational outcomes, and the management of internal and external problems by organizational leaders. The transformation of the organization in a global world will be investigated through postmodernist research and the inequalities

caused by gender and ethnicity will also be explored. This course will also analyze the workings and success of non-governmental organizations (NGO's) and investigate South Asian experiences of success and failure.

SOCL 516: Social Psychology (3 credits)
Social Psychology addresses how people think and interact in groups, a very vital component of Sociology. This course will explore a number of theories and their applications from small group interactions, to larger groupings of people to formal organizations. As much of applied Sociology is conducted through government or NGOs, it is important to understand how people interact with each other in groups.

SOCL 517: Advanced Readings in Criminology (3 credits)
The course will stress the importance of the various theories of criminology and will examine the implications of each of these in the real world, especially in Pakistan. This course will focus on theories that explain the phenomenon of crime and its causation form the rational choice, biological, sociological, political and economic perspective. The application of these theories to Pakistan and the Pakistani criminal justice system will be a running theme in this course.

SOCL 518: Aging and Health (3 credits)
The course is focused towards building a basic understanding of the students towards the process of aging along with the physical, psychological, social and economic factors that affect health and aging at the individual and population levels. The course will begin with an overview of the demography and epidemiology of aging, physical and mental disorders, functional capacity and disability, health services, Governmental policies and discuss how aging is viewed in society today, including myths of aging and stereotypes of aging, and briefly review theories of aging.

SOCL 519: Aging and Public Policy (3 credits)
This course will address the impacts of sweeping national age-based and age-related policy and programs such as Social Security, Medicare, Medic-aid, and Pakistan Disability Act. In addition, it will examine the implementation of these programs in state and local settings, where implications are tangible for vulnerable groups such as low-income and frail older people and their families. Policy challenges of issues such as Alzheimer's, long term care, housing, caregiving, transportation, nutrition, research funding, emergency management, and disease prevention will be discussed. Furthermore, this course will address how local governments can shape policy to respond to the needs of their own aging populations. Examination of these aging issues and policies as portrayed in current media and popular culture will reinforce course content. Although the focus is on the Pakistan, there will be many opportunities for students to explore aging policies in international settings.

SOCL 520: Advanced Readings in Health & Health Systems (3 credits)
Health and illness are central to our lives and are major areas of work, policy and debate in society. This program helps students to explore key areas of health including: the experiences of health and illness; the nature of the health professions; health inequalities; the rise of new health technologies; and the ways in which social class, gender, age and ethnicity influence health. International health systems will be studied with specific context to comparative patient safety and satisfaction, and performance and efficiency.

SOCL 521: Comparative Criminal Justice Systems (3 credits)
In this course the students will develop a theory based comparative understanding of the criminal justice organizations and processes. The main purpose of this course is to apply this knowledge in the context of Pakistan to better understand the Pakistani criminal justice system. The comparative approach is used to help students develop a) a theoretical foundation for understanding how the criminal justice systems operate and b) a knowledge base that would allow them to critically analyze and compare the different criminal justice systems. In the local context this approach is used as a proxy due to the lack of empirical literature on the Pakistani criminal justice system. However, the focus of this course will be on specific issues that are inherent to a varying degree in all systems rather than the structural differences in the various criminal justice systems and models. It will be maintained throughout this course that the nature and extent of these issues are not determined by the type of the criminal justice model implemented within a system but by an amalgamated effect actuated by various individual level, group level, organizational and contextual forces.

SOCL 522: Religion in the Postmodern World (3 credits)
This course will aim to explain the diverse organizations of religion, prominent theories of religion and the difficulties in measuring religiosity in a postmodern world. The debate over the decline of the role of religion or secularization will be critiqued. Social and economic structures that have replaced the role of religion will be explored. The focus will be on new religious movements (new age sects and cults), and areas of study will include: the reasons for their emergence, typologies and specific case-studies. In addition, the transfer to privatized forms of religion, religious pluralism and spiritual shopping in the postmodern world will also be examined. The impact of rising fundamentalism and extremist religious dogma in domain religions of Christianity, Islam and Buddhism will also be investigated with context to culture, region, politics, economics and foreign relations. Religious interpretation and ideology as a cause for stratification between ethnicities and genders will be explored.

SOCL 598: Master's Seminar on the Thesis (3 credits)
This course is required for the completion of MPhil Sociology degree at FCCU. Students will be graded on the quality of the research proposal that they will develop. The course has been designed to take the students through each stage of proposal writing. Students will develop a research question or hypotheses, conduct and write up a literature review, prepare their research design and methodology.

SOCL 599: Research Thesis (6 credits)
This course is required for the completion of MPhil Sociology degree at FCCU. Students will be graded on the quality and the unique contribution of their MPhil thesis. Only those students 1) who had taken SOCL 598, 2) whose proposal was approved by the Graduate Committee and 3) who have collected their data or at least a substantial portion of their data during the summer, will be eligible to enroll in this course. This course has been designed to take the students through each step of data preparation, data analysis, and understanding, presenting writing and interpreting results. By the end of this course, students will be expected to submit a completed manuscript of their MPhil thesis along with the approval of the Sociology graduate committee.

MPhil Statistics

M.Phil statistics program is designed to prepare a future generation of statisticians who are well equipped with mathematical and applied statistics knowledge, who are trained to solve the real world problems and communicate statistics eloquently using the skills they learn during their studies in this program. M.Phil program in statistics prepares student to become leading researcher not only in mathematical statistics but in applied statistics where they learn and understand the interdisciplinary nature of this subject.

Since its inception in 1974, with a vision to provide the best statistics education with high quality statistical services across all disciplines, and ensuring international recognition, It aims to devise and develop statistical techniques, and to disseminate statistical knowledge through teaching, advising, and outreach programs, by making our students responsible citizens and responsible users of statistics in order to serve the needs of broader community. The department offers a BS (Hons) and M.Phil degrees and is part of the Faculty of Computer and Mathematical Science.

The Department is well enriched with high quality faculty who are competent in their fields of interest having up-to-date knowledge of various dimensions of Statistics to produce high-quality graduates. The Department is producing the number of quality research publications every year, which are published in ISI indexed and well reputed national and international journals recognized by HEC of Pakistan. "Numbers Rule Your World" a seminar series provides an opportunity to students to learn by interacting with national and international professionals of high repute. The major research interests of the faculty are in the areas of biostatistics, statistical quality control, mathematical statistics, stochastic processes, sampling techniques and design of experiments.

Learning Objectives:
The aim of the program is to create well rounded individuals, having the capability to excel keeping the vision and the mission of the department and FCCU. Following are the salient objectives of the program for the students to:

Inculcate good working knowledge of the most commonly used statistical methods,
Including:
· Theoretical Statistics, computational statistics and applied statistics.
· Statistical modeling and the omnipresent role of variability.
· Efficient design of studies and construction of effective sampling plans.
· Develop good mastery of several standard statistical software packages and facility with data management strategies.
· Have a focused concentration in an area of application outside the discipline of statistics by effectively using real life data and available computational resources.
· Communicate effectively (written and oral) with skills in collaboration (within and between disciplines) and teamwork, and in organizing and managing theoretical and applied statistical research projects.

Admission Requirements:
Students seeking admission to the MPhil in Statistics program at FCCU must meet the following requirements:
· A 4-year BS (Hons) degree from HEC recognized university in the discipline of Statistics,

Biostatistics, Data Science, Mathematics, or related disciplines with a minimum CGPA of 2.0. Students with a minor in Statistics are eligible to apply.

OR

A conventional MSc in Statistics, Biostatistics with a minimum of 60% marks.

· Students with a degree other than Statistics are required to study deficiency courses recommended by the departmental admission committee.

· Written Test and Interview.

· Other requirements as per FCCU admission policy.

Degree Requirements:

To be eligible to receive the MPhil in Statistics, the student must meet the following requirements:

1. Completion of 24 credit hours of course work with CGPA of 2.5 or better (A student who has CGPA below 2.5 will not be allowed to continue to the thesis.

2. Approval of an MPhil research proposal at the start of second year.

3. A 12-credit hour MPhil thesis must be submitted, defended and approved by the thesis defense committee within the duration according to FCCU policy.

Distribution of Total Credit Hours

Mphil in Statistics will be a two-year evening program comprising the total of 36 credit hours including mandatory coursework of 24 credit hours and 12 credit hours of thesis. The contents of courses have been designed according to the need of the subject, industry, and job market, in line with HEC requirements. Break up of total credit hours is stated in the following Table:

Time Duration	Category	Credit Hours
Year – 1	Semester-I	4 courses of 3Cr.Hrs = 12
	Semester-II	4 courses of 3Cr.Hrs = 12
Year – 2	Thesis	12
Total	-------	**36**

Courses

STAT 501: Advanced Probability Theory (3 credits)

Algebra of sets, fields and sigma-fields, limits of sequences of subsets, sigma-field generated by a class of subsets, Borel fields, Probability, measure on a sigma-fields, probability space, and continuity of a probability measure. Real and vector-valued random

variables, distribution functions (cdf) discrete r.v.s., r.v.s of the continuous type, decomposition of cdf, independence of two events and (n>2) events, sequence of independent events, independent classes of events. Dynkin's theorem, independence of r.v.s, Borel zero-one law, Expectation of a real r.v. and of a complex valued r.v. Linear properties of expectations, characteristic functions, their simple properties, uniqueness theorem. Convergence of a sequence of r.v.s., convergence in distribution, convergence in probability, Kolmogorov strong law of large numbers (without proof), monotone convergence theorem and dominated convergence theorem, continuity theorem for characteristic functions. Lindeberg's CLT and its particular cases, Cramer's theorem on composition of convergence in distribution and convergence in probability.

STAT 502: Advanced Statistical Inference (3 credits)

Objective of statistical analysis and theory, criteria for the choice of families of models, the likelihood, sufficient statistics, some general principals of statistics inference, significance tests: simple null hypothesis and simple alternative hypothesis, some example, discrete problems, composite alternatives, two-sided tests, Local power, Multidimensional alternatives, composite null hypothesis, similar Region, invariants tests, Distribution– free and randomization tests: permutation tests, Rank test, Randomization tests, distance tests, Interval estimation: Scalar parameter, scalar parameter with nuisance parameters, Vector parameter, estimation of future observations, Point estimation: General considerations on bias and variance, Cramer–Rao inequality, Achievement of minimum variance and remove of bias, estimates of minimum mean squared error, Robust estimation, Asymptotic theory: Introduction, maximum likelihood estimates, large sample parametric significance tests, Robust inference for location parameters.

STAT 503: Advanced Regression Analysis (3 credits)

Brief review of multiple regression by least-squares, Outliers: Analysis of residuals, Influence measure, identifying influential observations, Diagnostics Tests, Robust regression, Tests for normality, choosing a regression model using various computational techniques: All possible regressions, forward selection, backward elimination and stepwise regressions. Re-Sampling techniques: Jackknifing, Bootstrapping and Cross-Validation.

STAT 504: Advanced Design of Experiments (3 credits)

Incomplete Block Designs, Lattice square designs, generalized lattice designs, Alpha lattice designs, Youden Square, Change-Over Design, Cyclic Designs, and Response Surface Methodology, First and second order RS designs. Designs Robust to underlying Model, Outliers and Missing observations, Taguchi Methods., Optimal designs (An optimal, D optimal).

STAT 505: Advanced Applied Multivariate Analysis (3 credits)

Multivariate Normal Distribution, Wishart distribution and their properties, Hotelling's T^2 Distribution, Methods of Estimation; Maximum Likelihood and least squares, Multivariate Hypothesis testing, Likelihood ratio test, One sample and multi-sample hypothesis. Principal Component Analysis, Factor Analysis, Discriminant Analysis. Canonical Correlation, Cluster analysis, Path analysis, Multivariate Analysis of Variance (MANOVA).

STAT- 506: Time Series Analysis and Forecasting (3 credits)

Types of data, components of time series data, Stochastic processes, Stationary and non-

stationary processes, Forms and tests of nonstationary, Purely random processes, Random walk models, Lag operator, Difference equations and their solutions, Smoothing and decomposition methods, Univariate time series analysis (ARMA, ARIMA, Box-Jenkins approach, ARCH, GARCH etc.), Time series modeling and diagnostic checking, State space models and use of Kalman filter, 70 Multivariate time series analysis: Granger causality, Vector Autoregressive Models. Transfer function and intervention analysis, Time series forecasting, Co-integration analysis, Vector error correction model and Johansen approach.

STAT 507: Advanced Categorical Data Analysis (3 credits)

Introduction to categorical data analysis, Principles of likelihood-based inference, Sampling distributions for contingency tables, Measures of association for 2x2 tables, Testing independence in contingency tables, Exact inference for two-way tables, Inferences for three-way tables. Introduction to generalized linear models, Logistic regression, Model building, Alternative link functions for binary outcome, Diagnostics, Exact methods and conditional logistic regression, Methods for analyzing matched case-control data, Multinomial response models for nominal data, Multinomial response models for ordinal data. Poisson regression model, Poisson regression for rates, Log-linear models for contingency tables, Negative binomial models, Quasi-likelihood and Generalized Estimating Equations.

STAT 508: Advanced Survey Sampling (3 credits)

Sampling and its types, Non-Sampling Errors, Observational Errors, Incomplete Sampling, Nonresponse, Effects of Non -response, Response and Response Variance, Sources of Response Error, Detection, Control and Measurement of Response Error, Scaling Methods, Types of Scales, General Procedure in Attitude Scaling, Rating Scales, Likert Scale, Guttman Scale, Sematic Differential, A Survey of Super Population Models. Randomization theory results for SRS Model for SRS, and model for ratio and Regression Estimation. Model for Stratified Sampling, Cluster Sampling, Models for unequal Probability Sampling, Complex Surveys, Variance Estimations in Complex Surveys, Categorical Data Analysis in Complex Surveys, Regression Analysis for Complex Survey, Effects of Survey Design on Regression Analysis, Effects of Two-stage Sampling on OLS Methods, Comparison of Domain Means in Two-stage Sampling.

STAT 509: Survival Analysis (3 credits)

Basic Concepts, Censoring, Types of Censoring, Survival Functions, Relationship between Survival, Hazard and Density Functions, Survival Curves, Estimation of Survivorship Functions for Different Parametric Distributions, Non- Parametric Methods of Estimating Survival Functions, Non- Parametric Methods for Comparing Survival Distributions, Some Well-Known Survival Distributions and their Applications, Estimation Procedure for Parametric Survival Distributions without Covariates, Graphical Method for Survival Distribution Fitting, Test of Goodness of Fit and Distribution Selection, Parametric Methods of Comparing Two Survival Distributions, Parametric Methods for Regression Model Fitting and Identification of Prognostic Factors, Identification of Prognostic Factors related to Survival Time: Cox Proportional Hazard Model, and Non Proportional Hazard models.

STAT 510: Applied Stochastic Models (3 credits)

Probability generating functions, compound distributions, simple random walk, branching processes, Markov process, discrete and continuous time Markov chains, birth-death

process, immigration and emigration process, immigration-death processes, renewal processes, Markov renewal process, Ergodic theorem, Gaussian processes and Brownian motion.

STAT 511: Advance Distribution Theory (3 credits)

Probability measures, expectations, conditioning, convergence of random sequences, law of large numbers, central limit theory, characteristic functions, discrete distributions, continuous distributions, systems of distributions: Pearson and Johnson, Chebyshev-Hermite polynomials, Gram-Charlier Series (Type-A), polynomial transformation to normality. Order statistics and their sampling.

STAT 512: Inference in Stochastic Processes (3 credits)

Inference in Markov chains, estimation of transition probabilities, testing for order of a Markov chain, estimation of functions of transition probabilities, parametric models and their goodness of fit Markov sequences, estimation of parameters based on likelihood and conditional least squares, auto-regressive series, Statement of martingale, strong law of large numbers and Central Limit Theorem for martingales, CAN property of the MLE from a general sequence of dependent random variables, Fisher information, Applications to Markov chains and sequences. Likelihood of Poisson and other Pure Jump Markov processes from first principles, CAN property of MLE's, testing for a Poisson process, nonhomogeneous processes, Analysis of parametric Pure Jump processes, Birth-Death-Immigration processes, testing goodness of fit of such models Diffusion processes and their likelihood, properties of estimators (without proof) Branching processes, Inconsistency of MLE/moment estimators, Properties of estimators on the non-extinction path, Asymptotic distribution theory. Elements of semi-parametric and non-parametric analysis, Theory and applications of optimal estimating functions, estimation of transition and stationary density, intensity function of a counting process.

STAT 513: Advanced Bayesian Inference (3 credits)

Classical vs Bayesian Statistics, Statistical Inference, Bayes' theorem; Likelihood, Prior distribution; Posterior distribution; Summaries of the univariate, bivariate & multivariate posterior distributions & applications. Posterior distributions using conjugate prior, Predictive distribution; Predictive inference, Methods of elicitation of non-information priors, Bayesian testing of hypothesis; Bayes factor for testing the sharp (point) hypothesis; The highest density region. Bayesian computation, e.g. Gibbs sampling, Bayesian Regression.

STAT 514: Financial Stochastic Models (3 credits)

Derivatives: forward and future contracts. Markets, prices, arbitrage and hedging, Options markets, properties of stock option prices. American and European options, Binomial model: One-step and two-step models, Binomial trees. Risk neutral valuation, Behavior of stock prices: Conditional expectation, Martingale, Brownian Motion, Markov property, ITO Process, ITO Lemma, Black Scholes model: Distribution of returns, volatility, Black-Scholes-Merton differential equation. Estimating volatility, Options on stock indices, currencies and futures. Greek Letters and hedging, Value at risk.

STAT 515: Generalized Linear Models (3 credits)

Review of the General Linear Model for Normal Data: Linear regression, fixed- and mixed-model ANOVA, Analysis of covariance. Extending the General Linear Model: Non-normal

error structure, exponential class, Linear and non-linear link functions. Theory of Estimation and Model Fitting: Likelihood functions and maximum likelihood, iteratively reweighted least squares. Theory of Statistical Inference: The deviance function, Analysis of deviance, Likelihood ratio tests, Wald tests, Confidence regions. Examples and Illustrations: Classical normal-based models, Logistic and other binary regression, Log-linear models for count data, Gamma regression models. Extending Generalized Linear Models: Extending the exponential class, Over-dispersed models, Quasi-likelihood models, generalized estimating equations, Polytomous response models.

STAT 516: Advanced Statistical Methods in Quality Control (3 credits)

Concepts and definition of quality, Statistical Process Control (SPC) tools, Multivariate Process Control, Hotelling's T2 control chart, Failure-Mode and Effect Analysis (FMEA), Quality Function Deployment (QFD) - Akao model, House of Quality. Design of experiments, Fractional factorial designs, Robust designs. Taguchi experiments in industrial setups, Mixture Designs. Six Sigma concept, Define, measure, improve, control (DMAIC) philosophy. Design for Six Sigma (DFSS), Quality standards - ISO 9000, ISO-14000, ISO 22000.

STAT 699: Research Thesis (12 credits)

Research is a one-year thesis in which MPhil students will conduct a research in the 2nd year of MPhil program and at the end of research work, students are required to write a comprehensive thesis. Research work should be a combination of development of new theories and applications as well which will be significant for the betterment of society. The research should be original and new work.

At the start the students will write a synopsis for the proposed research for approval. Students will do the research with the guidance of allotted supervisor and submit thesis as per Mphil thesis guidelines to supervisor for internal and external evaluation. After evaluation viva voce will be arranged. FCCU and HEC plagiarism policy should be followed.

PhD
Biotechnology

Program Mission Statement
The mission of PhD Biotechnology is to produce knowledgeable professionals, capable of addressing societal and socio-economic challenges by using biotechnological approaches. The program strengthens the capabilities of students as academicians, researchers, bio-entrepreneurs, and human resource for industries through research of international standards.

Program Objectives
1. To provide comprehensive practical knowledge in selected field of study in biotechnology.
2. To develop independent researchers capable of identifying research questions, developing hypothesis, and conducting research
3. To prepare students for communication across the scientific community
4. To prepare students to apply biotechnology techniques and skills for addressing the current challenges of the society
5. To produce competent trained human resource for academia and industry

Admission requirement
For admission into the PhD, minimum CGPA 3.0 according to HEC criteria or First Division (in the Annual System) in MPhil/MS/Equivalent in any area related to life sciences is required.

Subject Test
"At the time of admission" students must have proof of qualified GAT Subject or equivalent test with 70% score.

Degree Requirements
Total credit hours
The student is required to successfully complete a minimum of 36 credit hours for the degree. The details are as follows:

Course Work
Course work of 24 credit hours preferably in the first year is required to be completed and followed by a comprehensive examination for granting candidacy as a PhD researcher. A minimum of 60% score is required to pass the comprehensive exam.

Research
After the successful completion of course work students are required to register for 12 credits of research work

Plagiarism Test
The Plagiarism test must be conducted on the Dissertation before its submission to the two foreign experts, as described below.

Foreign Expert Evaluation
The PhD Dissertation must be approved by at least two PhD experts from technologically/academically advanced foreign countries in addition to the local Committee comprised of internal and external examiners.

Research Paper
Acceptance/publication of at least one research paper in an HEC approved "X" category journal is a requirement for the award of Ph.D. degree. *Or at least one publication in an ISI*

indexed impact factor carrying journal.

Open defense
An open defense of Dissertation is an essential part of PhD Program after receiving positive evaluation from two foreign experts.

Copy of PhD Dissertation to HEC
A copy of PhD Dissertation (both hard and soft) must be submitted to the HEC for record in the PhD Country Directory.

Conduct of PhD Program
According to the HEC, initially there should be at least 3 relevant full time PhD Faculty members in a department to launch the Ph.D. program. The KAM School of Life Sciences currently has 22 PhDs out of which 12 are HEC approved PhD supervisors.

The maximum number of PhD students under the supervision of a full-time faculty member is three.

Program of Studies:
· Minimum period of completion: Three Years
· Maximum period of completion: Eight years
· The Comprehensive exam will be conducted after completion of course work. A maximum of three attempts can be made to pass the exam.

Admission to PhD program will only be made in the research areas which are supported through research projects. In case of non availability of research funding/grant, student may be registered with the approval of Rector.

Course Descriptions:
BIOT 701: Gene Structure and Regulation (3 credits)
Prokaryotic and eukaryotic gene structures, Genome organization, Gene families, Gene regulation in prokaryotes and eukaryotes. Transposons, mutagens, mutations and DNA repair, molecular basis of mutations, transposable elements, and mechanisms of DNA repair. Basic concepts about epigenetic inheritance patterns. Epigenetic gene regulation mediated by chromatin modifications, non-coding RNAs and their involvement in various cellular processes.

BIOT 702: Advances in Cell Biology and Signaling (3 credits)
Cellular organization and specialization, Membrane transport, Biomembranes and subcellular organization of eukaryotes, Regulation of the eukaryotic cell cycle/apoptosis, Protein sorting, protein secretion, Muscle contraction, Cell surface and communication extra cellular matrix, Cell-to-cell signaling, Hormones & receptors, Primary and Secondary messengers, Ion, steroid, G-protein, enzyme-linked, Nuclear and cytoplasmic interactions, growth factors Cancer.

BIOT 703: Forensic DNA Typing (3 credits)
History of forensic science, Principles of forensic sciences, Crime scene investigation, Fire and explosive examination, Death investigation, Collection, storage and analysis of biological evidence and strains, Trace biological evidence, Forensic DNA analysis, DNA isolation and amplification, Paternity identification, DNA profiling, Data collection and interpretation.

BIOT 704: Advances in Virology (3 credits)
Viral classification and structure, Bacteriophages, animal and plant viruses, Viral genome replication, regulation, and virus assembly. Virus host interactions and epidemiology, Host defense mechanisms, vaccines and antiviral drugs, Diagnosis and Pathology, Resistant to infection Treatment and Prevention, Prion diseases, Retroviruses and AIDS, Orthomyxovirues and influenza, herpes viruses, Control of viral disease by immunization.

BIOT 705: Advances in Immunology (3 credits)
Cells and organs of immune system, Generation of B cells and T cells, organization, and expression of immunoglobulin genes. Antigen-antibody interaction. Major histocompatibility complexes, T cell receptors, T cell maturation, activation, and differentiation. B cell generation, activation, and differentiation, immune system in health and diseases.

BIOT 706: Practical Approaches to Recombinant DNA Technology (3 credits)
The course covers the latest and emerging technologies in the field of Recombinant DNA Technology. A thorough discussion in the areas of RNAi, miRNA, ZFN's, TALENs and CRISPR-Cas systems for developing disease resistance strategies; development of cDNA Libraries, development of BAC Libraries, development of subtractive libraries and chromosome walking technologies; their principles and practices; DNA Microarrays and quantitative Real Time PCR; Marker free plasmids, Molecular farming, and High throughput sequencing; and Problem-solving exercises.

BIOT 707: Journal Club (3 credits)
The course will comprise of at least one presentation by each student on critical analysis of recently published research article in international journals. The research article will be assigned to each student in the beginning of the semester. Besides that, every student will be required to attend all presentations and actively participate in the weekly journal club.

BIOT 708: Non-Coding Genome (3 credits)
This course will deal with RNA mediated silencing pathways and RNA biology, RNA mediated Silencing in different compartments of the cell, Role of proteins in compartmental and tissue specific vs systemic RNA mediated Silencing, Non Coding RNAs as a part of antiviral and anti-genome defense mechanisms: RNA directed methylation and demethylation, Epigenetics and Non-Coding RNAs, Non coding RNAs in Genome stability: Regulation of transposable elements, Maintenance of heterochromatin and centromere formation, Meiotic silencing of unpaired Chromatin, Paramutation and DNA elimination in Ciliates, Role of Non Coding RNAs in cancer: Human cancer associated lncRNAs.

BIOT 709: Advances in Epigenetics (3 credits)
The course will delve into advances in epigenetic technology, such as Epi-proteomic analyses, Single-Cell Genome-Wide Methylome and Transcriptome Sequencing, Three-Dimensional (3D) Chromatin Methods. The course will also include topics on maintenance of (Epi) genome integrity and current research in cancer epigenetics and progression, environmental influence on the epigenome, and reprogramming of somatic cells back to stem cells.

BIOT 710: Integrated Endocrinology and Metabolism (3 credits) – 46th AC
Introduction: historical perspective; organization of endocrine and neuroendocrine systems; chemical nature of hormones; synthesis and release of hormones; patterns of hormone

secretion; transport and metabolism of hormones; feedback mechanisms; systemic endocrine physiology - function of hormones: growth and development; reproduction; maintenance of internal environment; regulation of energy homeostasis; mechanisms of hormone actions: ligand and receptor interaction; signal transduction – peptide, polypeptide hormones, neurohormones and steroid hormones; role of endocrine system in integrating metabolic pathways; endocrine and metabolic basis of common metabolic diseases and their clinical implications with emphasis on scenarios such as diabetes mellitus, obesity, and infertility.

BIOT 799: Research (12 credits)
After the successful completion of course work students are required to register for research work. A CGPA of 2.75 is required to be eligible for Research. Students will join the ongoing projects or work on an independent problem (depending on availability of facilities and funds) under the supervision of faculty members (Research Supervisors).

PhD
Chemistry

Department of Chemistry, FCCU, is determined to demonstrate the distinguished features of this great institution including excellence in learning and research. The department has excellent faculty, most of them being PhD and HEC approved PhD supervisors. The Department has extensive research facilities, such as Atomic Absorption Spectrophotometer (AAS), Flame Emission Spectrophotometer (FES), Thermal Analyzer (TGA-DSC, CHNS/O Analyzer, Gas Chromatography-Mass Spectrometer (GC-MS), HPLC with auto sampler and automatic fraction collector, Gas Chromatograph(GC), FT-IR Spectrophotometer, UV-VIS Spectrophotometers, Digital Polarimeter, and Rotary evaporators, Freeze Drier, Cyclic Voltammetry, Potentiostat, Tablet Dissolution Apparatus Schlenk Line, Density, Sound Velocity and Viscometer (DSA5000), Ultrasonic Probe, Microwave Synthesis, Magnetic Susceptibility Balance, Spray Dryer, and Nuclear Magnetic Resonance (NMR) Spectrophotometer (Benchtop, 60 MHz, ^{1}H, ^{13}C, DEPT and COSY).

The Department of Chemistry follows, in general, the admission and qualification criteria as recommended by the Higher Education of Commission of Pakistan subject to the approval by the relevant bodies of the university.

PhD in Chemistry is a 3-year program focusing on independent research and learning. The scholars are encouraged to do research in areas like natural products, organic and inorganic synthesis, medicinal chemistry, drug design and targeted drug delivery, computational chemistry, polymers & biopolymers, colloidal chemistry, organometallics & catalysis, nano and composite materials among others.

Program Mission
The mission of PhD Chemistry degree program is to educate and train students as successful independent researchers and professionals in the field of chemical sciences by equipping them with advanced concepts, research techniques and skills, and ethical and service sensibilities.

Program Objectives
Following are the objectives of the program:

1. To educate students in the advanced concepts, techniques and professional skills in the relevant field of studies and research.
2. To provide a program with an emphasis on acquisition of research methodological skills covering identification, formulation, critical evaluation and communication of a meaningful research inquiry in a specialized field.
3. To teach the students to critically analyze ideas and data presented, and work on high-priority areas and interact with other experts of the field from academia and industry.
4. To teach the students to identify the issues that may arise in their work or discipline and conduct and disseminate research skillfully, responsibly, and safely, in accordance with the ethical norms and professional standards.

To encourage students to build self-awareness regarding employment opportunities and other professional involvements in their research domains or area of specialization.

Research Facilities

The Department has four dedicated teaching laboratories and six postgraduate research laboratories. The research and teaching instruments available include:

Atomic Spectroscopy
Flame Emission Spectrophotometer
Atomic Absorption Spectrophotometer (AAS)

Molecular Spectroscopy
UV-VIS Spectrophotometers
FT-IR Spectrophotometer
60 MHz Benchtop NMR Spectrometer (^{1}H, ^{13}C, ^{1}H-^{1}H COSY)

Chromatography
Gas Chromatography-Mass Spectrometer (GC-MS)
Gas Chromatograph
HPLC
Flash Chromatography

Thermal Analysis
Thermal Analyzer (TGA-DSC)

Electrochemical Instruments
Potentiostat/ Cyclic Voltammetry

Other Instruments and Apparatus
CHNS/O Analyzer
Digital Polarimeter
Digital Magnetic Susceptibility Balance
Hand-held Digital Densimeter
DSA 5000 (Density, Sound velocity and Viscometer)
Karl Fischer Titrator
Plate Reader
Tablet Dissolution Apparatus
Freeze Dryers
Spray Dryer
Centrifuge
Shaking Incubator

Thermostat (oil bath)
Muffle Furnace
Laboratory Ovens
Digital Melting Point Apparatus
Ice making machine
Rotary Evaporators
Schlenk Line
Ultrasonic baths and ultrasound probe

Conferences & Workshops Organized by the Department of Chemistry
1. Three Day Workshop on "Computational Chemistry", January 7-9, 2014.
2. Two-day workshop on "Chemo-metrics & Chemical Data Handling Tools", October 16-17, 2014.
3. Three-day international conference, "Exploring New Avenues in Medicinal Chemistry: Opportunities & Challenges", January 21-23, 2015.
4. Three-day Workshop on "Computational Chemistry Workshop: A New Approach to Understanding & Solving Chemical Problems", January 20-22, 2016.
5. Three-day international conference, "Current Research in Chemical & Pharmaceutical Sciences", January 18-20, 2017.
6. Three-day international conference, "Chemical and Pharmaceutical Sciences: Recent Approaches in Research & Applications", January 17-19, 2018.
7. Three-day conference on "Nanomaterials: New Trends in Development & Applications" held at Department of Chemistry, Forman Christian College (A Chartered University), Lahore, Pakistan from 29-31st January 2019.
8. Three-day international conference, "3rd International Conference on Chemical & Pharmaceutical Sciences: New Trends in Chemical & Pharmaceutical Chemistry", held at the Department of Chemistry, Forman Christian College (A Chartered University), Lahore, Pakistan from 29-31st January 2020.
9. The Department of Chemistry organized a workshop on Lab Safety.
10. The Department of Chemistry organized a webinar on "Asymmetric Catalysis" on November 25, 2022, where Dr. Wesley Moran from University of Huddersfield gave his talk.
11. The Department of Chemistry organized a Chemistry & Drug Discovery Symposium on June 21, 2022.
12. The Department of Chemistry organized a Two-day workshop on "Drug Delivery and Design" in collaboration with HEC, held at FCCU, July 24-25, 2023.

Funded (HEC and PSF) Research Projects

Completed Projects

1. Project# PSF/NSLP/P-FCCU (179). **Isolation of natural products from a medicinal plant of Pakistan and their Chemical and Biotechnological studies**.

    PI: Dr Dildar Ahmed

    Co-PI: Dr Kauser Abdulla Malik

2. Project# 20-1986/R&D/11. **The assay-guided isolation of chemical constituents from a medicinal plant (Carissa opaca), and the study of their bio activities**.

    PI: Dr Dildar Ahmed

3. Project# 20-3133/NRPU/R&D/HEC/13/675. **Synthesis of novel sulfonamide derivatives as inhibitors of ectonucleotidases**.

    PI: Dr Mariya al-Rashida

    Co-PI: Dr Jamshed Iqbal

4. Project # 20-3775/NRPU/R&D/HEC/14//220. **Substitution of synthetic polymers with highly biocompatible and inexpensive polymers from renewable sources in formulation of pharmaceuticals**. (Year Awarded: 2016)

    PI: Dr M Saeed Iqbal

    Co-PI: Dr Shazma Azeem

5. Project # 5475 (Approved by HEC) **Drug Delivery Using Choline Based Green Surfactants** (Year Awarded: 2016)

    PI: Dr Hafiz Muhammad Abd ur Rahman

    Co-PI: Dr Muhammad Nadeem Asghar

6. Project # 5676 (Approved by HEC) **Interaction, Dynamics and Speciation in Binary Solution of Choline Based green Ionic Liquids with Molecular Solvents**. (Year Awarded: 2016)

    PI: Dr Athar Yasin Khan

    Co-PI: Dr Hafiz Muhammad Abd ur Rahman

7. Dr. Muhammad Tariq Qamar (HEC) Start-up research grant of PKR 415000/- funded by HEC against concept paper titled **Photocatalytic Efficacy of CeO2 based Materials for the Abatement of organic Toxins. (Year Awarded: 2017)**

8. Project # 7676. Project Title, **"Ionic Liquid Mediated Multicomponent Reactions (MCRs) for Synthesis of Biologically Active Heterocyclic Compounds: Synthesis, Structural Elucidation and Evaluation of Biological Activities Targeting Neurodegenerative Diseases"**. (Year Awarded: 2018)

    PI: Dr. Mariya al Rashida

    Co-PI: Dr. Jamshed Iqbal

Ongoing HEC Funded Project
1. NRPU Project # 15423 "**Green Surface-Active Ionic Liquid-based Drug Delivery Systems**"

    PI: Dr Muhammad Nadeem Asghar
    Co-PI: Dr. Asad M. Khan

Research Patents
The Department of Chemistry has the following US patents to its credit.
1. Amin, M Saeed Iqbal. Solvent-free synthesis of acetaminophen. US 9,006, 488 B1, Apr 14, 2015.
2. Abdul Hameed, Nafees Iqbal, Jamshed Hashim, Khalid Mohammed Khan, Syed Tarique Moin, Shakeel Ahmad, Syed Abid Ali, Fatima Zahra Basha, Mariya al-Rashida, Rima D Alharthy, Shahnaz Perveen. Process for the preparation of quinoline-based ionic fluoride salts (QUFS). US-Patent No. 9643169, Application No 15.158,867, Patent Date 09/05/2017.
3. Ghumro, S. A., Alharthy, R. D., Saleem, S., Al-Rashida, M., Iqbal, N., Ahmed, S. A., Syed A., Moin, S. T., Hameed, A. Pyridine Based Ionic Fluoride for Catalyzing Indole and Tetrazole Formation. United States Patent Application 20190375711 (2019).

Collaboration with Other Institutions and MoU
In order for our students to avail facilities available at other institutions, collaboration has been established with institutions like HEJ Research Institute of Chemistry, PCSIR Laboratories, NovaMed Pharmaceuticals, Pharmagen Ltd., Lahore.

The Department of Chemistry has signed MoUs with following institutions and organizations:

National MOU
1. **All Cure International, Lahore** (signed/ renewed January 2022)
2. **Hydromech Corporation, Lahore** (Signed December 2018)
3. **NovaMed Pharmaceuticals Pvt. Ltd.** (Signed May 2013)

International MOU
1. **TUBE Pharmaceuticals GmBH - Vienna, Austria** (signed September 2021)
2. **University of Bengkulu, Indonesia** (Signed January 2020)

Degree Requirements
Total Credit Hours:
The student is required to successfully complete a minimum of 36 credit hours for the degree. The details are as follows:

Course Work:
Course work of 24 credit hours, preferably in the first year is required to be completed and followed by a comprehensive examination for granting candidacy as a PhD researcher. A minimum of 70% score is required to pass the comprehensive exam.

Research:
After the successful completion of course work, students are required to register for 12 credits of research work.

Foreign Expert Evaluation:
The PhD Dissertation must be evaluated by at least two PhD experts from technologically/academically advanced foreign countries in addition to the local Committee comprising internal and external examiners.

Plagiarism Test:
The Plagiarism Test as per HEC's Plagiarism Policy must be conducted on the Dissertation before its submission.

Open Defense:
An open defense of Dissertation is an essential part of PhD Program after positive evaluation.

Research Paper:
Publication of at least one research paper as its first author, based on the research project, in an HEC approved "X" category (or above) journal (or in an ISI-indexed impact factor carrying journal) during his or her doctoral studies is a requirement for the award of PhD degree.

Copy of PhD Dissertation to HEC:
A copy of the PhD Dissertation (both hard and soft) must be submitted to the HEC for record in the Ph.D. Country Directory.

Program of Studies:
· Minimum period of completion: Three Years
· Maximum period of completion: Five years
· Students must register for courses each semester as per the university policy.
· The comprehensive examination will be conducted after completion of course work. A maximum of three attempts can be made to pass the examination.
· At the end of the second semester, a student must obtain a minimum CGPA of 2.5/4.0 and must also pass all the courses in order to be promoted to the next semester for research.
· A student who has earned "F" or "D" grade in a course may be allowed to repeat the same course when offered or take one additional course, as offered by the department, to fulfill the minimum criteria of course work prior to the formal beginning of his/her research work.

Department of Chemistry
PhD Chemistry Roadmap

As per HEC new PhD policy a PhD student (MPhil qualified) has to complete a 24-credit hour coursework. **Semester I** Coursework: Students are advised to take at least 4 courses from the following: • CHEM 704 Recent Trends in Chemistry • CHEM 705 Characterization of Coordination Complexes • CHEM 741 Modern Organic Synthesis • CHEM 745 Medicinal Chemistry • CHEM 762 Computational Chemistry ➢ Six-monthly Progress Report (to be submitted at the end of the semester) ➢ Participation in a Job Fair/Industrial tour etc.	**Semester III** ➢ Registration for Research Thesis CHEM 799A ➢ Synopsis submission for DPC, BoS, BAS&R ➢ CHEM 798: PhD Research Seminar I ➢ (Synopsis Defense Seminar) ➢ September 2023 ➢ Six-monthly Progress Report (to be submitted at the end of the semester)	**Semester V** ➢ Registration for PhD Research 799C ➢ Publication in HEC-recognized journal ➢ Oral/Poster presentation in a scientific gathering ➢ Six-monthly Progress Report (to be submitted at the end of the semester)
Semester II Coursework: Students are advised to take at least 4 courses from the following: • CHEM 703 Quality Assurance in Research • CHEM 707: Drug Regulations & Drug Information Systems • CHEM 708: Advanced Pharmacokinetics and Pharmacodynamics • CHEM 746 Advanced Natural Products • CHEM 763 Electroanalytical Techniques ➢ Six-monthly Progress Report (to be submitted at the end of the semester) ➢ Participation in a Job Fair/Industrial tour etc. ➢ Comprehensive Exam: August 2023 (Minimum CGPA: 3.00 in 24 credit-hour coursework)	**Semester IV** ➢ Registration for PhD Research 799B ➢ Publication in HEC-recognized journal ➢ Oral/Poster presentation in a scientific gathering ➢ Six-monthly Progress Report (to be submitted at the end of the semester)	**Semester VI** ➢ Registration for PhD Research 799D ➢ Publication in HEC-recognized journal ➢ Six-monthly Progress Report (to be submitted at the end of the semester) ➢ PhD Research Seminar II ➢ (Pre-Defense Seminar) ➢ Aug 2025 ➢ Sep 2025: PhD Thesis submission for foreign evaluation ➢ Viva-Voce Exam (by External Evaluators) ➢ Notification by CoE/Registrar, FCCU ➢ Oral/Poster presentation in a scientific gathering

Semester	Total Courses × Credit Hours	Credit Hours (36)
Fall 2022 (4 courses)	4×3	12
Spring 2023 (4 courses)	4×3	12

Course Descriptions:

CHEM 703: Quality Assurance in Research (3 Credits)
Definitions and terminology, accreditation, scope, and specification of analytical requirements; analytical strategy; non-routine analysis; sample handling and preparation; quality assurance and quality control in chemistry research, issues related to environment, equipment, reagents, traceability, measurement uncertainty, methods/procedures for calibrations, method validation, and reference materials.

CHEM 704: Kinetics of Electron Transfer Reactions (3 Credits) – 48th AC
This course is designed as a specialized course for PhD students in the field of physical chemistry to enable students to develop a better understanding of underlying principles and mechanisms underlying electron transfer reactions.

CHEM 705: Characterization of Coordination Complexes (3 Credits)
Elemental analysis, use of ChemSketc and ChemDraw software; structural elucidation, vibrational /rotational spectroscopy, electronic spectroscopy, circular dichroism, nuclear magnetic resonance, determination of magnetic susceptibility, electron spin resonance; determination of ionic charge on metal ions; crystallography.

CHEM 706: Advanced Drug Delivery Systems (3 Credits)
This course will focus on the principle of designing advanced drug delivery system, their characterization, mechanism of drug release and route of administration. Advanced drug delivery approaches will be explored details focusing on biodegradable drug delivery systems, polymers used in drug delivery systems, hydrogels, micelle, liposomes, dendrites, solid lipid nanoparticles, carbon nanotubes, nanoemulsion and microspheres other novel drug delivery systems.

CHEM 707: Drug Regulations & Drug Information Systems (3 Credits)
This course is aimed develop an understanding of the origin, structures, impact and relevance of the law in place to regulate the manufacture and distribution of drugs, pharmaceuticals and medical devices. Emphasis will be placed on the understanding of the purpose of the laws and their applicability to drug manufacturing and sale. The regulatory aspects related to drug discovery & development will also be covered. Salient features required to develop and manage a drug of a drug information system will included.

CHEM 708: Advanced Pharmacokinetics and Pharmacodynamics (3 Credits)
This course focuses on pharmacokinetic, pharmacodynamics and pharmacogenomics characterization of drugs in living systems using a physiologically based conceptual approach. The course contents will cover physiology based pharmacokinetic model, biopharmaceutics, non-compartmental pharmacokinetic, pharmacodynamics models, pharmacogenomics, computer simulations for these topics.

CHEM 745: Medicinal Chemistry (3 Credits)
Principles of drug design, nature and types of drug molecules, drug-receptors interactions, biochemical aspects of drug designing, new approaches to drug designing and drug delivery, categories of different drugs and mechanism of their action.

CHEM 746: Advances in Natural Products (3 Credits)
Recent advances in chemistry of natural products, alkaloids, terpenoids and flavonoids, and their application in various fields such as medicine, food and agriculture; antioxidant, anti-

enzymatic and antimicrobial properties; advances in isolation techniques, structural elucidation, structure-activity relationship (SAR) and derivatization.

CHEM 762: Computational Chemistry (3 Credits)
Background, concepts and applications; different computational programs and their application to predict molecular structures, mechanisms, and structure to activity relationship; role of computational chemistry in drug discovery and other fields.

CHEM 763: Electroanalytical Techniques (3 Credits)
Controlled potential techniques, chronoamperometry, polarography, pulse voltammetry, AC voltammetry, stripping analysis, flow analysis, electrochemical sensors.

CHEM 798: PhD Research Seminar (Non-credit course)
This is a non-taught mendatory course offered to the PhD chemistry students who have met PhD coursework requirement and qualified the PhD Comprehensive Exam. It aims at providing technical guidance to PhD students in writing and defending PhD synopsis and dissertations, and polishing their presentation and communication skills to enable them to defend their research work at any scientific forum. The course consists of two seminars (Research Seminar I & Research Seminar II), one prior to the submission of PhD research synopsis to BAS&R and the other before the submission of PhD thesis for foreign evaluation.

RESEARCH WORK:
CHEM 799: Research Thesis (12 Credits)
After the successful completion of the course work and other requirements, a PhD scholar will conduct research under the supervision of a faculty member (who is an HEC approved PhD supervisor), and thereafter write, based on his/her research, a research thesis and submit it to the Department for evaluation. At least one research paper based on the research work has to be published in an HEC approved journal.

PhD
English
Literature

In 1835, Lord Macaulay planted a seed of English Language and Literature in the subcontinent. Forman Christian College was among the very first institutions in the Punjab which readily nurtured this non-native plant in its idyllic courtyard. This seed, over the years has developed into a full- grown shady tree. It was natural. Being a Mission School, Forman Christian absorbed and developed English Language and Literature inherently and easily. Since 1901, FCCU has successfully been holding English MA classes, whereas, the University of the Punjab started it in 1932. Ours is the first institution which opened its doors on the women students heralding the traditions of coeducation – a rarity. All kudos to our staff, teachers and incomparable scholars like Dr HC Velte, Dr FM Velte, Rev HD Griswold, Dr EJ Sinclair and Dr SL Sheets who worked tirelessly to make it a success.

Even today, English Department of FCCU is peerless in many ways. Many MPhils apart, on our roll are seven permanent Doctorate faculty members, five of them are foreign qualified. Since 2014, the Department has very successfully been holding MPhil classes, where the most serious, advanced and all-inclusive research in English literature is being conducted. We design and teach most modern courses, which are sometimes not even heard of in this part of the World. Some of these are: Postmodern Fictions, Narratology in Narrative Poetry, Ecocriticism and Pastoral Tradition, Literature and Human Rights, American Modernist Poetry and Poetics, Evil and Violence in Post-World War II Literature and lot other. We have the best facilities in the town. That is why, it is high time to introduce PhD at FCCU.

The PhD program at FCCU will be distinct because of its special focus on literatures and languages of minorities. Following a global trend in literary studies, our department takes pride in representing the under-represented cultures, ethnicities, viewpoints and traditions. Our goal is to instill critical and theoretical sensibility in our students so that they could read and analyze minorities' related works of their choice, from across the globe and through six centuries of literatures in English.

FCCU has been trailblazer in many ways, especially in teaching of English Language and Literature. But, it seems that many "common institutions" are cutting our heels by taking prior initiatives. In addition to the prestigious institutions like the University of the Punjab and the Government College, there are common far younger and less-privileged institutions like UMT, Government College, Faisalabad, Iqra University, Islamabad which are already running PhD English Program successfully. If they can, why cannot we? The faculty of English department is quite confident that PhD Program will be great success and service to the society and country. I, as the Chair of the department, am optimistic that we as a Department will make it a dream realized.

Admission policy:
I. For admission into the PhD, minimum CGPA 3.0 in BS/MPhil (out of 4.0 in the Semester System) is required.
II. A subject test conducted by the National Testing Service (NTS) or ETS, USA in the area of specialization chosen at the PhD level must be cleared prior to admission for the PhD Program.
III. There will be an entry test.
IV. Those candidates who qualify the written test will be called for the interview.
V. The admission will be on merit. The merit will be based on the score of entry test, interview, and the credentials.

Road Map:
First semester: One core course and two elective courses (3 credit hours each=9 credit

hours)

Second semester: One core course and two elective courses (3 credit hours each=9 credit hours)

After completion of 18 credit hours, there will be a comprehensive test. Students must qualify it to be eligible to write PhD Dissertation. PhD Dissertation is of 12/18 credit hours.

Courses
ENGL 701: Modern Poetry and Poetics (3 credits)
Course Description:
This course aims to discuss in the context of modernist literature a wide selection of poems by some of the major American poets of the first half of the 20th century exploring in depth how they have contributed by their individual styles to modernist poetry and modernist theory in general. Almost all of the poets whose poems are going to be under scrutiny are also well-known theoreticians and practitioners of modernist literature. Therefore, critical writings of these poets that expose connections with other literary movements and philosophical sources are also going to be a crucial part of the discussions on modernist poetry and poetics.

The main goal of this course can be summarized as to shed light onto modernist literature, in perhaps its both formative and prime years, with a special focus on poetry and poetics of the prominent American poets of that era. As the subject requires comparison of different poems and poetic styles under the umbrella theme modernist poetry, the course will be done in a comparative manner. The poets and the primary sources that are going to be used are listed below in the chronological order.

ENGL 702: Narratology in Literature
Course Description:
Storytelling and construction of narratives is central to the way human beings think and make sense of the world. The term 'narrative' itself has been much used and abused and a consensus on a definition and the nature of narrative remains elusive. Even so, the theory of the narrative, or narratology, has become an important area of study for the last few decades as both the narrative and the narrative structure influence our perception and the ultimate creation of meaning.

Narrative poetry relates a series of events through the use of the voices of a narrator and specific characters. Similar to the construction of a short story or novel, narrative poetry usually contains the elements of plot, character, conflict and setting. Although the narratological approach has been widely applied to novels and short stories, poetry has remained out of its area of interest. This course explores narrative poetry from the narratological point of view and how narrative voice impacts the narrative as a whole.

ENGL 703: Violence and Trauma in Contemporary Literature
Course Description:
This course examines the time period covering post-World War II to Post- 9/11 anglophone literature in the light of modern theories on violence and evil. The atrocities and horrors

witnessed all over the world since WWII have found voice in various forms of literature. The goal of this course is to analyze psychological and socio-political theories dealing with the nature and origins of human aggression, violence and evil in order to open up various literary genres based on these themes. The texts to be studied span the seven decades since the 1950s.

ENGL 704: Ecocriticism and Pastoral Tradition
Course Description:
This course provides students a trans-historical look at the pastoral tradition and it looks into the ways in which earth and its natural elements are exploited politically and economically with reference to pastoral texts in terms of both form and content, reading in the context of ecocritical theory. However, our primary focus will be the analysis of pastoral literature from diverse perspectives, including political and economic. The course will refresh the participants' general interests in the pastoral tradition in the Euro-American canon.

ENGL 705: Application of Modern and Contemporary Literary Theory
Course Description:
This course aims to provide main trends of critical literary theory, with an emphasis on major schools of thought in twentieth- and twenty-first century literary criticism and theory, ranging from Russian formalism to recent developments in disability studies and ecocriticism. The developments in and interconnections among various schools of thought, including Marxism and new historicism, post structuralism and narrative theory, feminism and queer theory, aesthetic and cognitive approaches etc. is the main emphasis of this course. It provides not only an insight into various critical theories but also the training to students in different aspects of contemporary literary criticism and literary and cultural theory. Students will be facilitated in developing a critical and methodological framework, and in pursuing their interests relating to literary and cultural production alongside their individual research projects. Within a particular, but broad theoretical framework, they will be able to study particular areas in depth or explore topics broadly relevant to their prospective research. They will be able to construct an individual program tailored to their research interests, in close consultation with an advisor who can be their dissertation supervisor. In fact, this course is designed in such a way to provide profound insight into literary criticism and theory that in turn will provide a gateway to a wide range of different research areas, including areas that are historically based.

ENGL 706: Literature and Human Rights
Course Description:
With the increase in human rights violation and refugee problems, discourses on human rights violations and displacement as well as survival have established themselves as new canon in the last few decades. Such discourses draw readers' attention to a possibility of "becoming" – to quote from *Slaughter* – by telling success stories of victimized people and enhancing similar plots. This interdisciplinary study explores the relationship between human rights and literature and analyzes how Western humanitarianism functions to cater to the Western reader, in particular, and humanity in general. Moreover, this course also debates the role of literature and storytelling in exposing, reconciliating, and making the world realize the gravity and heinousness of the problems. In this course, we will examine

selected literary works from world literature from a variety of genres (memoirs, poems, novels, testimony, plays, and short stories) and discuss theoretical works.

ENGL 707: Critical Gender Studies
Course Description:
Feminist and Gender Studies examines how societies organize gender roles, relations, and identities, and how these intersect with other hierarchies of power, such as class, race, nationality, ethnicity, sexuality, disability and age. The curriculum of Feminist Literature is designed to facilitate the production of new knowledge clustered around a larger issue or problem that is epistemological, Methodological, and conceptual in nature. This course explores both the theoretical and empirical issues relating to female identity in the context of social, political, Economic and cultural milieu.

ENGL 708: Postmodern Literary Genres
Course Description:
This course will examine postmodern fictions written in a period beginning in the 1960's continuing to the present. We could also call such texts as 'metafictions'–that is, texts which foreground, even insist on their textual status. We will examine how experimental novels lay bare their own fictionality, challenge our traditional reading strategies, and also blur boundaries between storytelling and truth telling.

ENGL 709: Polyphony and Intertextuality in Modern and Contemporary Fiction
Course Description:
The course focuses on novels written in English spanning from the 1920s till date in terms of their polyphonic structure and their intertextuality. The theoretical framework is constituted mainly by, but by no means limited to, Mikhail Bakhtin's, Roland Barthes's, and Julia Kristeva's works on heteroglossia, dialogism, and intertextuality, and Linda Hutcheon and Patricia Waugh's works on self-reflexivity and metafiction. The course aims to demonstrate different ways in which these concepts and strategies emerge in the novels in question as a means of resistance to or subversion of monological and hierarchical discourses on narrative, history and subjectivity.

PhD
Public Policy

The purpose of the PhD in Public Policy is to create a generation of scholars and professionals that are equipped to deal with some of the most crucial problems confronting Pakistan and the world today. By combining elements of a traditional graduate education in social sciences, particularly political science, sociology and economics, with a significant component of training in policy sciences and information technology, the program's graduates will be uniquely situated to undertake serious research and policy assessments with the goal of contributing towards formulation, interpretation and implementation of public policies. The program includes a set of rigorous core requirements, but also provides students with the flexibility to pursue in depth research in a broad variety of critical policy issue areas.

Admission requirement

For admission into the PhD programme a minimum CGPA equivalent to 3.0 or First Division (in the Annual System) in MPhil /M.S (with research)/equivalent as prescribed by HEC criteria in any area related to physical, social sciences and humanities is required. Candidate must pass the admission test and also submit a research proposal of 1500-2000 words.

Public Policy Subject Test

Students seeking admission in the PhD programme shall appear for an entrance subject test. The test will be conducted by the University Committee consisting of the PhD faculty and be at par with the GRE Subject Test. The qualifying score for this test will be 70%. Alternatively, the candidate may submit GRE subject score along with the application. A 60% score in GRE subject test is required for admission.

Total credit hours

The student is required to successfully complete a minimum of 30 credit hours for the degree. The details are as follows:

Course Work

Course work of 18 credit hours is required to be completed during the first year. A student may be enrolled, on the recommendation of the supervisor, in an MPhil course, which he/she has not taken earlier, that will be counted as part of the PhD credit requirements.

A PhD student may apply for credit hour transfers of PhD courses after proper permission by the DPC. The credit transfers may only be allowed from an HEC recognized University.

Comprehensive Examination

A comprehensive examination is a mandatory requirement for doctoral candidates as per the HEC guidelines. Students are not permitted to take comprehensive examinations for the PhD Public Policy until they have completed all required PhD core courses. The comprehensive exam will be based on the latest developments in the public policy field.

After passing of comprehensive examination, the student will present his/her PhD proposal before the DPC. Both the passing of the comprehensive exam and the approval of the PhD research proposal by the DPC are required for the grant of doctoral candidacy status to the student.

A student that fails twice in the comprehensive examination will not be allowed to continue in the PhD program.

PhD Dissertation

After the successful completion of course work students are required to register for 12 credits of research/dissertation work. The PhD dissertation may be inter-disciplinary, cutting across social science disciplines while focusing on a theme of Public Policy/Public Administration and Governance. The social science research may be informed by an understanding of politico-strategic dynamics and socio-cultural constraints and opportunities influencing policymaking and economic development.

CORE COURSES

700: Public Policy: Theories and Analysis

Public policy is in a new and exciting phase of its journey. New schools of public policy are opening, a testament to the fact that public policy is recognized as a separate discipline. New journals are also being published and it is difficult to keep up with all the recent developments.

Although political science and sociology still form the basis of the understanding of public policy, during the last two decades, public policy scholars have come up with theoretical models and frameworks that help one appreciate the "wicked" processes of policy formation and change at a deeper level. This course is a broad overview of the theories of policy process. We will discuss all the major public policy theories and learn to do policy analysis.

701: Public Policy, Politics and Society in Pakistan

The aim of this course is to provide participants with a clear understanding of the key issues confronting Pakistani society. Historical narratives will be discussed in an attempt to evaluate the current socioeconomic, political and cultural challenges Pakistan faces. Interdisciplinary readings will help students to evaluate the Pakistani scenario in parallel with other developing states with similar historical, cultural, social, economic and political settings. Some of these countries include India, Bangladesh, Malaysia and Turkey.

702: Technology and Public Policy

This doctoral course focuses on adoption of technological innovations by governments. The students participating in this seminar style course would discuss novel interventions that have brought technological reforms in governments around the world. Student would learn about actual web-based and android applications that governments around the world have adopted.

Moreover, in this course, various developments that link public policies with information and communication technologies (ICTs) will be studied as case studies such as software modules that Government of Punjab and Pakistan have developed in recent years to enhance the effectiveness of their service delivery.

703: Human Development

Human development was once a topic discussed only by doctors, psychologists and psychiatrists. It was concerned with the development of human abilities, from birth to old

age.

During the last three decades, human development index has become widely accepted and is quoted, along with GDP per capita and GDP growth, as a measure of national growth and development. The erstwhile Millennium Development Goals (MDGs) and now the Sustainable Development Goals (SDGs) have further increased the emphasis on human development.

This course is a broad overview of the concept, practice and measurement of human development. The last part focuses on human development in Pakistan.

704: Political Economy and Public Budgeting

This course is intended to equip students with knowledge of key theorists in the realm of political economy. Apart from being a theoretical course, it also develops administrative capabilities among the participants by allowing them to study and propose cuts to national and provincial budgets. The course would start by providing an overview of the way monetary and fiscal policies works in Pakistan and then would dig deeper into country's fiscal administration by studying Pakistan's revenue receipts and planned expenditures. Prior to delving into specifics, these students would be exposed to the works of key theorists such as Stiglitz, Rodrik and Evans, who have significantly contributed to the development of the academic discipline of Political Economy.

705: Research Methodology

This course will get students ready for doing their doctoral thesis research. They will be asked to come up with real world research problems that they find interesting and plan research for better understanding or finding solutions for these problems. They will be asked to prepare research designs and do literature reviews. Ethical issues that bedevil social science researchers will also be discussed.

706: Population and Security

This course explores the link between population dynamics and security challenges. It addresses how best to manage large ethnically, linguistically and culturally heterogeneous communities. Participants will learn about the best practices to manage/end conflict and promote peace.

ELECTIVE COURSES

720: Education & Development in the Muslim World

This course examines the intersection of education and development in the Muslim world. Countries of the Muslim world today stretch across hugely diverse geographical and cultural regions including Africa, the Middle East, Central Asia, South Asia, and Southeast Asia. The course will primarily make a survey of education and development in the Middle East, South Asia and Central Asia.

721: China, Iran, Afghanistan and Pakistan: Changing dynamics of religion, politics, security and great power interactions

This course aims to contribute towards re-conceptualizing 'area studies', as the existing frameworks of South Asia, Central Asia and Middle East are becoming increasingly

amorphous. It focuses on drawing attention to the geo-strategic significance of Iran, Afghanistan and Pakistan, providing an overview of their contemporary history, culture and politics. Based on this understanding, we shall analyze how domestic factors influence the security, foreign policy concerns, and the goals of these three states. The course will provide a rigorous analysis of how Iran, Afghanistan, and Pakistan collaborate and compete to pursue their national interests. In light of the pursuit of these goals, we will examine how these policy choices have evolved over the years and are affected by the regional powers—particularly China.

722: Urban Sprawl and the Future of Cities

This course looks at the challenges to urban development in Pakistan (broadly South Asia) and what policy options can be explored to overcome them. Special attention will be paid to the implications on governance and public service delivery. Core-periphery dynamics and the consequences for rural development will also be touched on. Examples of best practices from other similar countries will be analyzed and discussed.

723: Internal Migration and its Impact on Pakistani Society

It is imperative to develop an understanding of the migration patterns and it impacts on the wider society. This course addresses various questions with respect to internal migration such as what are the primary reasons for the internal migration in Pakistan and how the people and the governmental institutions respond to such large-scale migration. Other questions that will be addressed are what will be the impact of such migration on the infrastructure, resource base and governance capacity of the urban centres and how will migration impact rural areas, their economies and socio-cultural settings.

724: The Informal City

The course will explore how modern cities really functions under the veneer of formal policies and systems which may be considered an adhoc construction of different knowledges, practices and institutions with little internal consistency. For instance, it will explore how street vendors or xinchi rickshaw drivers ply their trade when they are considered illegal according to municipal laws. The course will aim to re-theorize the urban and urbanization as a process by assessing whether policies undermine or substantialize the livelihoods of expanding urban populations. By transcending the binaries of powerful-exploited, elite-excluded and formal-informal, it will explore localized systems of urban sustainability, concentrating on interwoven relations, services and networking needs, consumption practices, recycling and the impact on local ecologies.

725: Policy Choices for Informal Labour

The course will begin with the theoretical discussion on the relationship between formal and informal sectors and explore changes in academic thinking over the last few decades. It will explore the reasons for informal economic activity within the context of developing countries: from being a natural phenomenon based on social economy to an outcome of neo-liberal dispensation. Thus, putting the informal economy in context of black, illegal or sub-contracting economy as part of the global value chain.

726: Climate Change and Food Security

Climate change is real, yet its understanding, particularly in the developing countries, remains scanty. Therefore, its relationship and possible impact on population and food

security demands attention. Poor and rural populations are the most vulnerable to negative impacts of the climate change and food insecurity. The recent floods in Pakistan (2010 and 2014) had devastating impacts and yet the state were ill prepared for these calamities. Similarly, earthquake prone zones are identifiable and precautionary measures can be taken but few lessons were learned from the vast devastation in the wake of the 2005 earthquake. This course will focus on why, how and which climate change policies get approved and implemented and how they affect the people, particularly the poor, elderly and children.

727: International Politics of South Asia

South Asia historically has been impacted by the influence of countries in Central Asia, East Asia, Middle East and the Western world. Interaction between South Asia and these regions have determined the evolution of interstate relations and importantly, relations with the US, a global superpower. The course evaluates the linkages between domestic and international politics of South Asia and explores the effect of power rivalries and security concerns on countries like Pakistan, Afghanistan, India and Bangladesh. China's continual rise and perceived threat by the Unites States also has major impact on the international relations of South Asia.

728: Middle East Politics

This course will mostly focus on regional dynamics but will also focus on politics of important countries, such as Saudi Arabia, Egypt, Turkey and Iran. It will start with the collapse of Ottoman Empire and move to mandates, independence movements, creation of Israel, Arab nationalism, rise of political Islam and military strong-men, and finally to Arab Spring and its aftermath. National and regional dynamics will both be analyzed and interpreted.

729: Regional Economic Integration

This course is for students pursuing specialization in global politics or international relations. Building on international relations' school of liberalism, it intends to refine students' understanding of international agreements and projects that promise mutual development for two or more countries. International agreements such as Economic Cooperation Organization, South Asian Association for Regional Cooperation and China Pakistan Economic Corridor (CPEC), etc. would be discussed at length keeping in mind their economic costs and returns.

730: Religious Nationalism

In this course, we will first focus on nationalism and develop an understanding of the concept, power, and ubiquity of nationalism. After briefly discussing the increasing sacralization of politics, the theoretical underpinning of religious nationalism will be analyzed and it will be differentiated from ethnic, linguistic and civil/civic nationalism. We will also consider situations where religious and other forms of nationalism compete for the primary allegiance of people. The second part of the course will consist of five 'country' case studies. We will examine how religious nationalism rose to prominence in diverse countries utilizing disparate religious traditions. By the end of the course, students will have a better understanding of the phenomenon of religious nationalism, its successes and failures, as well as its promises and risks.

799: Research Thesis

An independent research study, which may be inter-disciplinary, cutting across social behavioral sciences disciplines while focusing on a theme of Public Policy/Public Administration and Governance. Theoretical rigor, innovation, and contribution in the field of public policy is of critical importance. The dissertation research may be informed by an understanding of politico-strategic dynamics and socio-cultural constraints and opportunities influencing policymaking and economic development.