



**FORMAN  
CHRISTIAN  
COLLEGE**  
(A CHARTERED UNIVERSITY)

**POSTGRADUATE  
DEGREE  
PROGRAMS** **2018-2019**

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# MESSAGE FROM THE RECTOR

Forman Christian College (A Chartered University) was founded in 1864 by Presbyterian missionaries. By the turn of the 20th century it had become recognized as a leading institution in the Indian subcontinent. Since August 1947 the University has served Pakistan with distinction. The number and quality of distinguished alumni of FCCU is rivaled by few universities in the world. Our graduates have leadership positions in government, business, education, various professions, religion and arts. FC College was established as a Chartered University by the Punjab Provincial Assembly in 2004.

In 2005, FCCU introduced the four-year BA/BSc Honors degree. In 2007, the first Postgraduate degrees were offered. Now it offers 14 MS/MPhil and other Postgraduate degrees as well as 3 PhD programs.

FCCU is a private and not-for-profit institution. The standards and traditions that have made the University in history are being upheld and even enhanced today. We strive to provide a truly outstanding educational program taught by well-qualified faculty that cares about students and can lead them in research. The University also provides strong co-curricular programs in order to enable students to not only enjoy themselves but be able to learn outside the classroom. Often students find that the values and habits that they learned while participating in such activities were important developmental steps for them for success later in life.

Forman Christian College (A Chartered University) is situated on 108 beautiful acres on Canal Bank Road in Lahore. Its facilities and labs are up to the latest standard. There is secure, high quality housing available on campus for female Postgraduate students.

We eagerly look forward to welcoming new Postgraduate students who will enroll in FCCU and become leaders and academics of Pakistan in the years to come.

**Dr James A Tebbe**  
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 Wheelless 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 four-year Baccalaureate (Honors) program designed in accordance with world-class 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**

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

Forman Christian College (A Chartered University) 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 Affairs coordinates and promotes activities of all the student societies; almost every academic department has a student society. Each society plans and conducts programs during the year that enrich the learning experiences of students and provide opportunities for student leadership.

Currently following societies are functional:

Armacost Psychological Society	Forman Sociological Society
Art Junction	Forman Sports Society
Bazm-e-Fikr-o-Nazar	Forman Statistics Society
Benade Physics Society	Formanites Computing Society
Character Building Society	Formanites Education Society
Christian Life Program	Formanites Journalism Society
Dean Geography Society	Griswold History Society
Earth Watch Society	International Affairs Society
Ewing English Society	Islamic Society
FCC ACM Chapter	Leadership Forum
Forman Biological Society	Lucas Economics Society
Forman Dramatics Society	Philosophy Society
Forman Model United Nations Society	Red Crescent Youth Group
Forman Music Society	Rotaract Club
Forman Pharmaceutical Society	Speers Chemical Society
Forman Photographic Society	Undergraduate Mathematics Society
Forman Political Science Society	Women's Empowerment Society

## Religious Life

As a University, we are concerned with teaching values and building strong positive character traits 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 regular Chapel programs, we offer regular Bible study groups and opportunities for volunteer service. No classes are scheduled on Friday during Juma or Chapel time.

## Sports

FCCU has a College Sports Board that organizes, promotes and conducts games. The Sports Board features a very active intramural sports program with competition in athletics, basketball, cricket, football, hockey, table tennis, wrestling, lawn tennis and swimming. Participation in intervarsity competitions in many of these sports is part of the sports program.

## 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

The University offers emergency first response services through the Mercy Health Center, an on-campus facility equipped for the routine medical needs of the on-campus residents, day scholars, faculty and staff and has an on-going relationship with the nearby United Christian Hospital for cases that require specialized attention.

## 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 University Counseling Center, located in the Mercy Health Center, is a facility to help students deal with problems which they may not want to discuss with family, friends or their teachers. The Center provides individual and confidential counseling and may refer students to other professionals, if needed. The Center does not deal with issues related to academic advising, but with personal and emotional issues that students face in their lives.

## 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 every 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
- Behavior that disrupts the normal flow of academic work or co-curricular activities is prohibited
- Destruction, defacement or damage caused to University property shall be severely dealt with

The following are strictly forbidden on the University campus:

- Possession or use of alcoholic beverages or drugs. This includes cigarettes and electronic cigarettes or vapes
- Weapons of any kind

## 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 Affairs 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](http://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 Aid page 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 graduate or 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
- 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 not courses that are required to be eligible for admission (Such courses should be taken before admission is awarded)
- These are undergraduate courses that are required (by the instructor/supervisor) to be taken by the student to overcome any deficiency in their understanding of the current course
- Deficiency course enrollment needs approval of the respective Chairs and Postgraduate Dean and are charged at the current undergraduate tuition credit rate
- These undergraduate courses appear as Audit Courses (AU) on the transcript and are pass/fail only. The undergraduate credits earned appear on the transcript but not included in the calculation of the graduate program's GPA/CGPA

## 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 2.50/4.00 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 2.75/4.00 during coursework is placed on probation. Students must have a CGPA of 2.75 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 2.75 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 synopsis

or 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**

At FCCU, admission to PhD program is offered in the research areas which are preferably supported through research projects, and in which faculty research groups are currently engaged. Admission will be made by the Department. Students must have a GPA of 3.0 or 70% marks in MS/MPhil or equivalent and they must show evidence of research aptitude. Departments may also impose extra admission requirements in order to admit strong candidates who are likely to complete the program. Admissions in PhD programs continue throughout the year.

### **Coursework**

There will be a minimum of 18 credit hours of coursework preferably during the first year. Students must maintain a GPA of 2.75 in coursework. A student

with a CGPA of below 2.75 during coursework is placed on probation. There will also be a departmental Comprehensive Exam at the end of the coursework.

### **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. After the PhD proposal is approved, the time limit for completion is 4 years. Approval from the Rector must be sought to exceed this limit. Minimum duration of PhD program is 3 years.

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.

## **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.

## Transfer Credit

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.

## 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.

## Admission requirement for all Transfer Students

Any student applying for transfer must:

- Present official transcripts of the previous university
- Present current accreditation status of the university where coursework was done
- Be in overall good academic standing with a CGPA of 2.0 or above
- Meet all other criteria of admission as established by the Admissions Office

- In the event that any of the criteria are falsified or not disclosed appropriately, admission is liable to be cancelled

### **Course Credit that is Acceptable for Transfer**

- An official request for transfer of credits takes place through:
  - The Admissions Office prior to a new admission
  - The Academic Services Office for students going on approved student exchange programs during their course of study at FCCU
- An official transcript is required for all transfer credits to be published on the FCCU transcript
- The transfer courses must come from an accredited institution
- The courses must be appropriate for FCCU's Degree Requirements
- The grade for each course must be a "C" or better to be accepted by FCCU
- The Chairperson of an individual department determines how transfer credits count toward the fulfilment of FCCU's Degree requirements

### **Course Credit that is Unacceptable for Transfer**

Transfer of credit based on the following is unacceptable:

- Applicants that have previously withdrawn officially from FCCU
- Applicants that have been previously released for academic, or disciplinary measures, including dismissals based on Academic Probation
- Unapproved study at another institution while an active student at FCCU
- Unapproved simultaneous enrolment at two institutions (one being FCCU) in the same semester
- Distance learning programs that have not been properly approved prior to beginning
- Transfer credit request based on unofficial or photocopied transcripts
- Courses studied at non-accredited institutions

## **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.

### Business Holds

Students whose dues remain in arrears will be put on business holds. Students pre-registering for courses (usually in the previous semester) can lose those courses if fees for them are not paid by the last date of payment. This will happen before add/drop. 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 with Distinction
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.

The 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.
  - o Forms will not be given to the student requesting the grade change or department administrative staff
  - o Grade Change forms must not be stored in excess by instructors/ departments
- The grade change form must be filled completely:
  - o The reason for the change must be stated clearly
  - o The form must be signed and dated by the instructor.

- o 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
  - o Incompletes in regular courses (due to typing errors and miscalculations) will continue to be accepted by the Academic Services Office up to 8 weeks of the following semester
  - o Research should be awarded an “I” in the semester registered and changed within 3 years
  - o 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:
  - o Has been in good standing
  - o 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.

## 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, 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 expunged or 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.



# 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
- LCCI (Lahore Chamber of Commerce and Industry)
- BF Biosciences Ltd
- Pioneer Pakistan Seeds Ltd
- Waste Busters, Lahore
- Chughtai Lahore Labs
- International Center for Theoretical Physics
- HBL Foundation
- Allama Iqbal Medical College (AIMC)/Jinnah Hospital
- FB Genetics

### ORIC Management Includes

- Dr Kauser Abdulla Malik, Director
- Haroon Samson, Senior Manager



# 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 graduates 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 will soon be initiating its PhD in Public Policy. 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 Centre (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

CPPG was established in 2007, and the year 2017 marked a decade since its inception. In the ten years of its existence, the Centre has made significant accomplishments in research, teaching, training and advocacy in the areas of governance, civil service reform, demography, urban policy, citizens engagement, youth electoral democracy, energy and conflict resolution and peace building, 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 on social issues among citizens, and elected public and non-elected public officials. Our effort is to expand the listening capacity of decision makers, in order to achieve tangible results in terms of 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 so that it contributes towards enhancing policy outcomes while promoting citizen ownership of these policies.

Thirdly, we plan to initiate short courses and certificates 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.

Given the launch of our MPhil program in 2014, the CPPG plans to launch its doctoral program in 2018 with the expectation that it can get recognition as a Centre of Excellence in research, teaching and training nationally, across the region and globally.

If you aim to pursue a degree in public policy and have a passion for public service, we encourage you to apply and join in any of the above programs that best fit your professional needs.

**Dr Saeed Shafqat**  
Professor and Founding Director CPPG

## 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, 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 2016-17 are as follows:

- “Bringing Science to Policy: Sustainable Water Reforms for Addressing Water Scarcity and Environmental Challenges” by Dr Akhtar Abbas
- “Liaqat Ali Khan: Jinnah’s Right-Hand Man” by Dr Roder D Long
- “Turkish Nationalism and Islam” by Dr Raja M Ali Saleem
- “From Millennium Development Goals (MDGs) to Sustainable Development Goals (SDGs): Change in Development Paradigm” by Suljuk Muntansar Tarar
- “The Image of ‘Muslim’ in Europe: A Century of Positive and Negative Stereotypes” by Slimane Zeghidour
- “Regional Organizations: The Good, The Troubled and the Irrelevant - Why Association of South East Asian Nations (ASEAN) thrives while South Asian Association of Regional Cooperation (SAARC) and African Union (AU) struggle” by Adnan Rasool
- Seminar on Civil Resistance hosted by CPPG in collaboration with the International Center on Non-Violent Conflict
- “Interpreting Tradition in Modern Islamic Thought: Comparing Turkey and Pakistan” by Dr Daniel Brown
- “Changing Dynamics of US-China Relations and its Impact on Pakistan” by Dr Miles Toder
- “Democratic Cultures: Insights from South Asia” by Dr Lucia Michelutti, Dr Paul Rollier, Dr Ashraf Hoque, Dr David Pucherit and Dr Arild Ruud
- “Climate Change, Nuclear Disarmament and Humane Global Governance” by Richard A Falk
- “Emerging Trends in US-Pakistan Relations” by Rizwan Saeed Sheikh

- “Confronting Religious Extremism in China’s New Silk Web” by Dr Charles Ramsey
- “China’s Rise: How is it Impacting the Gulf, Iran, Pakistan and Beyond?” by Dr Saeed Shafqat
- “Shari’atization of Islam in the Post-Secular World” by Dr Azmi Mohammad
- “Terrorism, Education and Development” by Dr Ummad Mazhar
- “Pakistan and Afghanistan under the Gaze of Incoming US President” by Dr Marvin Weinbaum

## 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 and 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 and 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:

- A program to Assist and Manage MPhil Research Grants for Peace and Conflict Studies, funded by United States Institute of Peace (USIP) - Ongoing 2016-2018
- A project to review, assess and improve the Social Welfare Department Punjab in context of the 18th Amendment by conducting an Institutional Assessment of the Department and undertaking comprehensive capacity-building exercises of the Department’s officials. Funded by the USAID Small Grants Program - Ongoing 2016-17
- 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

Executive Masters Public Policy is a one-year inter-disciplinary and analytical degree program in Public Policy. 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
- Skills-based curriculum that blends theoretical, skills specific and real life experiences into an integrated module
- 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:

- Four core courses (12 credits): CPPG 601, CPPG 602, CPPG 603, CPPG 604
- One Research Course (6 credits): CPPG 698
- Two skills courses (5 credits): CPPG 605, CPPG 606, CPPG 610, CPPG 611, CPPG 612
- Any 3 courses out of 1 concentration (9 credits):
  - o Governance, Democracy and Institution Building: CPPG 650, CPPG 651, CPPG 652, CPPG 653, CPPG 654, CPPG 655
  - o Environment, Demography and Urban Change: EDUC: CPPG 675, CPPG 676, CPPG 677, CPPG 678 and CPPG 679

## 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 and 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 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 their supervisors twice a month 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 that 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)**

*Prerequisite: 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.

### **Concentration Area Courses**

#### **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.

## **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 with regard to education, marriage, family, reproductive health, migration and human trafficking.

## **MPhil Public Policy**

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.

- Four core courses (12 credits) from: CPPG 615, CPPG 616, CPPG 617, CPPG 618, CPPG 619, CPPG 620, CPPG 621, CPPG 622
- Three from any of the listed concentrations as well as one additional course from a different group (12 credits)
  - o 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
  - o 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
  - o 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
- Research Thesis: CPPG 699 (6 credits)

## Course Descriptions

### **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 MPhil 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**

### **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.

**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: 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.

**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: Conflict Analysis and Resolution Strategies (3 credits)**

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.

**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: 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: 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 method

**CPPG 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; policies and interventions that can be applied to Pakistan's security environment.

## **Seminars, Training Workshops and Conferences**

CPPG has organized more than 100 seminars since 2007. Distinguished scholars, policy analysts, professional and practitioners of public policy are invited in them. 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:

- American Foreign Policy in the Age of Trump by Dr Farhat Haq
- Walking Around the World by Mr Paul Salopek
- An examination of Hidden Hazardous Child Labor in the Brick Kiln sector of Pakistan as a complex human rights issue by Dr Muhammad Vaqas Ali
- Walking for Maryam's Grace by Dr Paul Rollier
- Dynamics of Internal Security in Pakistan by Dr Syed Ejaz Hussain
- Management and Professional Development Department (MPDD): Purpose, Function and Structure of a Training Institution by Mr Nadeem Irshad Kiyani
- Female Friendships and Frictions Sexual Politics in 1960s Pakistani Cinema by Dr Kamran Asdar Ali

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. By combining elements of a traditional graduate education in social sciences, particularly political science and economics, with a significant component of training in the information technology and management sciences, the program graduates will be uniquely situated to undertake serious research and policy assessments in the domain of Public Policy. CPPG plans to start this program in Fall 2018 after receiving Higher Education Commission's approval.

## Digital Lab

FCCU 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.



# DEPARTMENT OF BIOLOGICAL SCIENCES

The Biological Sciences Department at FCCU was founded in 1870. Distinguished professors, including Dr Saithi, Dr Purio, Dr HK Bhatti and Dr KK Bell, have made significant contributions to the Department and the field of Biological Sciences. In recent years the Department has taken great strides forward.

At the undergraduate level, 4-year degree programs in Biology, Biotechnology and Environmental Sciences are being offered. In 2009, the MPhil Biotechnology program was launched. Following the success of the 4-year BS (Hons) Biotechnology program and the 2-year MPhil in Biotechnology, an important step forward was taken by launching MPhil programs in Food Safety and Quality Management and Molecular Pathology and Genomics as well as PhD in Biotechnology. 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 120 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.

### Conferences Organized

- 1st Iran-Pakistan International Training Workshop on “Probiotics: Research to Production” at FCCU, from March 27-29, 2017
- 2nd International Biotechnology Advisory Committee meeting of ISESCO at FCCU, from February 27-28, 2017
- Second International workshop on X-ray Crystallography, October 15 to 19, 2016, FCCU, Lahore
- Hosted workshop titled “Preparing Biological Laboratories for ISO35001 (CWA 15793) Laboratory Biorisk Management”. July 17 to 19, 2016, FCCU, Lahore
- International workshop on “Genomics and Genome Editing” on May 24 to 27, 2016 at FCCU, Lahore
- International Conference on Food Security and Nutrition from November 5-7, 2015 at FCCU
- One-day conference “Status of the Progress of Wheat Biotechnology in Pakistan” on October 2, 2015, at FCCU
- An information session about Alexander von Humboldt (AvH) Fellowships and awards and re-union of AvH Alumni, at FCCU, Lahore, Pakistan on 24 November, 2014
- International conference “Emerging Trends in Life Sciences” at FCCU, Lahore from 9-11 October, 2014
- Workshop “Lahore Biotech Cluster”, at FCCU, Lahore, on 18 August, 2014

- Workshop “Orientation Session on Molecular Quantitative Genetics” at FCCU, Lahore, Pakistan, on 27 January, 2014

## Competitive Research Grants Awarded

### A: Submitted

Dr Deeba Noreen Baig, “Clinicopathological and molecular characteristics of non-Hodgkin lymphoma in Pakistan; an oncogenomics approach for precision in medicine. Pakistan – United States Science and Technology Cooperation Program: Phase 7

### B: Ongoing

- Dr Aftab Bashir, Utilization of multi-transcription factor genes for enhancing wheat yield funded by PARC-ALP 2018-2021
- Dr Kausar A Malik “Development of a new herbicide trait and its transformation into wheat and cotton”, funded by PARB (2017-20)
- Dr Asma Maqbool “Development of Vitamin B6-Enriched Wheat “funded by HEC (2017-2020)
- Dr Kauser Malik “Enhancing fertilizer use efficiency in wheat by using transgenic approach”. Funded by ALP/PARC (2014-18)
- Dr Zaffar Mehmood, “Food grade shelf stable and surfactant free nano-emulsions as vehicle for bioactives to enhance their bioavailability”. Funded by HEC, 2017-2020
- Dr Kauser A Malik, “Microbial diversity and metagenomic analysis of rhizosphere of plants growing in extremely halophytic and xerophytic environments”. Funded by HEC, duration: 2016-2019
- Dr Samina Mehnaz, “Isolation and characterization of secondary metabolites produced by rhizobacteria and their potential as biocontrol agents”. Funded by HEC (2015-2017)
- Dr Aftab Bashir, “Transgenic approaches for the development of drought and salt tolerance in wheat”, Funded by CAS-UAF, PKR 5 million. Duration 2016-2019
- Dr Deeba Noreen Baig, “Resistance Management by Vegetative Insecticidal Protein (VIP) Based Biopesticide”. Funds 4.6 million. Funded by Pakistan Science Foundation. Duration: 2016-2018

## Other Research Activities

- More than 24 research seminars by invited speakers
- Faculty members and PhD students have presented their work nationally and internationally in USA, Belgium, Iran, Taiwan, Oman, Jordan, Thailand and Spain
- Department started two new MPhil programs in evening
- More than 50 BS and 60 MPhil students have completed their research

- Currently 10 PhD students are enrolled, among these three are fully funded by HEC, two are fully funded by industry (4B) and rest of them are funded through our research projects
- Two PhD students availed IRSIP and spent six months in Canada and USA for research work, funded by HEC

## MoU

- In order for Biotechnology faculty to provide advice on career planning, leading to job placement of students, FCCU signed a memorandum of understanding (MoU) with BF Biosciences Ltd to explore novel areas in health biotechnology. Researchers from the Department have teamed up with the technical team at BF Biosciences to establish new research projects. A pilot project is the establishment of a bioassay to determine the biological activity of recombinant erythropoietin (rhEPO), a compound manufactured by BF Biosciences and used to stimulate red blood cell production in anemic patients
- Another MoU was signed with Chughtai Lahore Labs to initiate MPhil Molecular Pathology, an industry and academia training program
- The Department also signed an MoU with PCSIR to offer MPhil in Food Safety and Quality Management for professionals. This is a cross-disciplinary program between the departments of Biological Sciences, Business and Chemistry at FCCU and Food Sciences PCSIR

## MPhil Biotechnology

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

### 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.

The last 2 semesters will be dedicated to research of 12 credit hours on a theme chosen by or in consultation with the research supervisor.

## Course Descriptions

### BIOT 502: Advanced Microbial Biotechnology (4 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; wastewater treatment, bioremediation, intellectual property regulations; biosafety rules and guidelines.

### **BIOT 503: Recombinant DNA Technology (4 credits)**

This course deals with introduction, history and tool of recombinant DNA technology, vectors: cloning vectors for higher plants, binary vectors, introduction of restriction sites for cloning, the Ri plasmid, promoters, gateway technology, transcription factors, microRNA, RNAi history, discovery and its use in plant improvement, inserting genes into eukaryotic cells, transfer of genes into the chloroplast genome, how to obtain a clone of a specific gene, use of marker gene, manipulating gene expression, analysis of transgenic plants, studying gene location, identification of control sequences by deletion analysis.

### **BIOT 504: Techniques in Biotechnology (4 credits)**

Isolation of DNA, RNA and protein, estimation techniques DNA, RNA and protein electrophoresis, spectrophotometer, mass spectrometry, chromatography, protein crystallization, molecular imaging, microscopy, PCR types and their its applications, techniques for gene identification, transformation, antibody protein detection, ELIZA, and SNP identification.

### **BIOT 505: Protein Design and Engineering (3 credits)**

This course will deal with protein structure, synthesis and posttranslational modifications; structure-function relationship, protein folding and chaperons; protein structural families; protein-protein interactions: molecular immunological, biochemical and physical techniques for studying protein-protein interaction; modeling and prediction of protein structure; protein design strategies: mutagenesis (site directed, random, error prone PCR); computational protein design, directed evolution, gene shuffling, incorporation of unnatural amino acids into proteins; methods of selection and screening for modified proteins; commercial applications antibody engineering.

### **BIOT 506: Biostatistics (3 credits)**

An introduction to applied biostatistics; provides an introduction to 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.

### **BIOT 511: Journal Club (1 credit)**

This 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 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 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, biobusiness, raising a company, marketing a product/service, financing new ventures, career development overview.

### **BIOT 608: Advances in Agriculture Biotechnology (4 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 nano-medicine, pharmacogenomics and predictive medicine, bioethics.

### **BIOT 611: Omics (3 credits)**

The course is divided into several parts covering the different areas of OMICS. The two major parts include genomics and proteomics. The genomics section covers the structural and functional genomics with an insight into reverse genetics. The proteomics section includes the massive scale technologies for protein identification. The other OMICS areas include transcriptomics, metagenomics, epigenomics and metabolomics. The topics covered include the technologies and developments in the given areas and their applications.

### **BIOT 699: Research (12 credits)**

Research project will be allotted to those students who have a minimum of 2.75 CGPA in coursework. They are supposed to get registered for two semesters to complete their research project.

### **BIOT 703: Non-Coding Genome (3 credits)**

This course will deal with introduction to RNA mediated silencing pathways and RNA biology, RNA mediated silencing in different compartments of the cell, role of arganoue 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.

## **MPhil Food Safety and Quality Management**

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.

This, combined with 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, the government of Punjab has recently enacted food laws to take into account food safety concerns of consumers. The rapidly expanding food industry is also aware of these laws. 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.

### **Requirements for the Program**

A total of 42 credit hours comprising:

- 30 credit hours of coursework in semesters I and II
- 12 credit hours of research work in the last two semesters

## **Course Descriptions**

### **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 503: Food Laws, Regulations and Auditing (3 credits)**

Punjab Food Safety and Standards 2017 and current regulations; PSQCA food rules, Codex Alimentarius Food Standards; their role in ensuing safety and

wholesomeness of food for consumer and export purposes; understanding importance of auditing with special reference to food safety.

**FSQM 504: Public Health and Nutrition (3 credits)**

Role of public health in overall healthcare system; understanding the importance of nutrition in relation to a healthy population in order to promote a healthier population; focus on prevention rather than treatment of diseases.

**FSQM 505: Safe Food Supply Chain Management (3 credits)**

Concept, principles, scope, applications and future of food supply chain management.

**FSQM 506: Research Methodology and Biostatistics (3 credits)**

Research methodology and biostatistics provides an introduction to 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 601: Food Labeling, Authenticity and Traceability (3 credits)**

Key issues and requirements of food labeling; understanding systems, laws, standards and guidelines to ensure food traceability and authenticity.

**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.

**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)**

To understand the global food security and safety situation, challenges and possible outcomes

### **FSQM 606: Advanced Analytical Techniques for Food Safety and Quality (3 credits)**

To understand key issues relating to food sampling and importance of sampling to ensure food safety; use of modern food analysis techniques for food safety, authenticity, quality and traceability.

### **FSQM 699: Research Thesis (12 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**

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 the kind of knowledge that is available to aspirants. This program provides training in the application and interpretation of advanced molecular technologies and their use in pathology and clinical diagnostics. This specialist training enables physicians, scientists and technologists to validate, use and develop molecular assays for improved management of patients.

As an evening program, MPhil Molecular Pathology and Genomics allows in-service professionals 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 provides clinical and practical expertise.

### **Requirements for the Program**

A total of 42 credit hours over 2 years distributed as: 14 credit hours (4 courses) in 1st semester; 16 credit hours in second semester; followed by 2 semesters of research of 12 credits.

### **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 505: Genetic Basis of Human Diseases (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 506: Research Methodology and Biostatistics (3 credits)**

Research methodology and biostatistics provides an introduction to 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**

### **MPGN 601: Molecular Diagnostics – Technologies and Instrumentation (3 credits)**

This course is a comprehensive introduction to the basic principles of the rapidly growing field of molecular diagnostics and therapeutics. Beginning with an overview of essentials and unique terminology, the course addresses many direct and amplified nucleic acid test methods. Specimen handling, and the clinical applications, advantages, and disadvantages of molecular diagnostics are also covered. Most importantly, the principles behind molecular diagnostics are presented in detail, giving you a strong foundation for future exploration and study in molecular diagnostics. Introduction, the use of ELISA, DNA hybridization, PCR, RAPD and DNA fingerprinting, bacterial biosensors, PCR/OLA, and restriction digest, in molecular diagnostics. Infectious agents and point mutations with prognostic significance will be used when discussing specific applications.

### **MPGN 602: Molecular Oncology (3 credits)**

Advances in knowledge of the biology of leukemias and lymphomas; genetic alterations contributing to development of these neoplasms; hematopathology; 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 such as breast and colon adenocarcinomas have opened a new and controversial arena of clinical assays for cancer predisposition assessment and response to treatment. 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.

### **MPGN 603: Cellular Signal Transduction (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; Mosaicism; imprinting; uniparental disomy; trinucleotide repeat disorders; expression of phenotypes; penetrance and variable expressivity; anticipation; genetic, allelic, and locus heterogeneity; quantitative genetics; population genetics; Hardy-Weinberg equilibrium; laws of probability; Bayesian analysis; linkage analysis.

### **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 605: Molecular Pathology (3 credits)**

Molecular pathology is an emerging discipline within pathology which is focused in 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. It encompasses the development of molecular and genetic approaches to the diagnosis and classification of human diseases, the design and validation of predictive biomarkers for treatment response and disease progression, the susceptibility of individuals of different genetic constitution to develop disorders.

### **MPGN 699: Research (12 credits)**

Students can join an ongoing project or work on an independent problem in close cooperation with a faculty member (Research Supervisor).

## **PhD Biotechnology**

After the success of the 4-year BS (Hons) Biotechnology program, followed by MPhil in Biotechnology, the Department of Biological Sciences has taken an important step forward by launching a PhD Biotechnology program. This has been made possible due to the highly qualified faculty which is also recognized by the HEC as PhD research supervisors. The Department has been able to win competitive research grants worth more than Rs 50 million for conducting goal-oriented research.

### **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:

#### **Coursework**

Coursework of 18 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 coursework students are required to register for 12 credits of research work

#### **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.

#### **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 PhD 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 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 PhD program. The Biological Sciences Department currently has 19 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: five years
- Students must register for courses during the first year
- The Comprehensive Exam will be conducted after completion of coursework. 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; how various genetic and molecular tools are used to perform mutant screening to study biological function; 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 and 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)**

Introduction and 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; orthomyxoviruses and influenza; control of viral disease by immunization; the herpes viruses.

### **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; the 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 799: Research (12 credits)**

After the successful completion of coursework 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).

### **BIOT 703: Non-Coding Genome (3 credits)**

This course will deal with introduction to RNA mediated silencing pathways and RNA biology, RNA mediated silencing in different compartments of the cell; role of arganoue 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.

### **Linkages**

The Department has developed linkages with the following institutions which allow FCCU students to get internships and develop research collaborations:

- Center of Excellence in Molecular Biology, Punjab University (CEMB)
- National Institute for Agriculture and Biology, Faisalabad (NIAB)
- National Institute for Biotechnology and Genetic Engineering, Faisalabad (NIBGE)
- Pakistan Council of Scientific & Industrial Research, Lahore
- School of Biological Sciences, University of Punjab (SBS)
- Shaukat Khanum Memorial Cancer Hospital & Research Center, Lahore (SKMCH&RC)
- University of Health Sciences, Lahore (UHS)
- University of Veterinary and Animal Sciences, Lahore (UVAS)
- Lahore University of Management Sciences, School of Science and Engineering, Lahore (SSE, LUMS)

### **Ongoing Research Projects**

The faculty and Postgraduate students are currently involved in the following research projects:

Sr#	Titles of Ongoing Research Projects	Principle Investigator	Funded by	Duration
3	Enhancing Fertilizer Use Efficiency in Wheat by using Transgenic Approach (Alp-Fue)	Dr Kauser A Malik	PARC/ALP	2014-2017
6	Development of Homozygous Lines of Transgenic Wheat and Screening for Phosphorus Use Efficiency (PSF-PUE)	Dr Asma Maqbool	Pakistan Science Foundation	2014-2016
8	Incidence of Leptin and Melanocortin 4 Receptor Gene Mutations and Metabolic Profile in Subjects with Early Onset Severe Obesity	Dr M Arslan	Pakistan Academy of Sciences	2015-2017
11	Isolation and Characterization of Secondary Metabolites Produced by Rhizobacteria and their Potential as Biocontrol Agents (HEC Secondary Metabolites)	Dr Samina Mehnaz	Higher Education Commission	2015-2017

Sr#	Research Projects Under Review	Principle Investigator	Funded by	Duration
1	Improvement in Cotton Staple Length Integrating Classical and Molecular Genetic Approaches	Dr Aftab Bashir	PARB	2015-2018
2	Overcoming the Wheat Yield Gap in Pakistan: Development of Drought and Salinity Tolerant Wheat	Dr. Kauser A Malik	HEC/US-Pak S&T Cooperation	2015-2018

3	Development of Dipstick for Detection of Bt (Cry1ac & Cry2ab) Proteins in Cotton	Dr Aftab Bashir	PSF	2015-2017
4	Development of a New Herbicide Trait and its Transformation into Chloroplasts	Dr M Imran	PARB	2015-2018

### Seminars and Workshops

#### *Seminar on Genetic Spectrum of Severely Obese Children from Pakistan*

A seminar was conducted on genetic spectrum of severely obese children in Pakistan. A visiting scholar from Imperial College, UK, discussed the genetics basis of severe obesity in Pakistan, particularly in children. She also talked about the collaborative project with Biological Sciences Department on severe obesity in children.

#### *Seminar on Fluorescent Cell Imager, ChemiDoc Touch imaging system and V3 Western Workflow*

A seminar was organized on Fluorescent Cell Imager, ChemiDoc Touch Imaging System and V3 Western Workflow. The seminar was conducted by BioRad expert about the qualities and principle involved in the above-mentioned high-tech instruments. Faculty and students attended the seminar and took interest in the discussion. The seminar was followed by a demonstration of instruments by the Bio-Rad team.



# DEPARTMENT OF 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 for varied HEC-funded schemes. They are meticulous teachers and active researchers. Two of them have recently received the Research Productivity Award for the year 2012 by Pakistan Council for Science and Technology.

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.

The Department has four dedicated teaching laboratories and six postgraduate research laboratories. The research and teaching instruments available include: Atomic Absorption Spectrophotometer (AAS), TGA-DSC Analyzer, CHNS/O Analyzer, Gas Chromatography-Mass Spectrometer (GC-MS), HPLC Equipment, Gas Chromatograph, FT-IR Spectrophotometer, UV-VIS Spectrophotometers, Digital Polarimeter, and Rotavapors.

### **Conferences and Workshops Organized by the Department of Chemistry**

- Three-day workshop on “Computational Chemistry”, January 7-9, 2014
- Two-day workshop on “Chemo-metrics and Chemical Data Handling Tools”, October 16-17, 2014
- Three-day international conference “Exploring New Avenues in Medicinal Chemistry: Opportunities and Challenges”, January 21-23,

2015

- Three-day workshop titled “Computational Chemistry Workshop: A New Approach to Understanding and Solving Chemical Problems”, January 20-22, 2016
- Three-day international conference “Current Research in Chemical and Pharmaceutical Sciences”, January 18-20, 2017
- Three-day international conference “Chemical and Pharmaceutical Sciences: Recent Approaches in Research and Applications”, January 17-19, 2018

### Research Projects

- 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
- 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
- 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
- Dr Muhammad Tariq Qamar (HEC) Start-up research grant of PKR 415,000, funded by HEC against concept paper titled Photocatalytic Efficacy of CeO<sub>2</sub>-based Materials for the Abatement of organic Toxins. (Year Awarded: 2017)
- 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

### Collaboration with Other Institutions

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, B&F Pharmaceutical Company, NovaMed Pharmaceuticals and Pharmagen Ltd., Lahore.

## MoU

The Department of Chemistry has signed MoUs with institutions like HEJ Research Institute of Chemistry, PCSIR Laboratories, B&F Pharmaceutical Company, and NovaMed Pharmaceutical Lt.

## MPhil Chemistry

MPhil Chemistry is a two-year, four-semester degree program. The first year, which comprises of two semesters, is dedicated to coursework, 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 statement 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: Coursework

Semester I: 4 courses of 3 credits each (total 12 credits) from the following: CHEM 525, CHEM 526, CHEM 542, CHEM 549, CHEM 566.

Semester II: 4 courses of 3 credits each (total 12 credits) from the following: CHEM 506, CHEM 520, CHEM 524, CHEM 529, CHEM 541, CHEM 563.

#### Year 2: Research Work

##### Semesters III & IV

2 seminars related to the research project (2 credit hours)

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 508: Chemistry of Nanomaterials (3 credits)**

Synthesis, properties, characterization and application of composite and nanomaterials. Nanoscale properties including electronic, optical and magnetic properties. Surface modification and assembling of nanoparticles. Different techniques used for characterization of nanomaterials such as scanning electron diffraction (SEM), dynamic light scattering (DLS) and UV-visible spectroscopy.

### **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  $\gamma$ -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 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 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

## PhD Chemistry

The Department of Chemistry 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. Equipments like GC-MS, AAS, CHNSO analyzer, FTIR, UV-Visible Spectrophotometer Cyclic Voltammetry, 60 MHz Benchtop NMR (1H, 13C, DEPT, COSY), Magnetic Susceptibility Balance, Digital Polarimeter, TGA/DSC, Plate Reader, Freeze Drier and HPLC, etc. are available. 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 synthesis, medicinal chemistry, colloidal chemistry, organometallics, modern materials and bioactivities among others.

### 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:

#### Coursework

Coursework of 18 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 coursework, students are required to register for 12 credits of research work.

### **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.

### **Plagiarism Test**

The Plagiarism Test 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, based on the research project, in an HEC-approved “X” category journal (or in an ISI-indexed impact factor carrying journal) is a requirement for the award of PhD degree.

### **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.

### **Program of Studies**

- Minimum period of completion: three years
- Maximum period of completion: five years
- Students must register for courses in each semester as per the University policy
- The Comprehensive Examination will be conducted after completion of coursework. 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 coursework prior to the formal beginning of his/her research work

## **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 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 and Drug Information Systems (3 credits)**

This course is aimed at developing an understanding of the origin, structures, impact and relevance of the law in place to regulate the manufacturing 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 and development will also be covered. Salient features required to develop and manage 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.

## **Research Work**

### **CHEM 799: Research Thesis (12 credits)**

After the successful completion of the coursework 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.

## **Research Projects**

The Pakistan Science Foundation, Islamabad, has provided funds for a research project aimed at the isolation of natural products from a medicinal plant of Pakistan and their chemical and biotechnological studies. The principal investigator of the project is Dr Dildar Ahmed, while Dr Kauser A Malik, distinguished Professor of Biotechnology, is the co-investigator. Two groups of students under their supervision are working on this project. This has been successfully completed. HEC Pakistan has funded a project entitled "Activity-guided isolation of bioactive chemical constituents from the medicinal plant *Carissa opaca*". Dr Dildar Ahmed is the principal investigator of the project. A number of our MPhil/PhD students are working on various aspects

of these projects. HEC (NRPU) Project “Synthesis of novel sulfonamide derivatives as inhibitors of ectonucleotidases” has recently been awarded to Dr Mariya al-Rashida (Principal Investigator) and Dr Jamshed Iqbal (Co-Principal Investigator, COMSATS, Abbottabad).

## Collaboration with Other Institutions

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, B&F Pharmaceutical Company, NovaMed Pharmaceuticals and Pharmagen Ltd., Lahore.



# DEPARTMENT OF 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'. The MS program is also approved by HEC. The Department is housed in the Armacost Science Building and has five 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.

## MS Computer Science

The MS 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 coursework 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 and 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-year Degree Program

In order to qualify for admissions application process, a candidate must fulfill at least one of the following four criteria:

- BS (CS/SE/IT) 4-year degree (min. 130 credit hours)
- Computer Science Conversion Course 2-years degree referred to as "MCS" or "MSc (CS/SE/IT)"
- 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:

- Academic record. As a minimum academic performance, all applicants must have maintained a CGPA of at least 2.5 (on a scale of 4) or at least 60% marks in all university-level degrees
- Performance in admission test conducted by the Department
- 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
- Undergraduate students of FCCU can also enroll for the graduate courses, provided they meet the prerequisites and get permission from Graduate Studies Committee of the Department. Credits earned in graduate courses will be counted towards their bachelor's degree requirements

## Program Structure

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

**Timing:** Evening

**Type:** Full time

### Specialization Tracks:

- Software Engineering
- Intelligent Systems
- Computational Imaging and Vision
- Information Sciences and Technology
- Data Science

## Distribution of Courses

A student will need to complete 30 credit hours of studies. These will be distributed as follows:

- 3 CS core courses of 3 credit hours each (Table 1)
- 5 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	COMP 501	Mathematical Methods for Computer Science	3
2	COMP 502	Advanced Algorithm Analysis	3
3	COMP 503	Advanced Theory of Computation	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	COMP 513	Advanced Software Engineering	3
	COMP 514	Software Quality Engineering	3
	COMP 515	Software Requirements Engineering	3
	COMP 516	Software Architecture	3
	COMP 518	Software Project Management	3
	COMP 519	Formal Method in Software Engineering	3
	COMP 522	Component-Based Software Engineering	3
	COMP 523	Model-Driven Software Development	3
	COMP 611	Software Evolution and Reengineering	3
	COMP 612	Software Engineering for Safety-Critical Systems	3
	COMP 617	Agent-Oriented Software Engineering	3
	COMP 620	Empirical Software Engineering	3
	COMP 621	Software Process Improvement	3

Computational Imaging and Vision	COMP 531	Digital Image Processing	3
	COMP 532	Advanced Computer Vision	3
	COMP 533	Advanced Topics in Computer Vision	3
	COMP 634	3D Computer Vision	3
	COMP 635	Computational Photography	3
	COMP 636	Biomedical Image Processing	3
Intelligent Systems	COMP 532	Advanced Computer Vision (cross-listed with Computational Vision and Imaging)	3
	COMP 551	Advanced Artificial Intelligence	3
	COMP 552	Advanced Machine Learning	3
	COMP 553	Soft Computing	3
	COMP 554	Natural Language Processing	3
	COMP 555	Fuzzy Systems	3
Data Science	COMP 561	Data Mining	3
	COMP 562	Data Warehousing	3
	COMP 566	Advanced Big Data Analytics	3
	COMP 663	Information Integration on the Web	3
	COMP 664	Information Retrieval and Web Search	3
	COMP 665	Data Visualization	3
Information Sciences and Technology	COMP 571	Semantic Web	3
	COMP 572	Human and Information Interaction	3
	COMP 573	Web Services	3
	COMP 574	e-Government	3
	COMP 575	Social Network Analysis	3
	COMP 576	Ubiquitous Information Interaction	3

Free CS Electives <sup>1</sup>	COMP 581/681	Selected Topics in Computer Science	3
	COMP 582	Network Performance Modeling and Evaluation	3
	COMP 583	Parallel and Distributed Computing	3
	COMP 584	Topics in Computer Networks	3
	COMP 585	Network Security	3
	COMP 586	Operations Research	3
	COMP 587	Research Methods in Computer Science	3
	COMP 588	Advanced Operating Systems	3
	COMP 589	Advanced Optimization Methods	3
	COMP 590	Advanced Database Systems	3
	COMP 591	Advanced Topics in Mobile and Wireless Networks	3

### Distribution of Credit Hours

Table 3. Distribution of Credits

Course Category	Credit Hours
Core	9
Electives	15
Thesis/Project	6
Total Credit Hours	30

### Semester-wise Plan

#### Semester 1

Sr No	Courses	Credit Hours
1	Core Course 1	3
2	Core Course 2	3
3	Core Course 3/Elective 1	3
		Total: 9

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

## Semester 2

Sr No	Courses	Credit Hours
1	Elective 1/Core Course 3	3
2	Elective 2	3
3	Elective 3	3
		Total: 9

## Semester 3

Sr No	Courses	Credit Hours
1	Thesis (partial registration)	3
2	Elective 4	3
3	Elective 5	3
		Total: 9

## Semester 4

Sr No	Courses	Credit Hours
1	Thesis (full registration)	3
2		Total: 3
		Total (all semesters) = 30

## Award of Degree

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

- Passed at least 30 credit hours of coursework, including 3 core courses and 5 elective courses
- Obtained a CGPA of at least 2.5

## Course Descriptions

### 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 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 and 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-oriented 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: COMP 501 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: COMP 501 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: COMP 532 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: COMP 532 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: COMP 531 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: COMP 531 Digital Image Processing, COMP 532 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: COMP 501 Mathematical Methods for Computer Science*

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: COMP 501 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: COMP 554 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: COMP 502 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: COMP 502 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 and 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 and 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 588: Advanced Operating Systems (3 credits)**

*Prerequisites: Operating Systems (undergraduate level; must cover the deficiency by studying with undergraduate class if not taken previously)*

Characterization of modern operating systems; file systems, memory management techniques, process scheduling and resource management, architectural models, inter-process communication, distributed systems, concurrency control coordination, replication, fault-tolerance, mobile and ubiquitous systems.

### **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 and Wireless 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.



# DEPARTMENT OF ECONOMICS

Established in 1915, the Department of Economics at Forman Christian College (A Chartered University) has long offered undergraduate and Postgraduate degree programs. 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. Currently, more than 400 Baccalaureate students are majoring in Economics and around 3,200 students attend Economics courses each year.

The Department of Economics is well-equipped with major academic needs such as lecture halls, seminar rooms, classrooms, meeting rooms, workshop rooms, a computer lab and faculty offices. It continues to meet challenges by updating and revising its curricula, introducing new programs and adding new scholars to teach contemporary courses.

## **MPhil Applied Economics**

The Department of Economics at FCCU has been offering MPhil program since 2009. The MPhil Economics program was started due to a dire need to offer quality education and training in Economics at postgraduate level. The Department has evolved over time, adding resources, introducing new and wider range of courses, upgrading curricula and adding new scholars to bring it at par with contemporary needs. Located in the purpose-built Social Sciences Building, it has facilities like well-equipped classrooms, library, lecture halls, computer labs and interactive smart classrooms and other research related aides.

The Department has been running the graduate program for almost a decade to provide quality education in the field of Economics by exposing its students to the depth of theoretical knowledge as well as the breadth of its 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, makes this Department immensely appealing and attractive, both for its undergraduate and graduate programs.

### **Department Vision**

The Department wants to develop responsible, ethical and fair leaders in Economics with a view to develop new ideas based on transparency in economic analysis and policies, and could serve humanity in general and Pakistani society in particular.

### **Department Mission**

The mission of the Department is to provide high quality education and

research exposure in the field of Economics to the students, with the aim to enhance their analytical abilities to solve economic problems faced by the society. The Department strives to cultivate an environment conducive for independent, critical and creative thinking, competitive as well as collaborative attitude of seeking knowledge and an ability of lifelong, self-directed independent learning.

### **Department Goals**

- To provide quality education to students with sound theoretical foundations and comprehensive quantitative training
- To prepare students with a core set of competencies in the field of Economics that offers them attractive credentials for a wide range of work settings
- To inculcate a strong sense of global awareness along with broad based familiarity with local conditions
- To groom students adhering to high ethical and moral values to help them become ethically responsible leaders and citizens
- To produce graduates that could effectively perform leadership roles in society

### **Research Culture**

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 professional pursuits. The true contribution of a university, however, is measured by its research contributions. Forman Journal of Economics is an HEC-recognized peer reviewed research publication of the Department since 2005 and one dozen issues of the journal have been published up till now. Effective trainings for student to use latest relevant softwares for research and scholarly lectures to inform and engage students on contemporary trends in the field of Economics are being held regularly at the Department.

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

The first national conference, held in 2017, was on the theme “Economy of Pakistan – Vulnerabilities and Opportunities” and was very well received. The second conference was held under the theme of “Growth, Governance and

Socio-Economic Gaps” on 10 May 2018 and was very well attended. The quality of papers presented at both the conferences; and attendance from academia, industry, research organizations and government departments was extremely satisfying and a source of inspiration for the conferences to be held in future.

### **Learning Objectives**

The programs are designed to cater for the growing demand for a good quality graduate program in the field of Economics. The specific learning objectives are:

- To ensure a sound foundation for advanced research in Economics
- To promote a solution-finding mindset that addresses contemporary economic problems
- To train students in line with academic standards and market expectations from the graduates of research based program in the field of Economics
- To inculcate an attitude of lifelong learning among the graduates entitling them to become future leaders and economic planners
- To develop creative and analytical thinking ability in the graduates of the program

### **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) with 48 credit hours in Economics and a minimum CGPA of 2.5
- 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**

- FATE score
- Interview score
- Past academic achievements

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

### **Note**

- Students who are waiting for results can apply provisionally but must submit a complete official transcript at the time of interview

- CGPA in the last degree will be counted towards past academic achievements
- Candidates who fail FATE are not eligible to appear in interview

### **Degree Requirements**

The students must meet following requirements for receiving the degree of MPhil Applied Economics

- Completion of coursework composed of core courses (18 credit hours) and elective courses (9 credit hours) with a minimum CGPA of 2.75 before starting the thesis stage
- Successful presentation and defense of a research proposal, on a topic of researcher's interest and contemporary significance, before the Departmental Graduate Program Committee (DGPC)
- The Department will seek the approval of Board of Advanced Studies and Research (BAS&R) for the title of research, name of the advisor on the basis of one page synopsis
- In case the research involves the use of unpublished primary data based on questionnaire, prior approval is mandatory from Internal Review Board (IRB)
- Satisfactory completion of 39 credit hours for the degree, comprising of coursework (27 credit hours) and thesis (12 credit hours) with a minimum overall CGPA of 2.5
- The thesis must be of publication-acceptable standards and must not be submitted for any other degree
- Successful thesis defense 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 on the basis of reasonable grounds for one year after approval from the head of Department and statutory bodies. The maximum time limit to graduate is four years
- Compliance with all other concerned rules and regulations of FCCU and HEC

### **Areas of Specialization**

There is a wide range of areas of specialization in the field of Economics. The Department, however, offers a limited range of specializations (elective courses) to the students that could promise them healthy prospects for future research in Economics. Following areas of specialization are currently being offered at the Department.

- Monetary Economics
- Development Economics
- Applied Economics
- International Economics

## Core Courses

Following five courses are being offered as core (compulsory) courses for the MPhil degree at coursework stage in the Department.

## Course Descriptions

### **ECON 501: Advanced Microeconomics (4 credits)**

Based on the model building approach. Students learn rigorous theoretical modeling and decision-making behavior of consumers and firms under certainty and uncertainty.

### **ECON 502: Advanced Macroeconomics (4 credits)**

Focuses on the economic behavior of different economic aggregates in an economy and its interaction with world economy. Evaluates different stabilization policies to dampen the fluctuations in economic activity including economic growth.

### **ECON 505: Applied Econometrics (4 credits)**

Trains students in theoretical and practical discourse of econometrics and provides them knowledge of issues regarding application of various estimation techniques under different sets of information and assumptions.

### **ECON 625: Advanced Econometric Techniques and Forecasting (3 credits)**

Focuses on advanced topics of econometrics that are useful to understand current published research literature and to develop research ability among students at graduate level. Students learn theoretical as well as application of advanced econometric techniques

### **ECON 655: Applied Economics (3 credits)**

Designed to teach model building based upon economics and econometrics. Build up quantitative research skills in students about computer software's on spreadsheet analysis and econometrics.

### **ECON 699: Research Thesis (12 credits)**

Each MPhil student will carry out research on an approved topic of personal interest and economic significance, under the guidance of an approved supervisor. The supervisor provides the necessary guidelines during the process of research. The student has to 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.



# DEPARTMENT OF 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 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.

### Program Structure

- Successful completion of coursework, seminars and thesis (30+6 = 36 credit hours). Our MPhil students complete 6x3=18 credit hours of core courses and 12 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:** A 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 – three semesters of coursework followed by one semester of thesis writing. Coursework includes core and elective courses.

### **Core Courses**

ENGL 501: Research Methods and Publishing (3 credits)

ENGL 510: Transcultural Literary Texts and Contexts (3 credits)

ENGL 511: Translation Studies: Theory and Practice (3 credits)

ENGL 520: Critical Theory and Praxis I: Society and Culture (3 credits)

ENGL 521: Critical Theory and Praxis II: Text and Language (3 credits)

ENGL 690: Special Research Seminar (3 credits)

**Semester 1:** 3 core courses of 3 credit hours each – total 9 credit hours  
ENGL 501, ENGL 520, ENGL 511

**Semester 2:** 3 core courses of 3 credit hours each – total 9 credit hours  
ENGL 521, ENGL 510, ENGL 690

**Semester 3:** 4 elective courses of 3 credit hours each – total 12 credit hours  
ENGL 515, ENGL 516, ENGL 525, ENGL 610, ENGL 615, ENGL 616, ENGL 617 and ENGL 618

**Semester 4:** Compulsory thesis (ENGL 699) and viva of 6 credit hours

**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 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 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: Society and Culture – Part 1 (3 credits)**

(Note: The course is divided into two major groups of theories due to the complex nature of the texts and availability of the time. The groups are not chronologically or historically formed but are based on the correlation and association of the critical theories investigated.)

Introducing a wide range of canonical 20th 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 521: Critical Theory and Praxis: Text and Language – Part 2 (3 credits)**

Reading a particular text; language construction and use to create ideologies within societies; theories including The New Criticism, Russian Formalism, Semiotics and Structuralism, Post-Structuralism, Frankfurt Critical School, deconstruction, and Reader-Response Theory; ability to develop critical and analytical sensitivity towards language and its manifestations within society; investigation of transfiguration and development of language across diverse historical and spatio-temporal frameworks.

### **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 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 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 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.



# DEPARTMENT OF ENVIRONMENTAL SCIENCES

Environmental Science is an interdisciplinary subject that draws upon the knowledge from the Biological, Physical, Earth and Social Sciences. Study of the subject gives one the opportunity to find out as to how, we as people, through our use of water, land and energy resources, are affecting our surroundings and the globe at large. Information is also gained about the actions that could be taken to reduce, control and, in some cases, reverse the damage caused by us to the environment. An MPhil degree in Environmental Sciences from FCCU would 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 doctoral studies or gainful employment, both locally and overseas, as world-wide demand for such professionals is growing, at an ever increasing rate.

The Department of Environmental Sciences has a well-qualified and highly experienced local and foreign faculty to impart high quality education in the subject and, more importantly, to effectively guide the students during their thesis research.

## **MPhil Environmental Sciences**

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

### **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.

### **MoU**

Title: Assessment and Field Testing of an Arsenic Removal Equipment developed by PHILoS, agreed between FCCU and PHILoS, Republic of Korea  
Date: 27 September 2018

### **Workshop**

Title: Membrane Bio-Reactor Research: The Pakistan Perspective  
Date: 10 May 2018

### **Research Grant**

Title: Environmental Sciences Project  
Date: November 2016  
Donor: Korean Peace Fund  
Amount: 1.3m/one time

Title: Empowering Environmental Sciences Students  
Date: February 2018  
Donor: Serve Korea  
Amount: 0.6m/year

Title: Development of Biofouling Control Technique for Membrane Bioreactor to Treat Municipal Wastewater  
Amount: 0.2m  
Date: June 2017  
Donor: ORIC, FCCU

## 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 and 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 and 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 and 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 and 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 (4 credits)**

Strategies for a better environment: process internal solutions (process changes, raw materials changes etc.), process external solutions, product changes and others. 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, tidal, waste-to-energy, biofuels, 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, transformation 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.



# DEPARTMENT OF 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.

### **List of Conferences Organized**

- 1st International Physics Convention, 15 November, 2016
- 2nd International Physics Convention, 20-21 November, 2017

## List of Projects

- Dr Sadia Zaheer: “Quasilinear Theory of Electrostatic and Electromagnetic Instability with Non-Maxwellian Distribution Functions” approved by Pakistan Science Foundation as Principal Investigator, (2017)
- Dr Sadia Zaheer: “Alfven waves in a low beta” approved by HEC (under NRP scheme) as Co-Principal Investigator, (2017)
- Dr Khalid Javed: “Fabrication, Characterization and Magneto Transport Study of Ferromagnetic Hybrid Nanostructures” a Joint project of PSF and National Natural Science Foundation of China
- Dr Syeda Ammara Shabbir: Fabrication and Characterization of TiO<sub>2</sub> Based Perovskite Solar Cell, Internal Research and Innovation Fund, ORIC, FCCU

## MPhil Physics

### Degree Requirements

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 3.0 CGPA in coursework. The last two semesters will be dedicated to research on a theme chosen in consultation with the research supervisor.

### Semester 1 (12 credits)

PHYS 501: Methods of Mathematical Physics	3 credits
PHYS 504: Advanced Condensed Matter Physics	3 credits
PHYS 505: Advanced Electrodynamics	3 credits
PHYS 502: Advanced Quantum Physics	3 credits

### Semester 2 (12 credits)

Elective - 1	3 credits
Elective - 2	3 credits
Elective - 3	3 credits
Elective -4	3 credits

At the end of the second semester there will be a Comprehensive Examination based on the core courses studied in the two semesters. Two additional elective courses will be included in consultation with the supervisor from the research interest area and the Department Chair. Every student enrolled in MPhil Physics must pass this examination for continuing in the second year. A maximum of 2 attempts are allowed to pass the Comprehensive Examination.

### Semesters 3 and 4 (16 credits)

PHYS 696: Seminar (2)	2 credits
PHYS 699: Research Thesis	14 credits

**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 department concerned.

## Course Descriptions

### Core Courses

#### 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 quadrupole fields; multipole 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.

### **Compulsory Courses**

All students must take the following courses but they are not included in the Comprehensive Examination.

#### **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 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.

### **Elective Courses**

Note: Elective courses depend on availability and workload of faculty.

#### **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, nanomedicine 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 non-Maxwellian 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; rotational 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; Duffing 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; nonlinear Schrodinger equation; evolution equation for envelope function.

## **PhD Physics**

The Physics PhD program offers students 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.

### **Admission Criteria**

- MPhil/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:

### **Coursework**

Coursework of 18 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 coursework of 18 credit hours, Comprehensive Exam is conducted any time prior to submission of PhD thesis.

### **Research**

After the successful completion of coursework students are required to register for 12 credits of research work.

### **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.

### **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 PhD 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 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 PhD. The Department of Physics currently has 9 PhDs, out of which 8 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: five years
- Students must register for courses during the first year
- The Comprehensive Exam will be conducted after completion of coursework. 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)

*MPhil/PhD*

*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 behavior; drift waves; vortices and piece wise linear solutions.

### PHYS 702: Instabilities and Quasilinear Theory in Plasmas (3 credits)

*MPhil/PhD*

*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)**

*MPhil/PhD*

*Prerequisites: 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, CW 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)**

*MPhil/PhD*

*Prerequisites: 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)**

*MPhil/PhD*

*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)**

*MPhil/PhD*

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 semiconductors. Magneto-resistance in three- and two-dimensional systems and quantum hall effect.

### **PHYS 707: Optical Properties of Solids (3 credits)**

*MPhil/PhD*

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 to this, 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 799: Research (12 credits)**

After the successful completion of coursework, 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 a 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



# DEPARTMENT OF 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 Wheelless, Prof Mary Wheelless, 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. Research work is 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.

### Conferences

1. 2-day conference: "Ethno-Federalism in Punjab and Beyond"; March 2015 (scholars from Lahore, regional universities in the Punjab and Khyber Pakhtunkhwa as well as the US)
2. 1-day national seminar: "Strengthening Political Process of Functional Democracy of Pakistan"; November 2016 (scholars and policy-makers from across the country)

## Degree Requirements

### Candidates must:

- complete 30 credit hours of coursework including six core courses and any four electives
- complete an MPhil thesis proposal before the start of the second year
- 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: 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: 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 25,000 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 coursework. Students will conduct research under the guidance of a faculty member of the Department of Political Science with expertise in the relevant field.

## **Elective Courses**

### **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.

**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 is 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: 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 Maldives.

**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.



# 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 departments at FCCU. More and more students opt for either majoring or minoring in Psychology every year. In 2017, a psychological lab and a psychological test recourse center were established in the Department. With the establishment of the aforementioned facilities, the students will have more exposure to the use 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 focuses on the conceptual clarity of the concepts and emphasizes on critical thinking in terms of applying those theories and concepts in the cultural context. Our students easily get admission in a graduate program both nationally and internationally.

## MS Clinical Psychology

Owing to our success at undergraduate level, the Department strongly felt the need to start a graduate program. After careful and deliberate thinking and diligent planning, the Department of Psychology now offers MS Clinical Psychology. The duration of MS Clinical Psychology is two years and it is a full-time program, five days a week, divided in four semesters. The program comprises of 46 credit hours of mandatory coursework, 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.

### Admission Criteria

- 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\*
- The candidates will be required to pass both admission test and interview conducted by the Department
- 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

- MS Clinical Psychology is a full-time professional training program
- Minimum 75% attendance is mandatory for appearing in examinations for all semesters
- For award of MS degree, candidates are required to complete 46 credit hours of coursework. 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

- Ten 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, 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 growth

### Resources

- One of the best clinical faculties 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 includes 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 FCCU is well stocked with latest books, journals, and periodicals of Psychology
- Access to various electronic data basis
- Many classrooms are smart classrooms and 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 empirical manner and above all uphold 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 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		Psychological Assessment for Adults		Adult Clinical Placement		Workshop	

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 and Ethical Issues	3	Child Placement	280 - Hours	Workshop	1	Thesis	3
Statistics	3	Research Methods	1	Case Conference	1	<b>Elective courses</b> • Psychopharmacology Medical Rehabilitation • Forensic Psychology	3
<b>Total</b>	<b>15</b>		<b>13</b>		<b>8</b>		<b>10</b>

## Course Descriptions

### PSYC 501: Child Psychopathology (3 credits)

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 with 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.

### PSYC 502: Adult Psychopathology (3 credits)

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 critically review 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 510: Psychological Assessment for Children (3 credits)**

This course will focus on 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.

**PSYC 511: Psychological Assessment for Children (3 credits)**

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 520: Therapeutic Intervention 1 (3 credits)**

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.

**PSYC 521: Therapeutic Intervention 2 (3 credits)**

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.

**PSYC 530: Legal and Ethical Issues (3 credits)**

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.

**PSYC 540: Statistics (3 credits)**

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.

**PSYC 541: Research Methods (3 credits)**

This course will cover the range of research designs encompassing both quantitative and qualitative methods. The emphasis will be on 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.

**PSYC 550: Biological Basis of Behaviour (3 credits)**

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.

**PSYC 635: Psychopharmacology and Rehabilitation (3 credits)**

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 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.

### **PSYC 632: Forensic Psychology (3 credits)**

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 disciplines 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 to ethical issues and standards specific to forensic psychology.

### **PSYC 670: Child Clinical Placement (280 supervised hours)**

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.

### **PSYC 671: Adult Clinical Placement (280 supervised hours)**

These courses consist of supervised clinical experience in an 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.

### **PSYC 672: Community Mental Health Placement (280 supervised hours)**

This course consists of supervised clinical experience in an 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.

### **PSYC 580, PSYC 680: Case Conferences (2 credits)**

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.

### **PSYC 620: Workshop 1 and II (1+1 credits)**

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 and 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.

**PSYC 630: Community Wellness and Global Mental Health (3 credits)**

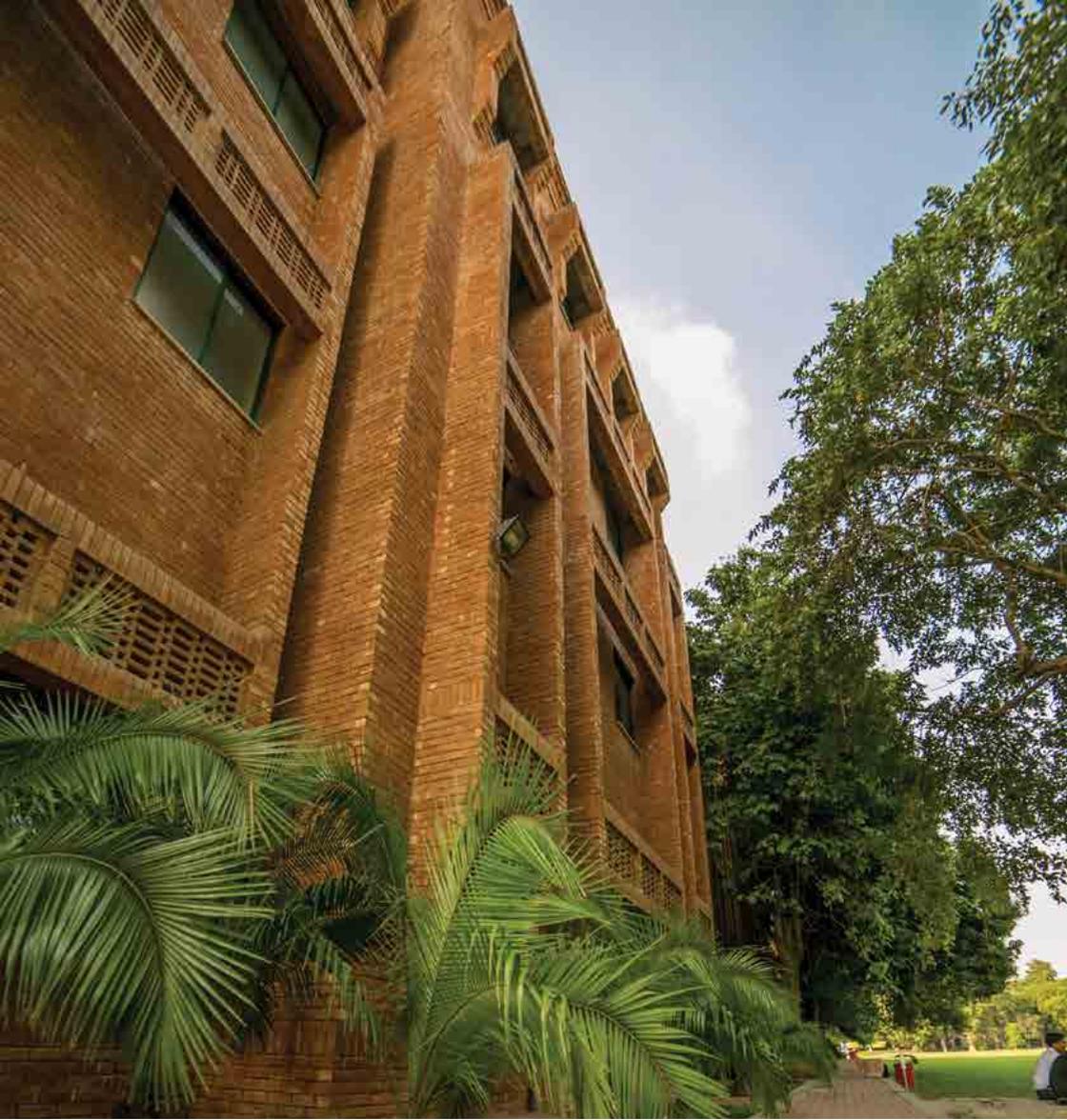
This course will provide students with a broad introduction to public mental health, inclusive of exploration of topics such as social determinants of mental health, cultural aspects of mental health, the meaning of “being well”, the culture of emotions, and global mental health.

**PSYC 699: Thesis-I (3 credits)**

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 Department of Psychology with a co-chair of the student’s choice.

**PSYC 699: Thesis-II (3 credits)**

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 Department of Psychology with a co-chair of the student’s choice.



# DEPARTMENT OF SOCIOLOGY

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.

## MPhil Sociology

MPhil in Sociology program 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.

### Learning Objectives

Students will:

- develop an analytical and critical understanding of Sociological paradigms and theories
- will be able to apply Sociological concepts and theories to understanding social forces and social problems in specific contexts
- will develop a holistic understanding of Sociology within the larger framework of Social Sciences from a multidisciplinary perspective
- will develop skills in both quantitative and qualitative research and will conduct research in a substantive area within the field of Sociology

MPhil Sociology is a 2-year program comprising 30 credit hours of mandatory coursework and a thesis for 12 credits (total of 42 credits). Coursework will involve six 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.

### **Degree Requirements**

To be eligible to receive the MPhil in Sociology, the student must meet the following requirements:

- Completion of 30 credit hours of coursework including six core courses
- Completion of 24 credits in the first year with a CGPA of 2.75 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 coursework to improve their grade point average.
- Completion of an MPhil thesis proposal, including approval by the Institutional Review Board (IRB). The IRB will review all MPhil proposals. Thesis proposals and their approval would be required prior to beginning of research. IRB would be responsible for vetting the ethical conduct of research. Also, if there are changes in the thesis proposals they also would be reviewed and approved by IRB
- A 12-credit hour MPhil thesis must be submitted, defended and approved by the thesis defense committee within a maximum of four years of the commencement of the program
- A cumulative grade point average of at least 2.75 must be maintained for the totality of MPhil coursework

### **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 599: Master's seminar on the 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 PLSC 509)  
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 Descriptions

### **SOCL 501: Quantitative Research in Sociology**

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**

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 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**

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 that will be explored throughout the semester, as will the emphasis on cultivating a “reflexive” understanding of sociological inquiry itself.

### **SOCL 504: Sociology of Development**

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**

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**

An exploration of the cultures and societies in South Asia is essential to develop a broad understanding of the social problems in Pakistan. This requires 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**

Demography is an important sub-specialty 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.

### **SOCL 508: Urban Sociology**

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**

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**

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**

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**

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**

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**

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**

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 (NGOs) and investigate South Asian experiences of success and failure.

### **SOCL 516: Social Psychology**

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**

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 from 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**

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**

This course will address the impacts of sweeping national age-based and age-related policy and programs such as Social Security, Medicare, Medicaid, 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 Pakistan, there will be many opportunities for students to explore aging policies in international settings.

### **SOCL 520: Advanced Readings in Health and Health Systems**

Health and illness are central to our lives and are major areas of work, policy and debate in society. This program helps students 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**

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**

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**

This course is required for the completion of MPhil Sociology degree. 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: Master’s Seminar on the Thesis**

This course is required for the completion of MPhil Sociology degree. 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.



# DEPARTMENT OF URDU

The Department of Urdu is one of the oldest at FCCU and has had renowned faculty such as Maulana Farzand Ali, Dr Agha Suhail and Prof Iqbal Ahmed Khan. Both teachers and students take an active interest in the fields of research, creative writing and literary criticism. The Department has also produced some fine writers. The Department of Urdu offers an MPhil degree and is part of the Faculty of Humanities.

## 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 the CSS (Central Superior Services) 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 introduced compulsory Urdu courses in its general education curriculum to make sure that every student attains proficiency in their national language. Keeping in view the future demand for Urdu language proficiency, 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 playwriting, 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 an HEC-recognized university or institution

- We will be following the 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 (program offers 24 credit hours for coursework 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 currently have an MPhil program. 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 help 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 coursework, seminars and submission of the thesis (24+6= 30 credit hours).

The students will not be awarded 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

No of Semesters	Declaration	Activity	Class Interaction	Per Week	Credit Hours/ Semester
1	15 weeks	Coursework	3 hours a day	4 courses x days/week	12
2	15 weeks	Coursework	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 and 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 and 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 and 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 indispensable 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 Urdu curriculum 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 art. 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 talk about creative similarities between works of literature having universal value but there is also a need to talk about 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 are also 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 *Subhas*; 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 for 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 the 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 a 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 the twentieth century and 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 ghazal and nazm. Since the meaning of ghazal 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 firsthand 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 writers, 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 and Arabic-to-Urdu. So, the study of dictionaries in Urdu has been made 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 the 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 were 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 through 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.



# SCHOOL OF MANAGEMENT [SOM]

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, a 4-year BS (Hons) Business with specializations in Accounting and Finance, Marketing and Sales, Operations Management, and Human Resources as well as short duration executive education courses.

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.

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.

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.

## Masters in Business Administration

This is a two-year program with a general management focus. The program aims to develop high quality professionals who will be agents of change through a combination of their creativity, initiative, competence and adaptability. The learning experience is highly interactive 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 emphasis on 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 in diverse environments. Over the last two years our graduates 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.

### **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. Each course is worth three credit hours.

## **Course Descriptions**

### **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, allocation, 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 and 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 and Critical Thinking II (3 credits)**

This is a follow-on course from BUSN 570.

**BUSN 580: Marketing and Sales Management (3 credits)**

Takes students across the spectrum of marketing concepts and application, and introduces critical issues faced by the sales-force in operations.

**BUSN 585: Marketing Research and Analysis (3 credits)**

Covers concepts, tools, and techniques used in marketing research, including consumer behavior, research methodologies, and statistical applications.

**Year 2****BUSN 601: Reporting and 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 importance of implementation of control systems in organizations and develops understanding of differences in selection of control systems.

**BUSN 622: Topics in Investment and Finance (3 credits)**

Focuses on more complex issues such as portfolio management, dividend policy, international finance, financial engineering and corporate finance.

**BUSN 625: Business Ethics (3 credits)**

Focuses on the importance of adhering to values and ethical behavior in the practical business environment.

**BUSN 630: Management Information Systems (3 credits)**

Focuses on the importance of implementation 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.

**BUSN 670: New Product Development (3 credits)**

Focuses on business innovation, new products and technologies for customer satisfaction, while maintaining quality and competitive advantage.

**BUSN 690: Business Strategy 1 (3 credits)**

Focuses on developing an understanding of the conceptual frameworks in the field of business strategy.

**BUSN 692: Business Strategy 2 (3 credits)**

This is a follow-on course from BUSN 690 and focuses more on analytical thinking and contemporary and relevant reference to local environment.

**BUSN 695: Managerial Negotiations (3 credits)**

Prepares the students for carrying out effective negotiations 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

**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 twelve business 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 online 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 14th 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.

# Program Modules

The modules are taught in the following order:

**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 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 and Control Systems (4 credits)**

Cost accounting, budgeting and management of control systems.

**BUSN 665: Law, Ethics and 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.



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