

# COURSE CATALOG 2020-21



**Habib University**  
shaping futures

# Disclaimer:

## HU Course Catalog 2020-21

The catalog is not to be considered as a binding contract between Habib University and students, parents, or guardians of students; nor other interested parties. Habib University reserves the right at any time, without advance notice, to change any part, portion or provision of the catalog; no vested rights shall run or be created by the catalog, including the right to notice of any modification, novation, amendment, supplementation, or other change of any term, provision or content of the catalog; such as right of the University to enact changes, etc., especially shall include but not be limited to:

- a) Withdrawal or cancellation of classes, courses, and programs
- b) Changes in fee schedules
- c) Changes in the academic calendar
- d) Changes in admission and registration requirements
- e) Changes in the regulations and requirements governing instruction in and graduation from the University
- f) Changes of instructors
- g) Changes of rules and regulations governing the students and student body organizations
- h) Changes of on-campus facilities, programs, and costs for room and/or board of students
- i) Changes of extra-curricular student activities, programs, and offerings
- j) Changes of any other regulation effecting students, their parents/guardians, or other interested parties

The official version of the Habib University Course Catalog is updated at the start of every academic year and resides on the Habib University website (See: <https://habib.edu.pk/office-of-registrar/academic-prospectus/>).

Consult the University website ([www.habib.edu.pk](http://www.habib.edu.pk)) for further information about the University. Catalog is compiled by the Office of the Academic Systems and Registrar and produced by the Office of Marketing and Communications.



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# Habib University

# Course Catalog

## 2020-2021



## Vision

Habib University is envisioned to be a preeminent institution of higher learning, dedicated to enriching individual lives and engaging society through teaching, research and service.

## Mission

**Our mission is to:**

- Educate promising students from all backgrounds and enable them to become competent, caring and critically conscious members of society.
- Engage outstanding academics with a passion for teaching, who will work with us to enrich the minds and lives of our students, and contribute positively to the larger community.
- Promote creativity, academic freedom and exchange of ideas in an intellectually stimulating environment of mutual respect and collaboration.

## Philosophy



Habib University will provide an indigenous liberal arts education that has, at its heart, the philosophy of Yohsin: a striving for excellence, an appreciation of beauty, passion balanced by awareness of consequences, respect for others and a desire to serve the communities, in which we are living in. A multidimensional concept, Yohsin encompasses a world-view where the worth of a person is measured not just in terms of their technical knowledge or skills, but by their interaction with nature and society at large. This involves living in a responsible way and positively impacting the community and the world.



## President's Note



Dear Class of 2024,  
Greetings! Welcome to Habib University!

You have just embarked on the most exciting journey of your lives, as you pursue intellectual pathways that will lead you to become engaged citizens of the world.

Our Catalog is a companion to the over 200 unique courses that will be offered in Habib University in 2020–2021. Here you will find the guiding principles of Habib University's liberal arts education, including its core courses and arts and science programs. The catalog is an invaluable resource that you can use to learn about our curriculum and academic policies.

Due to the anticipated impact of COVID-19 throughout the nation, for Fall 2020, Habib University will deliver courses primarily through advanced online learning models (with some limited exceptions). Whether your classes are on campus or remote, please be assured that HU remains as committed as ever to ensuring your academic success and intellectual growth, and to offering academic programs and support services that will help you reach your full potential. Indeed, now is an ideal time for you to pursue your educational and professional goals so that you can be competitive and prepared when you graduate and as the global economy improves.

In the meantime, use the University Catalog to explore old and new interests in ways that will lead you to become cultivated, socially conscientious citizens of the world – who are equipped to deal with the COVID induced challenges and opportunities ahead. This Catalog represents the heart and soul of what the HU faculty holds in promise for you. It comes to you with our best wishes for a successful year as we collectively embrace a 'new normal'. I am confident that you will make us proud!

With warm regards,

Wasif Rizvi  
President

# Academic Policies

(Applicable to all Habib University students, faculty, and academic staff)

## Academic Rights and Responsibilities

Habib University is a community of learners founded on the basis of the right to freedom of thought and respectful exchange of ideas. Neither students nor faculty should be disadvantaged on the basis of their political, religious, or other opinions. No member of the Habib University community will behave in any manner that infringes on the rights of any student, or faculty to teach, learn, carry out research, or pursue creative or other activities connected to the University.

Students are expected to attend all classes, seminars, and labs and to follow any other reasonable course of study, as determined by their instructors, academic advisors, or the Board of Faculty. Classroom assignments and course/degree requirements should be completed as prescribed in order to allow faculty sufficient time for adequate evaluation. Failure to fulfill these responsibilities may adversely affect course grades, cumulative grade point average (CGPA), and/or progress within the student's degree program.

Academic dishonesty shall be considered a serious violation of these responsibilities and will be subject to strict disciplinary action, as prescribed by the Habib University's 'Student Code of Conduct and Honor Code.' Academic dishonesty includes, but is not limited to; cheating, plagiarism, and collusion.

Faculty shall evaluate student performance based upon the expectations and the actual content of the class, lab, studio, or another course of study, as defined and communicated to the students, by the faculty member at the outset of the course. Students who feel that they have received a capricious or arbitrary grade, can appeal said grade as defined elsewhere in this document.

## University Statement of Anti-Discrimination

Habib University is committed to providing a learning environment free from discrimination and to nurturing a diverse and vibrant University community, while respecting the fundamental dignity and worth of all of its members. Supporting this commitment, the University does not tolerate discrimination in any form and provides mechanisms for redress for students, who feel they are being discriminated against.

Habib University does not discriminate against any person in the management and administration of its academic and admission policies, scholarship and financial aid programs, and other University-administered programs, nor does the University permit the harassment of any student or applicant on the basis of race, color, sex, gender, religion, national origin, creed, disability, marital status, sexual orientation, partnership status, pregnancy, age, military status, or any other legally protected status.

The Office of Community Values and Standards (OCVS) is responsible for coordinating the University's adherence to this policy and for complaint procedures, in regard to discrimination or harassment.

## Academic Advising

Academic Advising is a central element of the undergraduate experience at Habib University. Every student enrolled at Habib University is assigned two advisors: (i) a faculty advisor belonging to the student's program, and (ii) an advisor in the Office of Academic Performance (OAP), at the time of enrollment. Advising is intended to be a collaborative relationship between a student and their advisors through which students create educational plans, consistent with their personal, academic, and career goals. Students should meet with their advisors at least three times per semester to discuss their academic progress. Students who are struggling academically should first speak with their academic and OAP advisors for guidance. Students who have been placed below good academic standing must meet with their academic and OAP advisors, as described later in this document.



A student's academic advisor is listed in the University's Campus Management System (PeopleSoft), available via the Student Portal at the University's Intranet. Students wishing to change their advisor should make a formal request to the Office of Academic Performance.

## Declaration of a Major

All first-year students enrolled in DSSE must declare their major at the time of admission. AHSS students must confirm their major by the end of their second-year by submitting a 'Declaration of Major' form, to the Office of the Registrar.

## Change of a Major

Students wishing to change their major must submit a 'Change of Major' application form to the Office of the Registrar. A change of major application must be approved by the student's academic advisor, the concerned program director/assistant dean, and the Office of Academic Performance. Once the approval process is complete, a coursework/graduation plan must be submitted by the student to the Office of the Registrar, based on the graduation requirements for the most recent catalog year of the new major. This plan must be developed in consultation with the student's academic advisor and the Office of Academic Performance. The Office of the Registrar will process a change of major and notify the student and all concerned University offices including the Office of Student Finance for any financial adjustments needed that result from this change. Depending upon how many courses are transferred from the previous major to new major, a change of major may result in lengthening the student's stay at Habib University beyond eight semesters.

## Declaration of a Minor

Minors provide students at Habib University the opportunity to pursue an area of secondary specialization. A minor consists of a smaller set of courses, within a well-defined area as determined by the awarding program and duly approved by the University's Academic Council. Students interested in completing a minor must declare their choice before the end of enrollment of their seventh semester by filing a Declaration of Minor Form and submitting it to the Office of the Registrar.

## Transfers

All transfer requests, including transfer of credits, will be reviewed on a case-by-case basis. Incoming students who have completed university-level course work at other institutions may request for transfer of credits. All students, regardless of their transfer status, must satisfy the University's Liberal Core requirements, and spend at least four semesters at the University as full-time students before graduation and fulfill transfer criteria as per the University and Higher Education Commission (HEC) policies.

Enrolled students at the University may submit a request for a transfer of credits earned at other recognized institutions (e.g., through the University's learning abroad program) to the Office of the Registrar. On receiving a form that is duly-filled and signed by student, the Office of the Registrar sends the form along with the necessary documents (as mentioned in the form) to the relevant program director for approval of the Program Board of Studies (BoS). On receiving an approval of the Program BoS and the concerned assistant dean of the school, the Office of the Registrar processes the application and notifies the student and all concerned departments/units accordingly.

Courses for which a transfer of credits is approved appear on the student's transcript with a 'TR' (transfer) grade, which is not counted towards a student's semester/cumulative GPA. Further details and procedures are available in the Habib University's Transfer of Credits Policy.

## Attendance/Engagement Policy

Whenever classes are held face-to-face on campus, attendance is mandatory at Habib University. Unless an absence is due to a University-sanctioned event in which a student is officially representing the University, there is no distinction between excused and unexcused absences. Attendance will be taken and absences noted in all classes by the course instructors in the University's Campus

Management System (PeopleSoft).

All students must maintain at least 85% attendance for each class in which they are registered. Non-compliance with the minimum attendance requirements will result in an automatic failure of the course with an award of an 'F' grade and may require the student to repeat the course, when next offered, subject to the University's course repeat policy.

When classes are held online, or in Hy-Flex mode, the physical attendance requirement is replaced by the requirement that student be highly engaged with their courses. The standard expectation for student engagement at Habib University is that students are 100% engaged in their courses. Online learning environments offer students much greater flexibility in terms of when they engage with course materials, but they must engage with those materials at a meaningful level, for the University to give them credit for having completed a course successfully. Habib University has established the standard that students must satisfy the instructor and the University that they have met a minimal acceptable engagement level, reported as a "Student Engagement Level" (SEL) of at least 85% in every course for which they have earned credit. A low SEL in a course may result in either the student being dropped from or receiving a failing grade in the course.

### **Appeals for Retroactive Withdrawal Following Failure Due to Insufficient Engagement**

If a student fails a course due to insufficient engagement, the student may petition the Committee on Academic Standing for a retroactive withdrawal from the course. The Committee on Academic Standing will confer with the faculty member, as the Committee makes its determination whether the retroactive withdrawal is appropriate or not, and whether the withdrawal should be with or without the mark of "W" on the student's transcript.





## Grades and their Numerical Equivalents

Letter Grade	Scale
A+	4.00
A	4.00
A-	3.67
B+	3.33
B	3.00
B-	2.67
C+	2.33
C	2.00
C-	1.67
F	0.00
AU	Audit
W	Withdrawal
I	Incomplete
TR	Transfer
R	Repeat
R*	Repeat (substitute)
S	Suspended
P	Pass
CR	Credit (Pass)
NC	Non-Credit (Fail)

## Grade Point Average (GPA)

At the conclusion of each semester during a student's tenure at the University, grade point average will be reported in two ways:

- Semester GPA (SGPA): GPA for a single semester only;
- Cumulative (CGPA): A cumulative GPA for the duration of the student's enrollment.

Semester and cumulative GPAs are calculated only for courses attended at the University. In some cases, GPAs might be calculated for a school, program, concentration, or major. However, these specialized GPAs will not appear on a transcript.

### Calculating GPA

- Grades A+ to F earned in a course shall be counted towards the calculation of SGPA and CGPA.
- Grade F replaced by R or R\*, upon repeating a course, shall not be counted towards the calculation of SGPA and CGPA.
- Following grades shall not be counted towards the calculation of SGPA or CGPA: Audit (A), Withdraw (W), Incomplete (I), Transfer (T), Suspended (S), Credit (CR), Non-Credit (NCR), Pass (P).

- In case of a change of major, grades of the following courses earned while pursuing previous major will be transferred to new major and will be counted towards the calculation of CGPA:
  - All Liberal Core Courses irrespective of grade(s) earned;
  - Any core courses relevant to the new major irrespective of the grade earned;
  - Courses with a passing grade that may be eligible for transfer to new major as electives.
- In case of a change of major, the courses and respective grades which are not transferred to the new major, will also be listed on the transcript but their grades and credit hours will not be counted towards the calculation of CGPA. All passing grades of the courses not transferred will be recorded as CR and failing grades will be recorded as NCR or R, as per the number of attempts made for a failing course.

The formula for calculating GPA or CGPA is to divide the Total Quality Points (TQPs) earned in all courses by the Total Attempted Credits (TACs).

$$\text{GPA} = \text{Total Quality Points (TQP)} / \text{Total Earned Credits}$$

Quality Points (QP) for a course equal the course credit hours multiplied by the numeric value of letter grade earned in the course, as per the grading scale. Total Quality Points is the sum of Quality Points of all the courses that are included in the calculation of GPA.

## First Semester Grades

First semester is the transition semester from high school to a university environment for first year students. The transition requires them to learn new skills, adjust to a new environment, understand university expectations, and learn to manage themselves as independent learners. This policy has been developed to allow for an enriching first semester experience, without the pressure of maintaining a high semester grade point average (GPA) required to be in good academic standing.

- Students' aggregate scores in a course will be converted into Credit (CR) for a pass grade and Non-credit (NCR) for a fail grade, for all the courses attended in their first semester at Habib University.
- The cut-off for CR will be equivalent to the passing grade as described in the grading scheme of the most recent academic catalog.
- Aggregate scores are awarded for the purpose of determining CR/NCR status. These will not be recorded in the students' transcript or in any other official document.
- CR/NCR will not be included in the calculation of the final Cumulative Grade Point Average (CGPA) that appears on a student's transcript. However, the number of credits earned during the first semester will be counted in the total credits required to graduate.
- Students earning an NCR in one or more first semester course(s) may repeat the same course(s) or equivalent, in subsequent semesters. For such courses, the grading policy of CR/NCR shall apply.
- First semester CR/NCR will be considered in assessing students' academic standing status. First year students receiving one NCR (noncredit grade) or more in the first semester will be placed on 'Academic Warning' as per the University's Academic Standing Policy.
- Habib University's financial commitment to first year students, if any, will not be affected by their first semester grades.
- First year students will be considered eligible for student employment in the second semester of their study at Habib University if they earn CR in all of their first semester courses.



## Incomplete (I) Grade

Students are expected to complete all academic coursework and assignments during a semester latest by the last day of classes for that semester. If a student is unable to complete a course due to serious illness or exceptional circumstances beyond their control, and the work completed to date is of passing quality, they may request an Incomplete (I) grade from the instructor, provided that the grade gives no undue advantage to that student. Incomplete grades are not a privilege and are only awarded to students under exceptional circumstances i.e., they cannot be awarded as part of a course's assessment and grading policy.

### Procedure

**The Student-Faculty Meeting:** The student is expected to first meet with the faculty member of the course and determine together if the outstanding work can realistically be completed within 6 weeks of the last day of exams for the semester. This meeting is expected to take place in advance of the deadline for incomplete requests, which is the last day of final exams for a semester. Under exceptional circumstances where students are unable to meet with the faculty member (e.g., the student is hospitalized), the faculty member may proceed with submitting the petition for an incomplete on behalf of the student, but indicate why the meeting with the student has not occurred.

Only the instructor for the class may submit the petition for an Incomplete request, and must do so no later, than the last day of exams for the semester.

**Review of Incomplete petitions by the Associate Dean for Academic Systems:** Before making a decision, the Associate Dean for Academic Systems may request to meet with the student and faculty member to discuss the incomplete request and to clarify arrangements; for the completion of outstanding work. The Associate Dean may also request documentation from the student, if documentation has not been provided and is deemed necessary. Students and faculty will be notified of the Associate Dean's decision regarding the incomplete request by e-mail.

If an incomplete is approved, the faculty member should not enter any grade for the student. The Associate Dean for Academic Systems will enter the grade of "I" in the student record.

The instructor must record the permanent grade by the last day to complete I grades, as indicated in the Academic Calendar, or the 'I' will default to an 'F' grade. Incomplete grades are not calculated into a student's grade point average.

## Change of Grades

Grades awarded at the end of a semester/term for each course are considered final. Instructors may submit to the Office of Registrar a 'Change-of-grade' form after seeking approval of the Dean of Faculty, clearly mentioning the reason for which a change of grade is needed, which can only be due to a calculation or a clerical error. Change-of-grade form must be submitted by the course instructor latest by the end of the subsequent semester.

## Course Lettering and Numbering

All courses are designated by a letter prefix denoting the program/subject area in which the course originates. The prefix code is followed by a three-digit sequence denoting the course level. Levels are designated as follows:

- 000 – Pre-University and/or noncredit courses offered by the University. This may include some transitional courses.
- 100 – Courses that are generally taken in the first year.
- 200 – Courses that are generally taken in the second year.
- 300 – Courses that are generally taken in the third year.

400 – Courses that are generally taken in the final year of study.

In general, the course level dictates the point at which a student should take a particular course within the sequence of requirements. Typically, 100- and 200-level courses are categorized as lower-division, whereas 300- and 400-level courses are categorized as upper-division courses. Before enrolling in a course, students should check all of the course prerequisites to make sure that are eligible to enroll in that course.

Cross-listed courses must be approved by all the participating programs/teaching units through their respective Program Boards of Studies. Approved cross-listed courses shall have the prefixes of all the participating programs, and shall have the same level.

## Course Repeat Policy

Students are permitted to repeat any course offered by the University, either to improve their original grade or to clear a course in which an 'F', 'W' or 'R' grade was received. A student is permitted to retake a course two (02) times only, for a total of three (03) attempts. All attempts will be recorded on the student's transcript, but only the best-earned grade will be counted towards GPA. Previous attempts will be recorded with an 'R' grade, denoting Repeat.

The University is not obligated to re-offer elective courses, but courses defined as graduation requirements (e.g., Habib Liberal Core or programmatic requirements), must be re-offered or, if the course has been significantly redesigned or discontinued, must have an equivalent course defined by the relevant Board of Studies. The grade(s) earned in the discontinued course will be recorded on the transcript with an 'R\*', denoting that the original course has been discontinued and the requirement is met with a new course.

Students failing to clear courses required by their chosen program, especially those that are prerequisite(s) for later courses, may be unable to graduate within eight (08) regular semesters and must seek advice from their academic advisor and the program. The Office of Academic Performance (OAP) shall provide additional advising and academic support, in collaboration with the offering program, on a per case basis. Students failing a required course twice should give careful consideration to the chosen field of study and should seek advice from their academic and OAP advisors regarding future course of action.

A course repeat fee may be charged for any repeated course, regardless of the reason for a repeat.

## Maximum and Minimum Course Load

Full-time students at Habib University must register for a minimum of twelve (12) credit hours in a semester to maintain full-time status. The maximum allowable course load per semester is twenty (20) credit hours. Students with a cumulative GPA (CGPA) of 3.0 and above who are in their third or final year may submit a request to the Office of the Register to enroll in an additional course beyond the maximum allowable limit. This is subject to the approval by the Committee on Academic Standing.

Failure to maintain full-time status may affect student's financial aid and scholarship. Students who are allowed to take course overload may be charged additional fee. In either case, students are advised to contact the Office of Student Finance, for details of financial implications of course overload and underload.

## Auditing a Course

Students may audit a course for self-enrichment and academic exploration. An audited course will appear on the transcript with an "AU" (audit) grade. An audited course does not earn a grade or credit, is not included in the calculation of GPA, and does not count toward the minimum course load required for continuous enrollment. Students registering a course for credit have priority over those



wishing to audit the course. A student auditing a course may be asked to drop the course during the semester enrollment period if another student wants to enroll in the course for credit.

Audit courses do not fulfill degree requirements, but the credit value of audited courses may be included in the semester load for determining fees and the maximum number of credits carried each semester. An audited course cannot be used to meet the pre- or co-requisite condition of another course. The extent to which a student may or may not be required to participate in the audited course, including attendance or engagement, is determined by the instructor prior to enrollment. For example, the instructor may decide if a student auditing a course will be permitted to take exams, submit homework and have it evaluated. Students choosing to audit a laboratory course may be required to pay the additional lab fee.

The process for registering to audit a course is the same as registering for a course for credit along with the following additional requirements:

- Students wishing to audit a course must obtain approvals from the course instructor and their academic advisor and submit them to the Office of the Registrar using the Add/Drop course form before the end of the enrollment period.
- For courses with a laboratory component, approval from the lab instructor must also be obtained.
- The program that offers the course may have additional requirements. Students wishing to audit the course should contact the concerned program director for information about these requirements.

Changing a course status from audit to credit, or from credit to audit, or dropping an audit course must be done during the semester enrollment period. A student wishing to change from credit to audit status must meet the additional requirements of registering for an audit course.

An additional fee may be applicable for auditing a course if a student exceeds the maximum allowable course load. Students on financial aid should bear in mind that any fee for auditing a course may not be covered in their financial aid package. It is the student's responsibility to resolve all financial matters related to auditing a course by contacting the agency administering the scholarship or the Office of Student Finance.

## **Academic Standing, Probation, and Dismissal Policies**

Habib University requires all students to maintain good academic standing. Academic standing is determined by academic performance and is measured through a cumulative grade point average (CGPA). Failure to maintain good academic standing may result in an academic warning, first academic probation, final probation, or dismissal. At each stage, below good academic standing, students are provided learning support and advice in order for them to achieve good academic standing.

The Academic Standing policy defines good academic standing as well as identifies the circumstances under which a student is placed on academic warning, first academic probation or final probation, and the consequences of these standings.

### **Details of Academic Standing**

#### **Good Academic Standing**

Students who maintain a minimum cumulative grade point average (CGPA) as per the University's graduation requirement i.e., 2.33 and a fulltime status by enrolling in minimum 12 credit hours per semester, are considered to be in 'Good Academic Standing.'

Students who do not maintain a good academic standing, will not be eligible for the following:

- Apply for the University's learning abroad program

- To be on Dean's Honors List of the University in a given regular semester
- Avail student employment opportunities
- Avail scholarship and/or financial-aid.

### **Academic Alert**

Following two categories of students, while still in 'Good Academic Standing,' will be considered to be on 'Academic Alert.'

- Students who maintain a CGPA between 2.33 and 2.67;
- Students who maintain a CGPA above 2.33 but their semester GPA (SGPA) falls below 2.33 in any semester.

An 'Academic Alert' triggers intervention by the Office of Academic Performance (OAP) and concerned academic program(s). It is intended to provide timely academic support to prevent a student from losing their good academic standing. No official letter will be issued to students on Academic Alert.

### **Academic Warning**

Students will be placed on 'Academic Warning' in one or more of the following situations:

- Their CGPA falls below 2.33;
- Freshmen receiving one or more NCR (non-credit fail) grade in the first semester;
- They fail to maintain a full-time status.

Students will return to 'Good Academic Standing' if they meet the requisite conditions as defined under Good Academic Standing.

Students on Academic Warning must meet with their academic advisor in OAP and their faculty advisor to design an Academic Success Plan. If the student achieves a CGPA of 2.33 at the end of the semester, the student shall be restored to 'Good Academic Standing.'

### **First Academic Probation**

Students who are already issued an 'Academic Warning' will be placed on 'First Academic Probation,' if they fail to return to 'Good Academic Standing' by the end of the semester in which they were given the 'Academic Warning.' A student will return to 'Good Academic Standing' if they meet the requisite conditions, as defined under 'Good Academic Standing.'

Students on 'First Academic Probation' must meet with their academic advisor in OAP and their faculty advisor to revise the Academic Success Plan. During the probation period, students should expect close academic supervision and must meet with their OAP and faculty advisors as highlighted in the Academic Success Plan.

### **Final Academic Probation**

Students will be placed on 'Final Academic Probation' if they fail to achieve 'Good Academic Standing' by the end of the semester in which they were placed under 'First Academic Probation.' Students on 'Final Academic Probation' will remain actively enrolled but under the direct supervision of OAP and the relevant program director.

Students on 'Final Academic Probation' will not be allowed to enroll in more than twelve (12) credit hours and in any new course(s) unless their required repeat courses are not available. Students will enroll only in the courses suggested by their faculty advisor and OAP. They will also undergo any





additional intervention plan mandated by the Office of Academic Performance and the relevant faculty advisor and program director(s). Students will return to 'Good Academic Standing' if they meet the required conditions, as defined under 'Good Academic Standing.'

Students on 'Final Academic Probation' must meet with their academic advisor in OAP and their faculty advisor to revise their Academic Success Plan. During the 'Final Academic Probation' period, students should expect close academic supervision and must meet with their OAP and faculty advisors as highlighted in the Academic Success Plan. Students on 'Final Academic Probation' must achieve a CGPA of 2.33 to return to the status of 'Academic Warning' for an additional semester.

### **Academic Dismissal**

Students will be dismissed from the University if they fail to achieve the CGPA required to maintain 'Good Academic Standing' by the end of their 'Final Academic Probation' period. Additionally, students who refuse to follow the mandated course plan during 'Final Academic Probation' may also be dismissed from the University. Students dismissed for academic reasons are not eligible for readmission to the University or a tuition refund.

### **Academic Standing of Students Changing Major**

The academic standing of students who change their Major will be determined using the GPA of courses which are relevant to their new Majors.

## **Withdrawals**

Occasionally, it may be necessary for students to withdraw from one or more courses during a semester due to personal reasons. It should be used only when, in consultation with a student's academic advisor, there is no other alternative.

### **Administrative/Non-Voluntary Withdrawal**

Habib University reserves the right to administratively withdraw a student from classes.

The University may at any time decide to administratively withdraw a student if it finds such action is needed to maintain a campus environment that is conducive to its educational purpose, to maintain order, and/or to protect the rights and safety of its community members. To this end, officials may order the involuntary withdrawal of a student from the University and/or from its residence facilities, in accordance with institutional policy.

This policy will cover behaviors as described herein and that occur on University premises or at organizationally sponsored activities, but it also may address off-campus behavior if the University determines that the behavior has otherwise damaged the University, its property, or that of another community member irreparably. Likewise, if the continued presence of the student is seen to impair, obstruct, interfere with or adversely affect the mission, process, or functions of the institution; or if they engage or threaten to engage in behavior that poses a danger or physical harm to oneself or others at any time.

### **Procedures under This Policy**

This policy should not be seen as a substitute for appropriate disciplinary action as outlined in the Code of Conduct and procedures herein may run concurrently with those processes. This procedure may be implemented at any time in consultation with the competent authority, or if the Head of Student Life deems it necessary to do so.

Upon receiving a referral or report of an issue involving a student that could fit under this policy, the Office of Community Values and Standards (OCVS) will conduct a review of the information provided. If warranted, an immediate meeting with the student may be requested. After the meeting, the appointed

official may take one or more of the following actions:

- Determine that the guidelines have not been met for involuntary withdrawal and terminate the process entirely;
- Determine that the guidelines have not been met and refer the case to the student conduct process;
- Require that the student schedule an evaluation by a qualified, licensed, mental health professional outside of the University at the student's cost;
- Invoke an interim suspension pending further investigation and/or the outcome of a student conduct case;
- Impose additional requirements on the student that must be met in order to continue enrollment;
- Allow a student who meets the conditions herein to voluntarily withdraw from the University and waive the right to further procedures under this policy and any privilege to enroll in the University again;
- Proceed with an immediate administrative withdrawal.

### **Student's Failure to Comply**

A student may, with an immediate effect, be involuntarily withdrawn and/or disciplined under the policy, and forfeits any right to appeal for any of the following conditions:

- Failure to attend any required meeting;
- Failure to schedule and/or appear for any directives as associated with this process;
- Failure to adhere to any conditions placed on the continued privilege to enroll in the institution.

### **Forced Withdrawal**

Until a particular case of alleged misconduct has reached a final decision, the student shall retain all privileges to attend classes, use campus facilities, and otherwise be present on campus. As an exception to this shall be in cases where, in the view of the competent authority, a threat to the teaching/learning environment at the University, or the safety of community members is at risk. The University will take steps to ensure the protection of University property, and the University may decide to invoke an interim withdrawal of these privileges at any time. When in the opinion of the University an interim withdrawal/suspension is to be imposed, notification to the student may come in either verbal or written form. Within three (3) business days of an interim action, a student should be notified in writing of any formal allegations. The student will be given the opportunity to resolve the issue, either formally or informally, within ten (10) business days, according to the policies and procedures contained herein or in any other University publication.

### **Appeals**

A student may appeal an involuntary withdrawal using the same procedures as outlined in the student conduct process and the grievance policy.

### **Family Emergency and Medical Withdrawal**

On rare occasions, a student may have an emergency in the family or a medical reason that prevents them from completing a term. The student or student's family should notify the Office of the Registrar as soon as possible to request a Family Emergency or a Medical Withdrawal. It may be asked that proper documentation is submitted along with a 'Medical Leave of Absence' application.

In cases where the onset of the issue at hand was sudden and/or the student or family were unable to notify the University, the University may grant a retroactive Family Emergency or Medical leave. In such cases, a written request clearly stating the reasons and documentation should be submitted as





soon as possible to the Office of the Registrar.

Appropriate documentation for a withdrawal in this category consists of a letter from the student's attending medical provider that specifies the following:

- Date of onset of illness or other issues;
- Dates under professional care;
- General nature of the medical condition or any other issue and why/how it has prevented the student from completing coursework;
- Date the student was last able to attend school;
- Date of anticipated return to school.

## Grading after Withdrawal

All withdrawals completed after the course drop period will be noted on the transcript with a 'W' grade. Signed course withdrawal forms must be turned in to the Office of the Registrar before the deadline, as stated in the academic calendar for the current year.

## Interim Withdrawal/Leave of Absence

A request for a leave of absence will be granted if a student is not able to register for classes for more than one regular semester, for a documented reason. Students should consult with the academic advisor and the Office of Academic Performance before applying for Interim Withdrawal/Leave of Absence from the University.

A leave of absence is good for up to one academic year and may be renewed only once for up to one more year. To file for a leave of absence, an Interim Withdrawal/Leave of Absence Request Form may be obtained from the Office of the Registrar and must be signed by the academic advisor, and the concerned assistant dean of the school. In the event that the student has not declared a major, the Director of Academic Performance will approve the application.

Students taking Interim Withdrawal/Leave of Absence must bear in mind that the Higher Education Commission (HEC) requires students to be enrolled in at least eight (8) regular semesters in order to complete a four-year Bachelor's degree. Hence students proceeding on Leave of Absence will have to complete the required semester count, as one of the degree requirements.

## Summer Semesters

Summer semesters are offered at Habib University in addition to the regular semesters. The semester dates, course offerings, and enrollment are announced and handled by the Office of the Registrar. Fulltime students at Habib University may enroll in courses offered in Summer semesters to:

- Repeat a course if an 'F' or 'W' grade was awarded for that course previously;
- Improve grade for a previously attended course;
- Attend any additional courses other than those required to fulfill requirements of a major program offered at Habib University, e.g., to fulfill requirements of a minor.

Students may enroll in a maximum of two (02) courses (or 08 Credit Hours) in a Summer semester at the University. All University academic policies and regulations including the Attendance and Academic Standing policies will apply as in the regular semesters. All financial policies for a Summer semester, including tuition, fees (if applicable) and discounts are announced by the Office of Student Finance.

Further details are available in the University's Summer Semester Policy.

## University Records

Habib University maintains students' educational records and ensures their right to access and privacy of information, maintained in these records. The following guidelines provide procedures for maintenance of and access to student educational records, held by the University.

### Definitions

For the purpose of these guidelines, the terms used herein are defined as follows:

**Education Record** – Any record, document, or material maintained by the University (either directly or through a third party) that contains information directly related to the student which is recorded on any medium including, but not limited to, handwriting, print, audio, video, tapes, or electronic storage.

However, the definition of education record does not include:

- Records that are maintained by University officials in their personal capacity and are not available to others;
- Records established and maintained by campus security;
- Employment records of the students employed by the University;
- Records maintained by the Health and Wellness Center when the records are maintained solely for the purpose of treatment of the student;
- Records that are maintained after the person is no longer a student, such as Alumni records.

**Parent** – The natural parent, guardian, or an agent nominated by the parent/guardian to act as such.

**University Official** – An individual employed by the University in an administrative, supervisory, academic, research, or support staff position; a member of the Board of Trustees; an individual performing special tasks for the University, such as an attorney, or an auditor; a contractor, consultant, volunteer, or other outside party providing institutional services; and an individual serving on an official University committee, such as the disciplinary committee, or assisting the University in the performance of official tasks.

**Personally Identifiable Information** – any information linked or linkable to a student that, alone or in combination, would allow an individual of the campus community, who does not personally know the student, to identify the student with reasonable certainty.

**Legitimate Educational Interest** – An individual has a legitimate educational interest in education records if the information or record is relevant and necessary to the accomplishment of some employment, or other institutional tasks, service, or function.

**Disclosure** – To permit access to, to release, to transfer, or to communicate students' education records, or personally identifiable information contained in those records.

### Disclosure to Parents

The University reserves the right to release educational records to parents of students as per the University's 'Parental Access and Notification' Policy. The University does not require a student's consent to disclose information related to:

- The student's violation of local or federal laws,
- The policies of the University,
- Information about academic standing of the student,
- Any disciplinary action taken against the student.



## Disclosure to Third Party

The University does not disclose information to any third party without written consent of the student or otherwise covered in this policy. Some examples of requests for which the University does not require written consent of the student are listed below:

- If requested by a University office for legitimate educational use;
- If requested by another school where the student seeks or intends to enroll, or is already enrolled;
- Under Judicial Order or lawfully issued notice in a litigation against the University, or for disciplinary action against the student;
- In connection with the Financial Aid Program as necessary to determine eligibility for amount or conditions of the aid, or to enforce the terms and conditions of the aid;
- Needed for a collection of financial obligations to the University in case of delinquency of payment by the student;
- In case of threat of harm to self or others.

## Student General Grievance Policy and Procedure

Habib University is committed to providing a method of redress for legally impermissible, arbitrary, or discriminatory practices. This procedure is meant to provide students an avenue for addressing their concerns not mentioned in other University policies and/or procedures. If in light of the investigation and resolution an alleged violation of policy, procedure, or law is seen to have occurred, the University reserves the right to adjudicate the alleged violations through the appropriate procedure(s) as are applicable. Where the department or unit in which the violation allegedly occurred has written procedures for student grievances, students should first attempt to resolve the matter through those procedures.

### Grievance Resolution Process

Before filing a formal complaint under this policy, a student should attempt to resolve the matter informally with the person alleged to have committed the violation and/or with the head of the department, or unit in which the alleged issue occurred. The student may contact the Office of Community Values and Standards, in case of non-academic grievance, or Office of Academic Performance, in case of academic grievance, for assistance with informal resolution. Attempts to resolve the matter informally should be completed within thirty (30) calendar days, from the time at which the student knew or could reasonably be expected to have known of the violation.

If the incident is not resolved at the informal and/or departmental level, the student may file a formal grievance. Any formal grievance must be filed within sixty (60) calendar days of the incident, regardless of the progress of the informal and/or department level process.

Student grievances must be in writing and signed by the student. Grievances must contain the ID number, University e-mail address, physical address, and phone number of the person filing the complaint. It is the responsibility of the complainant to update all current contact information in order for it to be used throughout the grievance process. All official communication regarding the complaint will be sent via the University's official means of communication. The complainant should also provide a detailed statement of the specific action being grieved, the approximate date when the action took place, the resulting injury or harm, the specific law, policy, or rule alleged to have been violated, a description of the evidence supporting the claim, whether informal procedures were available and completed, and the remedy or relief requested. All grievances of an academic nature, including but not limited to grade appeals or instructor complaints, should be filed at the Office of the Registrar. Cases originating outside of academics and all cases of discrimination, harassment, or assault; should be filed at the Office of Community Values and Standards (OCVS).

Upon receipt of a formal grievance, the Head of the relevant office or designee shall review the grievance and make an initial determination regarding whether the grievance is complete, timely, within the jurisdiction of the Student Grievance Procedure, and alleges facts that, if true, would constitute a violation of University policy and/or law. If the grievance is untimely or deemed outside the jurisdiction, or factually insufficient, the grievance will be dismissed and the complainant will be notified of the decision with a written explanation of the basis for the dismissal within ten (10) calendar days.

If the grievance is accepted in full or in part, the relevant office shall initiate an investigation. At the completion of the investigation, a written determination of the case will be sent to both parties. Either party may appeal the decision which will be heard by the University Appeals Committee (UAC). The decision of the UAC shall be final and binding on all parties.

For academic-related grievances, the Office of the Registrar shall inform the student in writing of the decision within ten (10) business days. The decision may follow the UAC's recommendation or be a modification upon it. If it is a modification, the file record must show the Office of the Registrar's reasoning behind the modification.

\* If the program director or the concerned assistant dean is the primary faculty disputant, the student shall be permitted to request informal mediation from the Office of Academic Performance.

## Official Communication with Students

Official communication with students will be through the University email.

Students are responsible for checking their University-provided email accounts frequently and consistently, and for adhering to deadlines contained in emails from the University and/or its faculty or staff members.

The University will not respond to a student via a non-University email account.

Communication with parents will be through courier, or through the phone. It is the student's responsibility to ensure all contact information is kept current by reporting any changes to the Office of the Registrar.

## Mid-Term and Final Exam Policies

### Final Examinations

Final examinations are given at the end of each semester during the exams weeks designated in the University's academic calendar and are regulated either by the University's 'Examination Policy' or 'Online Examination Policy' as the case may be. The final examination schedule is announced by the Office of the Registrar.

All students registered in a course for which a final exam is given must attempt the exam at the scheduled time, unless an exception is approved by the Dean of Faculty.

### Midterm Examinations

The schedule of midterm exams, be they within or outside the scheduled class hours, are announced by the instructor and conducted during the midterm week, announced by the Office of the Registrar – before the start of each semester. For courses in which more than one midterm exam is administered, one midterm exam will be scheduled during the allocated week for mid-term exams. Examinations are announced in the course syllabus distributed to the class during the first week of classes.



## Missed Examination

All students are expected to complete their exams within the specified time frame and by the dates indicated in their syllabus. Students may request a make-up exam on the basis of religious obligation, serious illness, or family emergency.

Examinations will not be rescheduled to accommodate travel, family plans, or employment commitments. Generally, a student who misses an exam without a pre-approved alternate arrangement will receive a zero (0) mark in that exam. All make-up exams must be given before the official close of the semester.

## Religious Accommodation

Habib University recognizes that the examination schedule may conflict with some religious observations. In such cases, the University will make reasonable efforts to accommodate the affected students by providing alternative times or methods to attempt examinations.

Students should review the syllabus for each of their courses at the beginning of each semester to determine if personal religious observance may conflict with the scheduled exam(s). In the case of a conflict with a midterm examination, the student must submit to the instructor a statement describing the nature of the religious conflict, specifying the dates and times of conflict by the end of the semester enrollment period. If a suitable arrangement cannot be worked out between the student and the instructor, they should consult the concerned dean of the school.

In case of a religious conflict with a final examination, the student must submit a written statement to the instructor, the concerned program director, and to the Office of the Registrar. In such a case, any approved make-up exam may be scheduled after the final exams period. If a student fails to follow this procedure or fails to give a timely notice of conflict and subsequently misses the exam, no make-up exam will be given and the student will receive a grade of zero in that exam.

## Special Needs Policy

Habib University is committed to ensuring that all students have the opportunity to take part in educational programs and services. The institution ensures that no individual with special learning needs or medical condition shall, solely by reason of the disability, be excluded from participation in, be denied the benefits of; or be subjected to discrimination under any program or activity.

Habib University aims to provide this opportunity in a manner that meets national and international best practices. For more details and application procedure, refer to the University's 'Reasonable Accommodations for Students with Special Needs' Policy.

## Graduation Requirements

A student applying for graduation must satisfy all University requirements, regardless of degree or major in which they are enrolled. Besides University requirement, they are required to fulfill program specific requirements identified by their respective programs.

### Curricular Requirements

- **University Liberal Core:** A student must complete all requirements of the Habib Liberal Core, as described in the Academic Catalog of the induction year.
- **Minimum Cumulative Grade Point Average (CGPA):** Students must have a minimum cumulative GPA of 2.33 at the time of graduation.
- **Minimum Credit Hours Requirement:**

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1 Subject to the requirements of the accreditation bodies, the minimum credit hour requirements

• Program / Major	• Minimum Credit Hours Requirement
<b>Social Development and Policy</b>	124
<b>Communication Studies and Design</b>	124
<b>Comparative Liberal Studies</b>	124
<b>Computer Science</b>	130
<b>Computer Engineering</b>	137
<b>Electrical Engineering</b>	134

- **Transfer of Credits:** All transfer of credits must be processed in accordance with the Habib University Transfer of Credits Policy, by the last day of enrollment of in the Spring semester of the fourth year.

For other curricular and program-specific requirements, please refer to the graduation requirement grid of the program in this catalog.

## Road to Graduation (R2G) Program Requirements

Students entering their junior/senior year must fulfill the R2G requirements to ensure their readiness, for their transition to the job market, graduate schools, or to launch their entrepreneurial venture. R2G requirements can be met by:

- Attending mandatory workshops, events, and activities organized by the Office of Academic Performance and the Office of Career Services;
- Developing the tools essential for their career transition.

## Intent to Graduate Submission Deadline

The deadline to submit the 'Intent to Graduate' form is the last day of enrollment in the Fall semester of the fourth year.

## Declaration of Minor(s) Submission Deadline

The deadline to file a Declaration of Minor(s) is the last day of enrollment in the Fall semester of the fourth year together with the 'Intent to Graduate' form.

## Good Standing

In addition to the aforementioned University requirements, a student must be in:

- Good Academic Standing as defined in the Academic Standing Policy stated in the Academic Catalog and any subsequent addendums;
- Good Conduct Standing as defined in the Conduct Standing Policy.
- Good Financial Standing as defined by the Financial Standing Policy.

## Consumption of Habib University Technology Services

Habib University has on board the top-notch technologies to fulfill the pedagogical, instructional research, administrative and mission development needs alongside an eye on the future to ensure continual improvement.

The use of technology resources (infrastructure and service) is a privilege that is extended to members 

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 may change for specific batches.





of the University community. The IT resources mainly include a digital card for access to campus spaces, a unique digital ID (single ID and password for all applications), dedicated WiFi network, local area network, personal computers in labs and the library, unified communication system (skype for business), student portal (gateway to technology systems and collaboration), Oracle PeopleSoft Campus Management Solution (manage academic administration needs), Sakai (virtual learning environment), Turnitin (formative feedback and originality checking system), Koha (library management system), audio/visual equipment, printers/photocopiers, IT policies/guidelines, and a service desk (central point of contact for queries and issues pertaining to facilities provided by the institution).

As a user, students have access to valuable University IT resources, to sensitive data, and to internal and external networks. Consequently, it is important for students to act in a responsible, ethical, and legal manner. In general, acceptable use means respecting the rights of other computer users and the integrity of the physical facilities.

The University encourages the use of electronic communications to share information and knowledge in support of the University's mission of education, research, and public service, and to conduct the University's business. To this end, the University supports and provides interactive electronic communications services and facilities for telecommunications, mail, publishing, and broadcasting. A safe and civil environment is necessary for students to be successful in their educational pursuits.

Cyber-bullying by any member of the HU community toward another individual constitutes conduct that disrupts the educational environment of the University. Examples of cyber-bullying include, but are not limited to, harsh text messages or emails, rumors sent by email or posted on social networking sites, and embarrassing pictures, videos, websites, or fake profiles. Cyber-bullying is prohibited by state law and jurisdictions throughout the international community and subject to disciplinary action.

In order to make the best use of the IT resources, an IT handbook (available on the Student Portal), and a dedicated webpage are accessible through University website to guide students through the essential IT systems and services which can be used on any device, anywhere at any time to excel beyond the bounds.

# The Habib University Liberal Core

The classic liberal arts model demands that the total undergraduate experience includes exposure to a broad and inclusive range of existing forms of knowledge. Through the Habib University Liberal Core Curriculum, we ensure that all of our students, regardless of major, conform to this high educational aspiration. No well-educated person should remain ignorant of the insight and perspective offered by the humanities and social sciences, or inarticulate about the wonder of scientific and mathematical inquiry.

Habib University has chosen the Liberal Arts and Sciences model of education because of its commitment to the development of leadership as an essential goal. At the core of our institutional identity is our flagship Habib Liberal Core Curriculum, that seeks to fulfill our motto of *Yohsin*: 'The worth of all humans is in the measure of their thoughtful self-cultivation.' As students mature, the Habib Liberal Core enables them to reflect on and articulate the most critical aspects of their experience in the world they inherit.

The Core begins with the systematic development of reading, interpretation, analysis, communication, and presentation skills that will continue to be honed throughout the students' undergraduate careers. The humanities and social sciences component of the curriculum is built around a multidisciplinary engagement with the history, structures, and features of the modern world. From colonialism to nationalism and the nation-state, from war to the global political economy, from the growth of modern media to science and technology, our Liberal Core is committed to a rigorous analysis and critical evaluation of modernity in all its complexity. An encompassing historical understanding is essential to a classic liberal education – one that our core curriculum provides with a critical modern edge.

The principle of *Yohsin* tells us that the cultivation of thoughtful self-awareness is an ancient and universal aspiration. What makes Habib University's Liberal Core unique is its simultaneous focus on Pakistan's distinctive intellectual inheritance and the enduring legacy of Western knowledge. To illustrate this commitment, all students are required to complete at least one course in a regional language. A mandatory Liberal Core course, *Jehan-e-Urdu* ('The World of Urdu'), investigates modern Urdu literature and criticism in order to illuminate crucial aspects of our modernity.

Finally, no modern education is complete without engagement with scientific thought. Science and scientific methods pervade all forms of inquiry as well as our everyday lives. The Habib University Liberal Core Curriculum includes mandatory courses in deductive and quantitative reasoning, natural scientific method and analysis, as well as the nature and place of science in modern societies.

The expanse and logic of the Habib Liberal Core are built on the seven *Forms of Thought/Action*. The seven *Forms of Thought/Action* that govern the Habib Liberal Core Curriculum have been adapted from Stanford University's Breadth Governance model to reflect the regional context. Below are brief descriptions and justifications of the *Forms of Thought/Action* that reflect and govern the curricular logic at Habib. All students are required to take a determined minimum of courses under each form of thought/action.





### **Historical and Social Thought (02 courses)**

The extraordinary significance of historical and social knowledge in modern times arises from the unprecedented pace of change in modernity, as well as the growing complexity of modern societies. Across the disciplines, Habib University's faculty also demonstrate a remarkably coherent historical approach to both social scientific and humanistic knowledge. All students will be required to take a minimum of two (02) courses in *Historical and Social Thought*.

### **Philosophical Thought (02 courses)**

The study of philosophy has traditionally been at the heart of all liberal core curricula. Philosophical thought serves to enhance the reflective powers of the student, which is essential to concept-generation and innovation in all fields. Furthermore, an understanding of the philosophical depth of a tradition is crucial to a shared sense of inheritance. The Habib University faculty also widely share an interest in philosophy/theory. All students will be required to take a minimum of two (02) courses in *Philosophical Thought*.

### **Language and Expression (02 courses)**

The development of linguistic and expressive abilities is widely recognized to be a key benefit of a liberal arts education, and language and literature have traditionally been as central to liberal core curricula as philosophy. Communicative power is one key to achieving success in all fields and disciplines. All students will be required to take a minimum of two courses under this rubric.

### **Formal Reasoning (01 course)**

Deductive thinking is crucial across fields and disciplines in both science and engineering, as well as the social sciences and humanities, and a deductive reasoning requirement is standard in higher and liberal education. Such a requirement also reflects the strength of our science and engineering faculty at the University. All students will be required to take a minimum of one (01) course in *Formal Reasoning*.

### **Quantitative Reasoning (01 course)**

Numbers and quantities are an essential part of modern civilization and its forms of knowledge. Quantitative reasoning is the ability to interpret and contextualize large amounts of data, and is an essential skill in virtually all professions. All students will be required to take a minimum of one (01) course in *Quantitative Reasoning*.

### **Natural Scientific Method and Analysis (01 course)**

The development of scientific method and analysis is a fundamental feature of modernity and its forms of knowledge. A natural science requirement is standard in higher educational and liberal institutions. To ensure the scientific literacy of all our graduates, students will be required to take a minimum of one (01) course in *Natural Scientific Method and Analysis*.

### **Creative Practice (01 course)**

Creativity is increasingly recognized as an important indicator of success, and it is often a required feature of the best higher educational curricula. Given the nature of our programs and faculty in both the School of Arts, Humanities, and Social Sciences (AHSS) and the Dhanani School of Science and Engineering (DSSE), we have an excellent opportunity to make creative practice a distinctive feature of the HU experience. All students will be required to take at least one (01) course under this rubric.

The above core requirements are fulfilled through a combination of compulsory and elective courses. Given the University's unique pedagogical mission, we are committed to a common curricular experience for the HU student body. The Habib Liberal Core Curriculum requirements are fulfilled through the following courses.

Forms of Thought	Courses
Historical and Social Thought (2)	CORE 102: What is Modernity? CORE 201: Pakistan and Modern South Asia
Philosophical Thought (2)	CORE 202: Hikma I CORE 301: Hikma II; or any other course designated by the University to fulfill this Form of Thought.
Language and Expression (2)	CORE 101: Rhetoric and Communication CORE 121: Jehan-e-Urdu
Quantitative Reasoning (1)	Approved courses*: SCI 101: Introduction to Sustainability ENVS 101: Climate Change and Us MATH 106: Music and Mathematics SDP 202: Quantitative Research Methods  EE 354: Introduction to Probability and Statistics  *Or any other course designated by the University to fulfill this Form of Thought.
Formal Reasoning (1)	CS 101: Programming Fundamentals CORE 111: Logical Problem Solving
Natural Scientific Method and Analysis (1)	CORE 200: Scientific Methods Or any other course designated by the University.
Creative Practice (1)	All students are expected to take a University approved course in Creative Practice.

## Core Course Descriptions

### CORE 101: Rhetoric and Communication

The command of language and the ability to communicate effectively in speech and writing is essential to leadership. This is why eloquence in the broadest sense is one of the most highly valued benefits of a liberal arts education. The opening course in our Liberal Core is designed to develop the reading and presentation skills that our students will need throughout their lives. Our curriculum nurtures our students' rhetorical abilities throughout their college career, especially through the Liberal Core. *Rhetoric and Communication* is designed to first identify the different aspects of expression and eloquence as distinct and essential abilities, and to develop and improve them through application and practice.

Explaining the combination of powers involved in the ancient division of rhetoric into invention, arrangement, style, memory, and delivery, the Roman orator Cicero says in his classic text on rhetoric, *De Oratore*: "Since all the activity and ability of an orator falls into five divisions, he must first hit upon what to say; then manage and marshal his discoveries, not merely in orderly fashion, but with a discriminating eye for the exact weight as it were of each argument; next go on to array them in the adornments of style; after that keep them guarded in his memory; and in the end deliver them with effect and charm."



The material, classroom experience, and exercises of *Rhetoric and Communication* are designed to cultivate all five of these critical abilities, together with sophisticated reading skills. Class content will focus on compelling and relevant texts that anticipate the themes of the larger Liberal Core, and they are chosen to elicit opinion and encourage discussion and debate. As they develop their powers of reading seminal texts, students will practice and improve communication skills through regular writing assignments as well as presentations. *Rhetoric and Communication* will also feature the ethics of discourse and communication, so that tact and respect for the other become an essential part of students' experience and understanding of rhetorical ability.

### **CORE 102: What is Modernity?**

No one in the medieval world thought they were 'medieval.' The belief that we live in a distinct period of world history – that of 'modernity' – sets us apart from all pre-modern peoples. It is a defining aspect of who we are, essential to our modern identities. It is thus imperative to the task of understanding ourselves and our world, and it is essential to the task of thoughtful self-cultivation. Habib University's pedagogical charter of *Yohsin* requires us to ask the questions: What is it to be modern? What is modernity?

Our 'modernity' is the very air we breathe. It encompasses, at an ever-gathering pace, all aspects of our lives. This is why the question of modernity has been a central concern across the range of disciplines and fields of the arts, humanities, and social sciences. This course will address the most important elements of our global and regional modernity today. Beginning with an investigation of the emergence of this unique *world-historical identity*, we then turn to the historical formation of key structures and features of the modern in the following domains: political modernity, economic modernity, modernity and ecology, and modernity and religion. By the end of the semester the historical character and specificity of these foundational spheres of our present will be visible.

### **CORE 201: Pakistan and Modern South Asia**

Nation-states – including that of Pakistan – emerged in the region of South Asia in the middle of the 20th century. How did such a world-historical event come about? What has it meant for the peoples of this region? In short, what is the history of our present – what is the history of our regional modernity?

This question takes on a particular urgency in Pakistan as the region passes through the current period of crisis and change. With a significant focus on the emergence and trajectory of Indo-Muslim nationalism and the creation of Pakistan, this course will be an overview of the modern history of South Asia from the immediate pre-colonial historical scene, through the colonial period, including the rise of anti-colonial nationalism and decolonization, to the Cold War and the contemporary period of transformation and turmoil.

Apart from the main outlines of the history of modern South Asia, students will also learn to place the region's colonial modernity within the larger framework of modern history. Students will learn to identify major features of the colonial economy, politics, and society under which – especially after the Great Rebellion of 1857 – regional religious and other social reform movements emerged, nationalisms formed, and the dramatic transformation of regional languages and traditions took place, processes that continue into the present.

Students will learn to see contemporary conflicts, ideologies, identities, and structures as specific to the modern period rather than as natural cultural expressions, and they will begin to see regional cultures and societies themselves as historical entities.

### **CORE 202: Hikma I – History of Islamic Thought**

After the interrogation of modernity in Core 102 and 201 in particular, Core 202 turns to a second metatheme of the Habib Liberal Core Curriculum: *the question of inheritance*. Ranging across philosophy, literature, history, law, and the arts, *Hikma I* is an encompassing survey of Islamic thought that seeks to give a sense of the historical and philosophical complexity and depth of the tradition, with significant reference to the region of South Asia.

In the module on 'Religion & Modernity' in CORE 102, and subsequently in our historical survey of socio-religious as well as nationalist reform and revivalist movements in the colonial period in CORE 201, students study the dramatic transformation and discursive constitution of 'religion' and 'culture' in the colonial-modern period. Both regionally, as well as in the global modern generally, 'Islam' and its cultures and societies, have also become particularly sensitive and difficult regions of the discursive landscape.

### **CORE 121: Jehan-e-Urdu (The World of Urdu)**

This course is designed to fulfill our commitment to the vernacular, as well as to reap the potential of modern Urdu literature and criticism to illuminate decisive aspects of our modernity. Jehan-e-Urdu is a pedagogically dynamic course that will rapidly advance students' appreciation and knowledge of Urdu through engagement with powerful texts of prose and poetry selected to speak to the concerns of the student today, opening up Urdu as a living world of insight and thought.

### **CORE 200: Scientific Methods**

How do we make decisions? How do we evaluate information? Should we trust all information? How should we decide which information is trustworthy? How do we recognize the limitations of a claim? These matters are not only for practicing scientists but form an important part of our daily lives. At a time when information is more easily accessible than ever before, how do we intelligently utilize available information in making choices? How should we develop our evidence-based decision-making skills? This course builds on the foundations of scientific methods of inquiry and works to apply them to our everyday lives. Utilizing a wide array of examples, it illustrates scientific methods and their applications.



# Social Development & Policy

## BSc (Honors) Social Development & Policy

### **FACULTY MEMBERS:**

#### ***Full-time faculty***

Aaron Patrick Mulvany, Associate Professor

Aqdas Afzal, Assistant Professor, Program Director

Massimo Ramaioli, Assistant Professor, Assistant Dean, AHSS

Mohammad Moeini Feizabadi, Assistant Professor

Muhammad Zulqurnain ul Haq Qazi, Lecturer

Noman Baig, Assistant Professor

Sadia Mehboob, Lecturer

Sana Khalil, Lecturer

Severine Minot, Assistant Professor

Shama Dossa, Associate Professor

Tajreen Midhat, Lecturer

#### ***Adjunct Faculty***

Farhan Anwar

### **VISION:**

“Development” has become a principal idea of our times and an object of aspiration for individuals, communities, and governments alike. One of the key questions we grapple with in the program is “How can we examine and engage with development as a multi-faceted process of social, economic, and political transformation while attending to context and ethical practice?” Responding to this key concern, the central vision of the Social Development and Policy (SDP) program at Habib University is to nurture an inter-disciplinary and comprehensive understanding of development and social change— one that is firmly rooted in an ethic of care and grounded in a sense of place. A careful, place-based understanding is deeply connected to the love of knowledge. Moreover, this sensibility is fundamentally tied to Habib University’s philosophy of Yohsin, the practice of thoughtful self-cultivation.

To fulfill this vision, the undergraduate major in Social Development and Policy combines rigorous classroom training in the social sciences and humanities with reflective, experiential learning through a practicum and practice-based courses. The first program of its kind in Pakistan, it aims to give students new ways to approach the challenges of development at home and abroad. Students are exposed to seminal ideas in social and economic thought that will enable them to understand and critique the processes of economic growth, development, and social change. They explore how major development concerns such as poverty, gender inequality, urbanization, and human rights are shaped by historical forces and processes of political power, while also examining the role of states, development institutions, markets, and civil society in shaping human well-being.

The program integrates perspectives and skills drawn from a wide range of disciplines, including anthropology, history, economics, sociology, political science, religious studies, philosophy, literature,

and Environmental Studies. In this way, the program equips students with interdisciplinary thinking and analytical skills that will allow them to understand and tackle a range of problems and challenges in their professional and scholarly careers

Offering critical insights into the core values of development and progress, the SDP major will train a new generation of social scientists who – like the best development practitioners – incorporate lived experience and vernacular sensibilities, into policy design at the national and international levels.

### **REQUIREMENTS FOR THE MAJOR - Class of 2023**

All students majoring in Social Development and Policy are required to complete a total of 35 course requirements. Students must maintain a minimum grade of C+ (2.33 GPA) in SDP major credit requirements in order to graduate with this degree. All SDP majors must complete the following six (06) courses

- SDP 101 Development and Social Change
- SDP 201 Qualitative Research Methods (QRM1)
- SDP 202 Quantitative Research Methods (QRM2)
- SDP 203 Social Theory
- SDP 301 Public Policy
- SDP 303 International Political Economy (Mandatory Elective Choice)

Students must also complete any two upper-level SDP electives. In addition to these courses, all SDP students must fulfill a language requirement, a Practicum, and a Capstone Project – Senior Research Seminar or an Honors Thesis, to complete the program requirements.

### **Language Requirements**

All students at Habib University must complete CORE 121 *Jehan-e-Urdu*, as part of the Habib University Liberal Core requirements. All SDP majors must also fulfill a vernacular language requirement by successfully completing at least three (03) sequential courses in a single language, for example Sindhi or Punjabi. For full language offerings, refer to the CLS Program Section in this Catalog.

### **Practicum**

All SDP majors are required to complete a Practicum, which is an application of the skills and competencies learned in SDP program. This Practicum must be a minimum of six (06) weeks and can be broadly construed in consultation with an assigned practicum adviser.

### **Capstone/ Senior Research Seminar**

All senior students in the Social Development and Policy program must enroll in at least one (1) Senior Research Seminar coded at the 400-level. For most students, successful completion of the requirements of this course will fulfill the capstone requirement.

### **Thesis**

Students desiring more rigorous research may pursue a thesis, which will be completed as an



independent, supervised study completed in their final semester. Students pursuing the thesis, must have a minimum CGPA of 3.5. Thesis is a much more substantial research project in which the student will explore a topic, building on existing knowledge by using qualitative and/or quantitative techniques. Thesis writing is an exercise in developing in-depth research that speaks broadly to the social, cultural, and/or economic issues of contemporary societies. The Honors Thesis must be guided by a committee comprising of at least one (01) faculty member. Students intending to complete an Honors Thesis must declare their intention at the beginning of their final academic year and submit a prospectus at the end of their penultimate semester. To be considered for a Thesis with distinction, a student must enter their final semester with a minimum CGPA of 3.5, and have earned a minimum grade of A- in both their senior/research seminar and thesis.

### Degree Requirements for the Major

Course Category	Number of Courses to complete
University Core	10
Foundation Theory Method	6
Field Practice	1
Elective (at least 3 upper division)	6
Capstone Project/Senior Research Seminar (2 Upper Level Electives)	1
Thesis	1
Regional Language Requirement	3
AHSS Requirement	2
Free electives	5
<b>Overall</b>	<b>35</b>

### REQUIREMENTS FOR THE MINOR

To earn a minor in SDP, students must successfully complete *Development and Social Change*, *Qualitative Research Methods (QRM1)* or *Quantitative Research Methods (QRM2)*, and *Public Policy*. Students must also take two SDP electives, one of which must be an upper-level course (300 or 400).



## **COURSE DESCRIPTIONS**

### **Mandatory Courses – SDP Core Courses**

#### **Course: SDP 101 Development and Social Change – 2 hours; Credit hours: 4**

This is an introductory course in social development and provides an overview of ideas, theories, and concepts as well as a discussion on critical development challenges. This includes issues of urbanization, food security, migration, intersectionality and gender, as well as wars disasters and conflict. The purpose of this course is to answer key questions about development and social change by introducing students to the history, theory, and the contemporary practice of development. The concept of 'development' will be defined within the broader field of social sciences. We will be shifting the analytic focus from instrumental outcomes of development policies to the meanings, implications, and consequences they have as expressions of societal beliefs and values.

**Fulfil: SDP Core**

#### **Course: SDP 201 Qualitative Research Methods (SDP Major) – 2 hours; Credit hours: 4**

Combining theory and hands-on practice, this course will expose students to key approaches and methodologies of qualitative research methods in the social sciences. Students will understand when and how qualitative research methods are used and combined. They will learn and practice a variety of methods and tools including participant-observation, interviews, focus groups, and discourse analysis. Alongside, they will study and debate the ethical complexities of conducting scholarly research and implementing both research and development projects.

**Fulfil: SDP Core**

#### **Course: SDP 202 Quantitative Research Methods (SDP Major) – 2 hours; Credit hours: 4**

Quantitative Research Methods will introduce various techniques of quantitative analysis used within social sciences. This is a foundational course to teach basic mathematical and statistical techniques used in social science research. Students will cover several topics including functions, graphs, mathematical relationships, and statistics and probability, among others, to best equip students with analytical methods for use both in the classroom and the field with a specific focus on survey research. This course will also prepare students to take higher level quantitative research methods courses offered in the program.

**Fulfil: SDP Core**

#### **Course: SDP 203 Social Theory (SDP Major) – 2 hours; Credit hours: 4**

This course introduces students to foundational concepts and theories in the social sciences. Starting with enlightenment thinking and the emergence of positivism and empiricism, this course tackles this major transition in the way social order is conceptualized and theorized. Students will be exposed to key social theorists, including Marx, Weber, Durkheim, Fanon, and Freire as well as some of their legacies. Students will tackle different levels of analysis, understand structural forces and societal dynamics, and engage in social interaction analysis from a social-psychology perspective, in contrast to the grand theory tradition.

**Fulfil: SDP Core**

#### **Course: SDP 301 Public Policy (SDP Major) – 2 hours; Credit hours: 4**

The purpose of this course is to introduce students to the world of public policy. The concepts of "public" and "policy" will be critically defined within the broader field of governance. Students will





engage in an analysis of the genealogy, conditions of existence, and effects of specific policies in various sectors. Our approach to this course will be anchored on mixed methods, including critical humanist, and positivist approaches. Students will be exposed to reading material from a wide variety of disciplines. We will consider the empirical dimensions of policy building and impact from the perspective of multiple interpretive communities.

**Fulfils: SDP Core**

**Prerequisites: SDP 101, SDP 201, or SDP 202.**

**Course: International Political Economy (SDP Major) – 1.5 hours; Credit hours: 3**

Students majoring in SDP will have to fulfil this requirement as a mandatory elective, by completing one third-year elective course, which tackles the dynamics of *International Political Economy*. Various options will be offered yearly to allow students to complete this requirement.

**Fulfils: SDP Core**

**Prerequisites: SDP 101, SDP 201 or SDP 202.**

### Regional Language Requirements

#### **LANG 101 Sindhi Sikhiya I**

This introductory course introduces students to the Sindhi language. It covers the fundamentals of Sindhi Language including the basic competencies in reading, writing, and speaking.

#### **LANG 201 Sindhi Sikhiya II**

This intermediate course enhances students' reading and writing skills in the Sindhi language. Students will be exposed to folklore rhymes, folk songs, fables and tales, and poetry. The course will introduce major Sindhi language Sufi poets and prose writers from 1843-1947. At this level, students will learn to contextualize readings in a larger Sindhi cultural context.

#### **LANG 301 Sindhi Sikhiya III**

This advanced level course aims to equip students with more in-depth reading and writing skills in Sindhi language. The students will read classical and colonial Sindhi poets and fiction writers, and will develop interpretative tools to understand Sindhi literature and culture.

#### **LANG 102 Punjabi Rachna I**

*Punjabi Rachna* will enable students to develop a basic understanding of the Punjabi language in the context of Punjabi culture, idioms, linguistics, and literature. This is the first of a three-course sequence, with each module being interlinked in a systematic flow starting with an emphasis on linguistics, moving on to literature, and finally to history of the Punjabi language.

#### **LANG 202 Punjabi Rachna II**

*Punjabi Rachna II* is a continuation of *Punjabi Rachna I*. Students will hone their Punjabi language skills further and be exposed to more complex literary forms.

### **LANG 302 Punjabi Rachna III**

*Punjabi Rachna III* is the final course of the required Punjabi language sequence. Students will acquire advanced skill in reading and writing Punjabi. They will be exposed to advanced literary forms and genres.

### **Other Program Requirements**

#### **SDP 302 Practicum**

The major purpose of the practicum is to enable students to acquire skills and competencies in their interaction with individuals, communities, development agencies, and organizations. Moreover, students are expected to contextualize their learning as the practicum allows students to select agencies working on a range of thematic areas. Students will complete a specified number of hours and meet other practicum requirements. Although every practicum experience will be different, learning outcomes will include building networks, engaging in advocacy, and working with various stakeholders.

#### **Research**

Students majoring in SDP will have complete at least one (1) Senior Research Seminar coded at the 400-level, successful completion of the requirements of this course will fulfill the capstone requirement.

Students desiring more rigorous research may pursue a thesis, which will be completed as an independent, supervised study completed in their final semester. Students pursuing the thesis must have a minimum CGPA of 3.5.

### **Fall 2020 Offerings**

#### **SDP Electives**

#### **ECON 101 - Principles of Microeconomics – 1.5 hours; Credit hours: 3**

Economics studies the social construction of the material side of our life. A focus on production and exchange distinguishes economics from other social studies focused on culture (the concern of anthropology), government and state policy (political science), or social networks (sociology). Focusing on the social organization of production and exchange distinguishes economics from engineering and psychology. Economics examines production as a social process where people work with each other, often exchanging or sharing the products of their labor. In microeconomics, we focus on how individual economic decision makers -- households, firms, workers, and the government – made economic choices, and how these decision makers interact with each other through markets and other social institutions such as class. Our goal in this course is to take some initial steps towards understanding how each part of the economic system works, how the parts work together, and to apply this knowledge to a broad range of social and economic issues.

**Fulfil: Core Liberal & Economics and Management**

#### **SDP 200 - Introduction to Statistical Analysis – 1.5 hours; Credit hours: 3**

This course is about understanding basic rules of data analysis and grounding human enquiry in a systematic manner amid uncertainty. It teaches students how data generating processes work, how



to compute, analyze, and interpret inferential procedures. Using statistical inferential procedures, it teaches how critical decisions about future are made with the help of randomly drawn samples that could either be very large or very small. The course is designed to create a foundation for conceptualizing diverse paradigms in quantitative reasoning. Some motivational questions, for example, are as follows: How do we know that certain differential outcomes are purely due to discrimination? Can small-scale surveys accurately predict future events? How can we tell certain social policies are going to be fruitful? Specifically, for example, in public schools, will free lunches help increase female enrollment rates? Similarly, how can we tell other social policy will not backfire? For example, how do we know that mandatory schooling will not increase son-preference? A quantitative approach to find answers to these questions will entail meticulously designed surveys and experiments to collect, analyze, interpret, and review data. Knowledge of concepts such as expectations, variance, central limit theorem, etc. could be indispensable to certain enquiries. Broad learning outcomes of this course are as follows:

- i. Develop analytical reasoning. Using graphs, charts and tables, students will be engaged in finding patterns and drawing general conclusions.
- ii.

Introduce students to real-life problems and help them develop their answers using appropriate statistical models for estimation and inference

iii. Develop a foundation for more advanced techniques in data analysis, which may be covered in later courses in applied form, e.g. Quantitative Research Methods (QRM) which develops the command over a Statistical software package for data analysis. Students taking QRM are strongly advised to take this course. Introduction to Statistical Analysis is specifically designed to improve the theoretical side. Like QRM, this course is ideal for students who eventually want to go into research and development oriented private or public institutions, or those who want to pursue graduate studies with a quantitative flavor.

#### **Fulfil: Core liberal & SDP Elective**

#### **DEV 200 - Development and Environmentalism – 1.5 hours; Credit hours: 3**

This is an introductory course and it will provide an introduction to ideas, and theoretical debates about environmentalism and how it is variously perceived and understood. The course critically examines the development of environmentalism as a global issue, and its implications for economic and social development in the 'South'. This course will not look at environmental problems from the lens of physical environmental science. Instead, it will be a political analysis of environmental problems and the implications on social and economic development in the South.

#### **Fulfil: SDP Elective**

#### **DEV 200 - Gender Inclusion & Analysis in Development Policy – 1.5 hours; Credit hours: 3**

Why are females head of the states so popular in fighting with the COVID pandemic? Why is there so much resentment against inclusion of women in economic life in developing world? As Policy makers what are we missing as a developing country, in terms of gender in policy making? In order to answer these and many other important questions related to gender and development policy, this course explores the gender dimensions of economic life by introducing students to the rich body of research on gender-aware analyses of household economics, violence against women, work (paid and unpaid), labor markets, poverty, inequality, public policy, markets development, formal and informal employment; policies addressing work-family life balance and social issues by looking at developed and developing countries as examples. The focus of this course will be on the history of women empowerment and inclusion or exclusion of gender in mainstream policy making, how the 21st Century policy making is tackling such issues in development practice and how fruitful are the results. In short, this course will equip you to look at policy making at micro level by introducing you to very important issues of gender and how to fight them.

**Fulfil: Core liberal & SDP Elective**

**SOC 201 - Socialization and Cultural Identities – 2 hours; Credit hours: 4**

This is an interdisciplinary course, which combines conceptual and theoretical notions drawn from psychology and sociology (social psychology), and the broader foundations of cultural studies and social philosophy. This is a fundamental course for those interested in understanding the processes that shape our ways of being, thinking, acting. It looks at the construction of the self, first in clinical terms, and moving on to intellectual, moral and social terms. Questions such as “Who are we?” and “Why we are the way we are?” are at the core of our inquiry into the formation of individual and collective identities. The toggles between nature and nurture, and between structure and agency, represent the constant negotiation of individuals and collectives in defining themselves, usually according to parameters consisting of socially produced categories, institutional practices, norms, expectations, traditions, ideological discourses, and a complex system of rewards and constraints, which are produced and experienced in context, as the general conditions of one’s “located” existence. Those interested in identity politics, mental health, marginality and “deviance,” social roles, conformity Versus difference, power dynamics, relational hygiene, counseling, or “caring” and “healing” work, will find this course useful.

**Course Synopsis:** This course is based on a thematic progression, which introduces students to the topics of socialization, infancy and stimuli/exposure, the unconscious/subconscious, behavior and the learning of patterns of practice, family socialization and parenting in cultural contexts, cognitive development and knowledge, schooling and peer socialization, gender conditioning and morality, the self, identity and life stages, habitus (dispositions) and forms of capital, language socialization, religious socialization, national identities and globalization, consumer socialization, as well as mass media and social control. All these themes will be the subject of student presentations, coupled with class debate and followed by exercises of introspection and sharing/writing, either individually, in pairs or small groups. The classroom must be a safe place and great emphasis will be placed on ethics, and on the privacy of confidential information shared in the class. Students will be exposed to the work of Freud, Skinner, Piaget, Kohlberg, Gilligan, Bourdieu, Chomsky, Berger and Luckman, among many others.

**Fulfil: SDP & Free Elective**

**SDP 300 - Advance Quantitative Research Methods – 2 hours; Credit hours: 4**

- Present data using graphics and descriptive statistics in a clear and informative manner. Apply basic concepts from probability theory to social science research questions.
- Describe the threats to making causal inferences from observational data and identify how they could change the conclusions of a study. Make inferences about the distribution of populations based on a sample.
- Correctly conduct and interpret hypothesis tests.
- Understand linear regression in theory and practice (i.e., be able to read and interpret regression tables in academic articles).
- Independently gather, analyze, interpret, and present your own data.
- Practice Stata, Stata data sets, Demographic Health Survey, and other data sets.
- Learn Experimental Research Methods, Panel Data Analysis, Regression Analyses suiting varying contexts and methodologies.

Students will learn how to conduct their own econometric analysis, effectively communicate results from a regression analysis, and critically evaluate applied research. Throughout the semester, we will analyze data and generate results using Stata. Most classes will include time spent in the computer



lab gaining hands on experience with data analysis. No previous use or knowledge of Stata is required.

**Fulfil: Core liberal & SDP Elective**

### **ECON 222 - Environmental and Natural Resources Economics – 1.5 hours; Credit hours: 3**

According to Global Climate Risk Index (2017), Pakistan was the seventh most-affected country by extreme weather events for the period 1996-2015. At the same time, Pakistan's environment and natural resources are facing a lot of pressure from the country's significant population growth. Linkages between climate change, the ecology, natural resources and economic growth necessitate a careful analysis of how humans utilize natural resources—drawn from the ecological system—for economic production so that the rate of climate change can be mitigated, while also ensuring the conservation of the ecology as well as natural resources. This course will focus on using an economic perspective to carefully analyze the mentioned linkages. Some topics that will be covered include: climate change, resource and pollution management models, sustainable development and economic growth.

**Fulfil: SDP Elective**

**Prerequisite: SDP 101 Development and Social Change**

### **Dev 266 - Urban Planning – Past, Present & Future – 1 hour 15 minutes; Credit hours: 3**

The *Course* aims to inculcate in students an understanding of how triggers, both internal and external, having political, socio-economic, and environmental factors shape the design of cities – how challenges have been met (successful case studies) and how we can place this understanding within the context of Karachi City. More relevant to the debates around the specificities of 'southern urbanism', the core focus of the *Course* would be on themes of 'urban equity' and 'inclusivity' – How the development profile in Karachi relates with an understanding of 'urban equity' – How fragmentation within an urban context based on class, gender, ethnicity gets reflected in the physical and social construct of the city – and the larger implications for urban resilience and sustainability. The students would be able to bring a 'theoretical' understanding of key aspects of 'urbanism' to two particular areas of sustainable urban growth – Public Space Design and Urban Mobility. Using the methodologies and approaches of 'Human Centered Design', within this specific context – they would be understanding critical considerations of inclusive public space design and urban mobility that would include discussion on issues of gender, equity, considerations for climate change and how these considerations fit within the larger understanding of sustainable city design – how all this gets incorporated in an inclusive and participatory planning process.

**Fulfil: Quantitative Reasoning, Formal Reasoning, Natural Scientific Method and Analysis, and Creative Practice**

### **ECON 301 - Marxian Economics – 1.5 hours; Credit hours: 3**

The course will introduce students to the study of capitalism as a social formation, the core of which is capitalist mode of production. The course will try to weave two separate but related strands together into a coherent narrative about capitalism: one, a theoretical analysis of the capitalist mode of production, and two, a historical account of the emergence of capitalism from the womb of the feudal mode of production in Western Europe. After a historical overview, we will begin the concept of primitive accumulation, and then we will continue with an analysis of the commodity, and in the next step, we will move on to studying capital and surplus value. Understanding how surplus value is generated and appropriated under capitalist social relations will be one of the main goals of this course. The process of circulation will occupy us in the next part of the course, which we will close with a discussion of the theory of capitalist crises. We will end the course with a brief discussion of alternatives to capitalism.

**Fulfil: SDP Free Elective**

**Prerequisite: ECON 101 Principles of Microeconomics**

**ECON 313 - Political Economy of Development – 1.5 hours; Credit Hours: 3**

“Development” has come to signify different concepts for different people. Where some economists and development experts consider development to be primarily composed of economic growth, others, like Amartya Sen, focus on linking development with enhancing human “capabilities.” At the same time, experts have highlighted different mechanisms through which development objectives can be achieved. Where some promote a free market or “invisible hand” approach, others argue for state-led or “statist” economic growth and development policies. In other words, development cannot be separated from the political and economic dimensions and thus it is extremely important to understand the political economy context of development—why do experts prescribe the policies they do? Are there any hidden agendas? In this course, students will examine and analyze various ways in which development has been interpreted. Students will also develop a purchase about the political economy of development as well as the economic challenges faced by emerging economies (read: developing countries). This course will cover topics such as historical and contemporary theories of development, climate change, environment, balance-of-payments issues etc., while exposing students to the role of states, nongovernmental organizations corporations, and communities in charting the development trajectories of different nations.

**Fulfilis: SDP Core**

**Prerequisite: SDP 202B Quantitative Research Methods**

**SOC 321 - Methodologies in Gender & Sexuality Studies – 2 hours; Credit hours: 4**

This class will cover advanced methodological notions relevant to analyzing a host of themes related to sex, gender and sexuality. THIS IS A READING INTENSIVE CLASS. It is preferable, but not absolutely necessary for students enrolled in this class to have completed the SDP course in “Social Theory.” Various methodological paradigms will be covered in order to render analytical complexity in matters related to sex, gender and sexuality. Each week, students will be required to apply a different methodological paradigm to a specific social, political, economic and/or cultural issue related to the key themes for this course. While exploring these key themes, students will come to understand the benefits and limitations of different methodological frameworks, while fostering a sense of perspective that is vital to a broader understanding of power relations, structural inequalities, stereotyping, institutional dogmas, interpersonal negotiations, practices of representation, social change, etc. This course is highly recommended for anyone doing research on gender issues, including but not restricted to topics such as women’s rights, socialization into gender roles, gender-based violence and discrimination, gender and transgender subjectivity, gender rights, sexual orientation and heteronormativity, etc. Among the themes and paradigms covered, this course will include:

- Sex assignment and the bio-medical paradigm.
- Gendered socialization and the dramaturgical paradigm.
- Gender and sexual identities, and symbolic interaction.
- Sexual mutilation and sexual violence and phenomenology.
- Gendered divisions of labor and the conflict and post-marxist paradigms.
- Suffrage, emancipation and patriarchy and the liberal Vs radical feminist paradigms.
- Colonial legacies, technologies of governance, the regulation of bodies and post structuralism.
- Religious institutions and doctrines, and historical materialism.
- Marriage and family forms and the functionalist paradigm.
- Sexual health and inequality, and the social development paradigms.
- Intersections with class, race/ethnicity, age, and nationality, intersectionality and postmodernism.
- Gender and sexuality in the media and social constructivism; and · Gender and sexuality across cultures and cultural relativism.





## **Fulfil: SDP & Free Elective**

### **DEV 322V- Introduction to Program Planning and Design – 1.5 hours; Credit hours: 3**

A key skill set for all those who would like a career in social development and policy is learning how to design and assess a good quality funded development program/project. This development practice course provides students with an opportunity to develop practical skills in program and project planning and design.

#### **Fulfil: SDP Elective**

### **Prerequisite: SDP 201 Qualitative Research Methods & SDP 202B Quantitative Research Methods**

### **SDP 400 - Contemporary South Asian Intersectional Theory – 1.5 hours; Credit hours: 3**

Intersectional and critical theory has been increasingly used to explore and make sense of marginalized identities in South Asia. Building from a foundation of several key texts in feminist, critical race and queer theory, this course will provide students the opportunity to engage deeply with contemporary currents of intersectional and queer theory in South Asia, providing both a framework for understanding its history, and development as well as a forum for students to practice its application. Together we will critically assess the consequences of certain intellectual traditions and the ramifications on culture, policy, and academia, in the subcontinent and beyond.

#### **Fulfil: SDP Core & Elective**

### **ANT 400 - Anthropology of Trade – 2 hours; Credit hours: 4**

The trade has a long history in human civilization. From camel caravans to economic corridors, from shipping to air cargo, trade has been seen as a social and an economic process of connecting people, places, and ideas together. While it has formed a complex web of commodity flows in the last two hundred years, trade has also brought misery and agony to millions. The infamous 'Triangular Slave Trade,' for example, that operated from 16th to 19th century in the Atlantic was the darkest period of abduction, ransom, and looting, that human has ever seen. In the last few decades, especially with a massive Chinese One Belt One Road project, we are witnessing a renewed significance of trading. In Pakistan, the Chinese Pakistan Economic Corridor known as CPEC has already generated an imagination for a better future among the middle class of the country. It has become a mantra among the ruling elite the more we exchange things the more peace it will bring. For instance, trading is dubbed as a panacea for India Pakistan rivalry. While such macro level trading happens between states, the more grounded trade such as *khaip* in South Asia, kula ring in Micronesia, and potlatch in British Columbia shows different modalities of exchange at an everyday level. These exchanges are not always guided by rational economic models of self-maximization. Rather it operates on a different principle of reciprocity that does not get easily mapped onto economic principles.

Within this context, this course seeks to explore a cultural logic of exchange. It investigates what noneconomic factors, apart from monetary gains, shape exchange of things. Under which value system do people reciprocate? The objective of the course is to rethink the ways in which economics has been practiced on an everyday basis. In the first few weeks, students will read some of the classical anthropological scholarship on exchange. The second module focuses on historical trade networks, and explores how commercial networks have been shaping the cultural and geographical imaginations in the region. Finally, in the last few weeks, students will investigate trade through commodities such as "people," sugar, and cotton.

#### **Fulfil: SDP Free Elective**

### **SOC 411 - Methodology, Fieldwork & Thesis Composition – 2 hours; Credit hours: 2**

This course aims to guide seniors in the preparation and conduct of a final year research project, whether formally a capstone or thesis, or any other research project. It provides structure to ensure the highest quality in undergraduate research production. This is part 1 of a 2-part course. The

course will be student-centered and allow Seniors to acquire depth and breadth of understanding with regards to the following:

- How to write a research proposal.
- Writing a literature review.
- Choosing a methodological frame -which implies exploring the applications of theories, paradigms and key concept.
- Choosing appropriate methods whether qualitative and/or quantitative, or whether involving only:
  - meta-analysis of existing literature
  - Developing data gathering tools, such as interview guides, surveys, observational grids, etc.
  - Sampling methods;
  - Considering ethical issues related to the research, along with risk mitigation strategies;
  - Drafting a consent form and other research related agreements;
  - Conducting fieldwork, and recording data in a systematic manner, allowing for an audit trail.

Part 2 of the course offered in spring will continue with:

- Data Management and Analysis
- Coding, Mind Mapping, Graphic Representation;
- Drafting and Reporting on findings; and Thesis/Report Formatting.

**Fulfil: SDP & Free Elective**

#### **SDP 411 - Advance Topics in Qualitative Research Design – 2 hours; Credit hours: 4**

This course is geared towards developing advanced skills in qualitative research design with a focus on three cutting edge approaches from a critical lens – feminist research; participatory approaches and arts in qualitative research. It builds on the introductory qualitative research course which focuses more on methods. This Course aims to provide a clear link for students between developing a research question; a theoretical lens; methodology; data analysis and representation. It is assumed that those registering for this course have relatively clear research question formulated which they think can be answered by a qualitative methodological approach. Students are expected to conduct an exploratory study and write a journal article styled research paper.

**Fulfil: SDP Elective**

**Prerequisite: SDP 201 Qualitative Research Methods, SDP 202B Quantitative Research Methods, SDP 203 Social Theory**

#### **ANT 101 - Introduction to Cultural Anthropology – 1.5 hours; Credit hours: 3**

The course introduces students to the intricacies of human cultures and highlights the interlacing of cultural patterns with the forces of modernity. For instance, how do gift-exchange practices of local communities help us understand the politics of international aid? How do rituals of magic explain the commodity fetishism of capitalism? Does understanding cultural theories of identity help us rethink notions of the modern developmental subject? Does tribal social organization undergird or conflict with the modern nation-state? Addressing questions like these will provoke students to think critically of culture as an important tool for making sense of patterns of contemporary social development.





## **Fulfil: AHSS Core - Historical and Social Thought**

### **POLI 102 - Introduction to Political Science – 1.5 hours; Credit hours: 3**

The course aims to provide an introduction to the study of politics. It will address first the main concern of the discipline, i.e., the analysis of the nature and features of social power and the features of some of the most important contemporary political institutions. The subfield of Comparative Politics informs the approach of this course, as it deals with political regimes and issues across different countries. More specifically, the course addresses themes such as the nature of social power, state and civil society, regime types (authoritarianism, democracy, hybrid regimes), democratic institutions and democratization, security, political ideologies, political economy, and contentious politics (revolutions, political mobilization, etc.)

### **POLI 200 - Pakistan Institutions and Youth – 1.5 hours; Credit hours: 3**

Pakistan Institutions and Youth will provide students a comprehensive and critical understanding of institutional structures in Pakistan. The course will draw from Pakistan's political, administrative and constitutional history and build students' understanding of their current functioning and significance. The course will further build the concept of citizenship and youth political participation to enable students understand their agency against state structures. This course will also provide students insights into state procedures ranging from federal to provincial and later to local level institutions in detail. Without a sound understanding of institutions and citizenship, one cannot completely comprehend social development.

## **Fulfil: SDP Elective**

# Communication and Design

## BA (Honors) Communication and Design

### FACULTY MEMBERS:

#### **Full-time faculty:**

Zain Saeed (Assistant Professor),  
Dr. Marco Grosoli (Assistant Professor),  
Muqem Khan (Associate Professor of Practice),  
Zahra Malkani (Assistant Professor of Practice)

#### **Adjunct faculty:**

Momin Zafar,  
Mariam Aziz,  
Ahsen Ali,  
Anser Shaukat,  
Haya Fatima Iqbal,  
Sheikh Taha Munir,  
Adil Siddiqui

### VISION:

The program in Communication and Design allows students to construct an interdisciplinary major in the arts and humanities that integrates historical investigation, critical analysis, aesthetic practice and social engagement. Our faculty are committed to engaging students in a conversation as much about the histories, theories and praxis of communication and design as about critical contemporary challenges that define our future.

Foundational courses in Communication and Design introduce students to a range of texts, movements, theorists, artists, designers, filmmakers, and writers from diverse cultures and historical periods, thereby training them in the close, comparative study of different artistic, cultural, and social forms. Studio practice – broadly understood through the hands-on production of film and photography, illustration and type, animation and new media – forms an essential component of the first two years of coursework so that students can learn how to craft image and idea even as they refine their critical and historical sensibilities. Our graduates will be alive to the transformative capacities of media and design, and will learn to apply their expertise with deliberate care, purpose, and responsibility.

In short, our mission is to train thoughtful, articulate, sophisticated practitioners who exercise critical judgment in the creation of work that challenges preconceptions and generates discussion that effects positive change in the lived world.



## REQUIREMENTS FOR THE MAJOR - Class of 2023

All students majoring in *CND* are required to complete a minimum of **36** courses (min **125** credit hours).

### Degree Requirements for the Major

Course Category	Number of Courses to complete	Credit hours
<b>University Requirements</b>		
University Core	10	32-40
<b>Communication &amp; Design (15)</b>		
CND Core	7	21-24
CND Electives	8	24-32
<b>Other Requirements (9)</b>		
Social Policy & Development (SDP) electives	1	3-4
Arzu Program for Languages & Literature electives	2	6-8
Other AHSS/Non-CND Elective	2	6-8
Free electives	6	18-24
<b>Overall</b>	<b>36</b>	<b>110-140</b>

### 1. CND CORE

#### 1. CND Core 1

One of the following or as designated. The semester in which these courses are offered is in parentheses.

- CND 105 Shaping Modernity (1)
- CND 106 Forms of Inquiry (2)
- CND 126 Communication & Culture (1)

#### 2. CND Core 2

One of the following or as designated:

- CND 226 Thinking Media (4)
- CND 242 Feminist Technology (3)
- CND 225 Frankfurt and Beyond (3)

3. Approved Intermediate Practice Course
4. CND 301 TransDesign Practicum (5)
5. CND 311 Elements of Aesthetics (6)
6. CND 491 Design Research I: Capstone Seminar (7)
7. CND 400 Design Research II: Capstone Seminar (8)

**2. CND Electives:** To fulfill their **8** CND Elective requirements, students must take **5** Lower-Level Electives (100 and 200) and **3** Upper-Level Electives (300 and 400) from the courses offered.

**COURSE DESCRIPTIONS for FALL 2020 and SPRING 2021 as approved by the BOF**

**FALL 2020**

**CND 126 – Communication and Culture; Credit hours: 4**

The course is meant to lay down the foundation in culture theories and contextualize the overarching field of communications and cultural studies. This course serves as a launch pad for further specific area studies, equipping the students with specific terms and theories that will be repeated again and again, in their degree. The course covers a wide array of topics in a fun and engaging manner. We will try to understand how culture was once the act of cultivating crops and domesticating animals and has over the years become a domain of arts and crafts. From the Industrial revolution to ever-popular memes, from classical music to K-Pop, students must brace themselves for a learning experience that merges history, technology, culture, communication and ends at the much-debated creative industries and creative economy.

**CND 121 – Introduction to Photography; Credit hours: 3**

This course explores the basics of photography and covers how photography plays an integral part in today's society. The course will also cover the history of photography to the working of a camera. Understanding of light is key. The world and everything in it, is perceived through reflected light. The course has been designed to introduce you to basic photography techniques as well as expanding your knowledge on photography.

**CND 135 – Introduction to Film Production; Credit hours: 3**

The course will introduce students to learn the fundamentals of cinematic language including various techniques and processes of film production in preparation for more advanced film courses. The course is organized through a series of exercises, which will help students explore a variety of cinematic methods through hands on practice with film equipment including the camera, lights, sound, and editing software.

**CND 137 – Foundations of Screenwriting; Credit hours: 3**

This course is designed to supply students with tools to expand and enrich their appreciation of all aspects of filmmaking and screenwriting in particular. Students will prepare for eventual entry into the professional world, learning how outside forces can influence the decisions a screenwriter makes. Through the practice of screenwriting, students will do the following: (1) Learn how to represent in words not only story, but also sound design, editing, visual design, and other parameters of media making, (2) Discover how core concepts of character, structure, plot, theme and tone interact within existing and emerging media and (3) Explore a variety of films, topics and exercises towards the inspiration and development of a piece of original work of personal significance.

**CND 223 – (Re)covering Ethnicities; Credit hours: 3**

This is a journalism course focused around covering Karachi in the backdrop of its ethnic diversity. Students will get firsthand experience of going into the field and reporting news stories and features, as well as producing photo features and audio slideshows. Sophomores, juniors and seniors who love roughing it out on the streets of the city are most welcome. This course's workload relies heavily on fieldwork and time management.



### **CND 225 – Frankfurt and Beyond; Credit hours: 4**

Mass culture (and by extension: media culture) can be said to have been born in the 19th century, but only in the 20th century it reached unprecedented diffusion and momentousness. This has raised huge concerns among intellectuals; notoriously, those who most vocally expressed their preoccupations were the members of so-called “Frankfurt School.” In short, this group of scholars, their profound mutual differences notwithstanding, basically feared that so-called “culture industry” was (or could be) a gigantic machine subjugating the masses and annihilating their critical consciousness, thereby preventing them from developing any oppositional stance against modern capitalism ruthlessly ruling their lives. This course will study some of the 20th century’s most overtly mistrustful theoretical reflections on mass media culture, and it will do so by focusing on the most vociferously mistrustful of them all: Frankfurt School. However, on the other hand, this inspection on the Frankfurt School will be close enough to reveal, within the FS body of thought itself, a hypothesis more or less lurking in the ideas of these theorists and between the lines of their texts, namely that mass media culture can harbor a secretly emancipatory potential for the masses that needs to be properly unearthed and valorized by critical theory. This is why the course will not focus on Frankfurt School alone. It will also cover those theoretical reflections on media that variously emerged in FS’s wake, such as Media Cultural Studies, Guy Debord’s critique of “The Spectacle” and Giorgio Agamben’s notion of “Apparatus”; in these and other cases, the original (if somewhat implicit) ambivalence of FS vis-à-vis mass media culture, well-concealed beneath its “apocalyptic” attitude, is properly brought to the fore, highlighting the oppressive and emancipatory potential of mass media culture to be inextricably intertwined.

### **CND 230 – Documentary Photography; Credit hours: 3**

This is an introductory course in documentary photography presented in a multimedia context. The course will look at the ideas and approach surrounding the changing world of photojournalism vs. more in depth exploration of documentary photography. The students will learn how to read and write about photography as well as it practicing it. The course will not emphasize on technical aspects of photography, rather use the mechanical and electronic abilities of the camera to develop and explore a more personal visual aesthetic and vocabulary. It is assumed that the students are familiar with the workings of the camera. The course focuses on research, approach to storytelling and learning to work with image and text.

### **CND 234 – Intermediate Film Production; Credit hours: 4**

Intermediate Film Production delves deeper into dramatic storytelling, taking students through the script-to-screen process of conceiving, writing, planning and executing the shoot and edit of a 5-7 min short narrative film. As integral elements to this process, cinematography, directing, editing and sound will take place in conjunction with the timeline of their process. Students will get to thoroughly explore creative choices when visualizing a script, as well as the technical craft and building blocks of narrative language. They will also gain an intermediate grasp on the process of executing a full project as a filmmaker and creative producer. While this is a practice course, engaging with screenings and occasional response papers to screenings will only enrich students’ creative choices and production timeline.

### **CND 235 – Computer Generated 2D Animation; Credit hours: 4**

In this introductory course, students immerse themselves in the theory and practice of 2D animation. The emphasis is on experimentation, critical thinking, and narrative structure for the sequential or moving images in the realm of two-dimensional environments. A clear understanding of the recognized principles of 2D animation and their inseparable relationship to the art of storytelling will be introduced in this introductory course. Knowledge about motion, timing, and sense of observation will be critical

in this class. Compositing, sound editing, and topics in motion picture production will be introduced at a less intense level. The course also emphasizes artistic and aesthetic creativity and familiarizes students with the notion of digital asset management (DAM). The assignments may include simple 2D image-based visual narratives, unambiguous reconstructions of realities, or more abstract compositions exploring natural phenomena, texture, light, and other formal or spatial elements. The final project will be based on the discussion, evaluation, and creation of animation ideas.

### **CND 247 – Film Aesthetics I; Credit hours: 4 Credits**

“Film Aesthetics I” is the first of two courses replacing “Film History and Theory I” and “Film History Theory II” (both previously offered at Habib). On the whole, they have been conceived in such a way as to organically interweave the exploration of various aspects of filmmaking (scriptwriting, montage etc.), the non-chronological illustration of a number of trends and developments in the history of cinema (from Hollywood’s classical Golden Age to Neorealism, from New Waves to digital cinema and beyond), and the study of a range of film-theoretical concerns (postcolonial perspectives, gender theory etc.). Students will learn how to analyze a film, how to frame cinematic phenomena historically and theoretically, and how to track down the formal workings of a film so as to connect them organically with broader (social, cultural, political etc.) contexts. Through a constant “zigzagging” between films from the past and films from contemporary international cinemas, students will get a sense of how cinema does not emerge in a void, and is instead historically and theoretically layered. “Film Aesthetics I” will revolve primarily around film narrative and a few of the aspects of filmmaking that most straightforwardly relate to it, such as scriptwriting, editing, genre and point-of-view. The five modules the course is broken down into will take the cue from these aspects to gradually shift to more abstract historical and theoretical concerns (such as classical-modern-postmodern periodization, gender theory, political cinema and the like). The focus is mostly on Hollywood and European cinema; non-Western cinemas will be tackled much more extensively in “Film Aesthetics II”.

### **CND 247 – Bollywood and the Construction of Masculinity; Credit hours: 3**

The course aims to introduce students to the concept of masculinity and how media shapes our understanding of gender. The focus lies on examining how Bollywood has shaped the idea of masculinity for its viewers especially the South-Asian audience. We will be watching mainstream Bollywood movies and reading their screenplays that have captured the imagination of the Bollywood audience in the last 40 years. We will identify and analyze different kinds of masculinities that Bollywood movies project, represent and shape. We will also examine the specific social, cultural and historical contexts from which these movies and types of masculinities emerge. Moreover, the course aims to turn students into conscientious storytellers, as they’ll be pitching and writing a 10-page script as their final project with a central character representing the kind of masculinity, they feel the audiences need to watch. Lastly, the course wants to turn the students into critical thinkers and develop their analytical skills as they engage with texts.

### **CND 250 – Conceptual Drawing; Credit hours: 4**

This course approaches drawing as an expanded field of experimental and investigative practice. What is the purpose of drawing beyond mere re-presentation of the visible world? How may we develop drawing practices that allow us to see the unseen, to represent movement or time or sound? Drawing practices to explore or study a problem, ask a question, or make an intervention? Can we think of drawing as a devotional practice or a relational practice? This course pushes the boundaries of traditional drawing, where drawing is not so much about skill and representation, but more so about process, poetics and polemics. Through experimental and gestural drawing exercises we acquaint ourselves with and understand the nature of drawing media (paper, graphite, ink etc.), on a deeper level.

Early in this course we will read texts shedding light on the Conceptual Art movement as well as texts reflecting on the changing role of drawing with the emergence of new visualization technologies



– from art historical texts to manifestos written by artists. We will look at drawing practices from the conceptual and minimalist art movements, from mystical traditions, and from urban activist organizations – expanding our ideas of what drawing practice looks like.

The course will be divided into 5 modules of 2-3 weeks, with students producing one artwork for each: Drawing as 1) Action, 2) Contemplation, 3) Investigation 4) Performance and 5) Installation.

### **CND 276 – Introduction to 3D Animation; Credit hours: 4**

This introductory course focuses on content creation from a three-dimensional digital environment and camera-based production techniques. The class instructions will introduce the related concepts, such as 3D modeling, lighting, rendering, narrative structure, pacing, and compositing. In this introductory course, students will develop knowledge and skills as they learn about and produce computer generated 3D elements, in the realm of VFX and broadcast animation. A good understanding of motion and timing, as well as a sense of observation, will be critical in this class. Students will also develop awareness related to the audiences' perceptual/emotional needs, digital asset management (DAM), and production methodology. The assignments may include ambiguous/unambiguous reconstructions of physical realities, simple 3D visual narratives, and VFX related experiments.

### **CND 301 – Trans Design Practicum; Credit hours: 4**

How does design operate in a complex world rife with 'wicked problems?' This course places design and its practices under the spotlight to critically examine the role of design over the last century, as it contributed to the intractable problems, we find ourselves in today. It raises questions about the contextual relevance of design, particularly in the global south, and its relationship to global design conversations. While seminars will look into the intellectual foundations of a transdisciplinary design practice, the studio will immerse students in a classic wicked problem, as they develop their own understanding of this new practice. The class will involve readings, presentations and discussions, supplemented by the practice-based studio component. Each student will be expected to lead course discussions and to make presentations to class, based on the readings.

### **CND 321 – Film Production III: Direction; Credit hours: 4**

This course provides students the skills to create and execute a director's vision for short films. Students will be tasked to analyze scripts, scenes and characters to create a Director's Binder which will be used to produce their short films. The two main aims for this course are for students to learn how to ANALYZE a screenplay, and EXECUTE a Director's Vision. This course will equip students with the tools to break down story, character, screenplay and create a unique director's vision for their films.

### **CND 325 – Writing the American Sitcom; Credit hours: 3**

The course aims to provide students with the tools necessary to pitch, develop, and write a pilot episode of an original half-hour single-camera comedy. Current television pilots and series will be analyzed. The class will replicate, as much as possible, the atmosphere of the "writers' room" on a sitcom during production. As with a real sitcom staff, the class will offer constructive criticism of each other's work. The various roles in the writer's room will also be explored. Students will pitch an idea for a half-hour, single-camera show, and work with other writers on developing a script. At the end of the term, students will submit the complete script of a sitcom pilot and a series bible.



**CND/LIT 362 – The Art of Fiction II – Contemporary Short Stories; Credit hours: 3**

This workshop course on reading and writing short stories will investigate the genre from 1975 to the present day. We shall focus on elements of craft and examine the place these stories hold in their respective milieus, with the aim of informing and inspiring ourselves to produce our own works of short fiction. Beginning with Raymond Carver’s seminal “Will You Please Be Quiet, Please?,” we shall adapt an urgent, international focus, reading stories from traditionally underrepresented places and communities, as well as those entrenched in the canon of contemporary British and American Literatures. We will also read and critique our peers’ stories with precision and generosity, with the aim of helping each writer achieve the best possible version of her stories, and refining our own work in the process.

**CND 428 – Design Research I; Credit hours: 4**

This class asks students to acquire a critical knowledge of the complicated relationship between concepts and ideas, as well as its transformation into a practice-based research proposal. The course introduces students to the concept of searching for and isolating problems in their physical world. They will be asked to present a product, process, or service in the form of a research proposal. The instruction in the class facilitates their research proposals, develops an understanding of relevant practice-based research, refines research approaches and methods, investigates their hypothesis, and improves their research skills. The goal is to provide an environment for the final year students to explore and develop the research paradigm necessary for the graduating year at Habib University. This course also offers the opportunity to conduct background research related to a specific problem, complete a formal proposal, and present their work. By the end of the semester, students will have a better understanding of their isolated problems/concepts/ideas in the context of interdisciplinary and transdisciplinary curiosities.

**CND 437 – Advanced Film Editing: Theory & Practice; Credit hours: 4 Credits**

Students will learn to Analyze and Practice Film Editing Techniques, which will help them to edit their own narrative Short Films. The two main aims for this course are to analyze the main Editing Theories like Types of Montage and give a hands-on experience on Advanced Film Editing Practice, so the students can experience the “Final stage of Writing Process”



# Humanities and Comparative Inquiry

## FACULTY MEMBERS:

### **Full-time Faculty**

Christopher Sherman Taylor, Full Professor

Muhammad Haris, Assistant Professor, Program Director – HCI

Jeffrey Kaplan, Full Professor

Nauman Naqvi, Associate Professor

Najeeb Jan, Associate Professor

Afzal Ahmed Syed, Associate Professor (Professor of Practice)

Inamullah Nadeem, Assistant Professor (Professor of Practice)

Ryan Davidson, Assistant Professor

Jessica Marie Werneke, Assistant Professor

Daniyal Ahmed, Lecturer

Basharat Issa Khan, Lecturer

Marcelo Alves de Paula Lima, Lecturer

Kainat Jalaluddin, Lecturer

Sadaf Habib, Lecturer

### **Visiting Faculty**

Alix Philippon, Visiting Associate Professor

### **Adjunct Faculty**

Sahar Shah

Tanveer Anjum

Sheikh Taha Munir

Tazeen Erum

Tahir Zaland

Irfan Muhammad

Zulfiqar Ali

Zainab Saleem

**VISION STATEMENT:**

HCI offers students an exciting opportunity to study several disciplines in the humanities, both critically and comparatively. Our areas of concentration include Philosophy, History, Literature, and Religious Studies. In teaching students to move fluidly across disciplines, we aim to cultivate not only breadth and depth, but an intellectual mindset attuned to the shared problems we face today as global citizens. HCI will challenge students to reflect on a range of theories about human nature and society — drawing from diverse cultures, histories, and traditions — and in doing so heighten their sensitivity to the way our rapidly globalizing age of transnational capital has reshaped our understanding of concepts such as self, identity, obligation, community, and nation. Students who pursue a HCI major will learn to think, both locally and globally, to examine problems through a number of intellectual frameworks and traditions, and practice honing the skills of humanistic inquiry that continue to make the comparative humanities essential to the dynamic and multidimensional job markets of tomorrow. Learning to think comparatively within the humanities means learning to think flexibly and differently about the many problems we encounter in various professional domains.

It also means knowing how to use a critical framework to think through a difficult problem and, more crucially, knowing how to articulate and assess that problem in language that is at once cogent and graceful. A HCI degree, therefore, clearly has both direct and indirect relevance to future pursuits in academia, media, journalism, management, government, law, and medicine, among the many other civic and international sectors in leadership where an insightful, perceptive, agile mind is an obvious mark of distinction.

**REQUIREMENTS FOR THE MAJOR - Class of 2024**

All students majoring in Humanities and Comparative Inquiry are required to complete a total of **40** courses.

**Degree Requirements for the Major**

Course Category	Number of Courses to complete	Credit hours
<b>University Requirements</b>		
University Liberal Core	10	
<b>Humanities &amp; Comparative Inquiry (12)</b>		
HCI Core	7	
HCI Electives	5	
<b>Other Requirements (18)</b>		
HCI Primary Concentrations	8	
HCI Secondary Concentrations	5	
Free Electives or Language	5	
<b>Overall</b>	<b>40</b>	



## **Course Descriptions:**

### **CORE 102 What is Modernity?**

No one in the medieval world thought they were 'medieval.' The belief that we live in a distinct period of world history – that of 'modernity' – sets us apart from all pre-modern peoples. It is a defining aspect of who we are, essential to our modern identities. It is thus imperative to the task

of understanding ourselves and our world, and it is essential to the task of thoughtful self-cultivation. Habib University's pedagogical charter of *Yohsin* requires us to ask the questions: What is it to be modern? What is modernity?

The interrogation and investigation of modernity is an essential dimension of Habib University's Liberal Core in its pursuance of a strenuously universalist and critical humanities and social sciences curriculum.

Our 'modernity' is the very air we breathe. It encompasses, at an ever-gathering pace, all aspects of our lives. This is why the question of modernity has been a central concern across the range of disciplines and fields of the arts, humanities, and social sciences throughout the modern period. This course will address the most critical and essential elements of our global and regional modernity today, modernity in our time and context.

Beginning with an investigation of the conditions of emergence of this unique world historical identity, we then turn to the historical emergence and formation of key structures and features of the modern in the following domains: political modernity, economic modernity, modernity and ecology, and modernity and religion. By the end of the semester, the historical character and specificity of these foundational spheres of our present will be visible.

### **CORE 201 Pakistan and Modern South Asia**

For the first time in its history, nation-states – including that of Pakistan – emerged in the region of South Asia in the middle of the 20th century. How did such a world-historical event come about? What has it meant for the peoples of this region? In short, what is the history of our present – what is the history of our regional modernity?

This question takes on a particular urgency in Pakistan as the region passes through the current period of crisis and change. With a significant focus on the emergence and trajectory of Indo-Muslim nationalism and the creation of Pakistan, this course will be a conspectus of the modern history of South Asia from the immediate pre-colonial historical scene, through the colonial period, including the rise of regional socio-religious reform movements, anti-colonial nationalism and formal decolonization, to the Cold War and the contemporary period of accelerated transformation and turmoil.

Apart from the main outlines of the history of modern South Asia, students will also learn to place the region's colonial modernity within the larger framework of modern history. Students will crucially learn to identify major features of the colonial economy, politics, and society under which – especially after the Great Rebellion of 1857 – regional religious and other social reform movements emerged, nationalisms formed, and the dramatic transformation of regional languages and traditions took place, processes that continue into the present.

They will learn to see contemporary conflicts, ideologies, identities, and structures as specific to the modern period, rather than as natural cultural expressions, and they will begin to see regional cultures and societies themselves as historical entities.

### **CORE 301 Hikma I**

Ranging across philosophy, literature, history, law, and the arts, *Hikma I* is an encompassing survey of Islamicate thought that seeks to give a sense of the historical and philosophical complexity and depth of the tradition, with significant reference to the region of South Asia. In the module on *Religion & Modernity* in CORE 102, and subsequently in our historical survey of socio-religious as well as nationalist reform and revivalist movements in the colonial period in CORE 201; we studied the

dramatic transformation and discursive constitution of 'religion' and 'culture' in the colonial-modern period. Both regionally, as well as in the global modern generally, 'Islam' and its cultures and societies, have also become particularly sensitive and difficult regions of the discursive landscape.

In recognition of this urgent conceptual difficulty in approaching Islamic phenomena and thought, this course is designed around fourteen key themes, corresponding to core sciences within a typical pre-modern Muslim scholastic syllabus.

The course begins with the medieval spiritual bildungsroman by Ibn Tufayl—Hayy Ibn Yaqzan – that conveys the philosophical depth and passion for knowledge in all its plurality that is chartered in the tradition as the means for thoughtful self-cultivation of the human. Next, students are introduced to the philosophy of education in the pre-modern Muslim world, and place of various disciplines in the *maktab* (primary school), *madrassa* (institution for education in the 'outer' sciences), and *khaniqah* (institution for advanced education in the 'inner' sciences of the soul) curricula.

### **CORE 303 Hikma II**

Whereas Hikma I focused on clearing the epistemological and philosophical ground to approach the history of Islamic thought, Hikma II directly engages primary texts and artefacts from the tradition, especially of a philosophical character.

### **Fall 2020 Offerings**

#### **PHILL-122 Introduction to Western Philosophy; Credit hours: 3**

This course aims to provide a systematic introduction to the main problems of metaphysics, epistemology, ethics and aesthetics, as addressed in the Western philosophical tradition. It familiarizes students with central debates in Western philosophy and permits them an overview of the works of some of the discipline's most pertinent thinkers. It does so by pointing out long term traditions of Western philosophical thought as well as their implications for contemporary intellectual discourse. It engages with several important issues concerning the nature of knowledge, truth, self, reality, consciousness, morality, language, and God. Along with reading texts by classic figures such as Plato, Descartes, Hume, and Kant, students will also get to study contemporary thinkers such as Simone de Beauvoir, Ludwig Wittgenstein, Edmund Husserl, Hannah Arendt, Martha Nussbaum, and Derrida. Students will learn to engage with various philosophical issues critically, to compare them analytically, and to translate what they mean for the present. In so doing, students will acquire the critical analytical vocabulary to understand our current socio-political predicament, in a reflected and philosophically informed way.

#### **RELS-123 Divine Proportions: Introduction to Islamic Calligraphy; Credit hours: 4**

Islamic Art is intimately tied to the Divine Revelation fusing truth and beauty as one and the same. The role of Islamic Art, according to Seyyed Hoosein Nasr, is not just to provide a historical understanding of art, but to mold the soul of the artist. Taking the example of calligraphy, we can liken the calligrapher to the reed pen, where one needs to empty themselves just as a hollow pen in order for the Divine to flow through. The ink itself is a metaphor for the latter.

In Islamic origin myth, the first thing that God created was qalam (pen). The first sound probably would be the screeching of qalam (sareer ul-qalam) when God inscribed the divine word on the Preserved Tablet (Loh- e-Mahfuz). The writing holds a paramount significance in Islamic cultures. Throughout the centuries, Muslim scribes and calligraphers perfect the art of writing. In pre-modern Muslim societies, it was an elementary learning aimed at grounding students firmly in the art and sciences of letters. The calligraphy was perceived as a spiritual exercise to cultivate perfect proportions within a soul, as a reflection of divine unity.

Designed as an experimental course for Habib University students, Divine Proportions fuses thought and action, perception and practice into a singular class taught by an anthropologist, Dr. Noman Baig and a calligrapher, Ustad Kashif Khan. The students will explore the historical formation of Islam art,



phenomenology of creative practice, and iconicity in religious visual culture. Furthermore, the course seeks to aspire students towards beauty – one of the fundamental tenets of Habib University's core concept of Yohsin. It also fulfils a Liberal Core requirement of Creative Practice.

### **CORE 111 Logical Problem Solving; Credit hours: 4**

Taking a comparative, experiential approach to the subject, this course introduces you to: a) definitions of logic, and b) frameworks and approaches to the logical analysis of arguments and problems. This course trains you to think critically about the various frameworks and approaches in logic, and to formulate thoughtful responses to questions of deduction, induction, validity, truth, and the very meaning and purpose of logic. Here, you will learn to employ logic pragmatically, as a complex of theoretical and analytical tools for structuring inquiry and argumentation in situations of indeterminacy that arise in experience, both academic and the broader lived experience. This course trains you to think in terms of schemes of symbolic representation. You will be introduced to various frameworks for generating logical inquiry and addressing the question of validity at the heart of it. The frameworks under consideration include: various approaches to deduction and induction, that is, categorical syllogism, sentential logic, first order predicate logic, analogical reasoning, probability analysis, causal reasoning, inductive generalization, the theory of communicative action, and the approach to logic and formal reasoning found in Marx's dialectical analysis. The logical frameworks we learn about will be used as models to define, understand, and address problems by assessing existing arguments pertaining to the problem at hand, and articulating new arguments aimed towards creating clarifying and possibly resolving problems.

### **LIT 121 Jehan-e-Urdu; Credit hours: 4**

Jehan-e-Urdu is a mandatory course for all students which they have to complete during their studies at the Habib University and is offered at different times for different programs. The course is designed to be pedagogically dynamic and interactive, consisting of a series of lectures, seminars and performances meant to introduce and rapidly advance students' appreciation and knowledge of Urdu through engagement with prose and poetry texts, identified to address the concerns of the student today with the primary intention of opening up Urdu as a living language with a rich and varied literary culture.

### **LANG 102 Introduction to Punjabi I; Credit hours: 4**

This is an optional course offered to students of Habib University. It aims to enable students to develop a basic understanding of Punjabi language in context to Punjabi culture, idiom, linguistic and literature. This course initiates a learning module, which will evolve in three semesters; each interlinked in a systematic flow starting with emphasis on linguistics to literature and finally history of Punjabi language.

### **LANG 101 Sindhi Sikhiya I; Credit hours: 4**

This Course will help students to comprehend, read and write Sindhi Language. Learning Sindhi will help students in various fields of work and internship in future. This course is chalked out to help students at different levels of skill in reading and writing through basic Sindhi language, folk rhymes, folk tales, folk songs etc. In addition to the lectures and discussion groups, tutorials will be organized and mediums such as Google and Youtube are used for additional help, to make things more meaningful and interesting. It will facilitate students in reading, comprehending and contextualizing the texts on the reading list, so the students will be able to speak, read and understand basic Sindhi.

### **HCI 101 Critical Inquiry and the Humanities: Love and Desire; Credit hours: 4**

This is the first course in the core sequence of the Humanities and Critical Inquiry major. The course is team-taught and consists of four units, one for each of the major concentration areas in the program:



History, Literature, Philosophy and Religious Studies. Using the central organizing theme for this course, which is love and desire, you will explore how each of these disciplines frames and examines some aspect of a broad complex issue that transcends a single academic discipline. Using the love and desire meta-theme of this course, you will consider what sorts of questions historians, scholars of literature, philosophers and religious studies scholars ask about love and desire, and how they analyze the topic and pursue answers to the questions they ask. By bringing together these four major disciplinary fields in the humanities, you will both learn something about how each discipline works and also about how intellectual discourse crosses traditional disciplinary boundaries. This facility for interdisciplinary and transdisciplinary inquiry is an important outcome for this major, and yields the distinctive abilities in critical thinking for which the graduates of humanities programs have long been distinguished and valued. Through this course you will also develop a deeper appreciation for differing perspectives.

### **REL/ANT 252 Anthropology of Religion; Credit hours: 3**

In Pakistan, when it comes to the study of religion, it is generally associated with Islamic Studies or commonly known as Islamiyat (a compulsory subject/course in a school, college and even a university) and a Madrassa. Normally, it is seen as a religious responsibility or something that is an interest of “religious people,” or people who are interested in religion. Hence, producing and provoking heated feelings and strong opinions based on an understanding of religion which is generally a static entity or a singular essence. In this course, we will be deconstructing such an understanding and we will learn to explore religion not as a reified or static entity, but as a living experience with more than just a singular essence. Since religion is one of the important topics in anthropology, we will focus on the themes that guide anthropology to look at religion, its role and expression in different societies. The aim is to develop the idea of anthropological approach toward religion. To achieve the aim, we will not only focus on major conceptual approaches and debates in the study of religion but will also explore religious life in specific socio-cultural and political contexts using different ethnographic studies.

### **LANG 204 Pukhto Pohana II; Credit hours: 4**

We have taken a step to simplify the presentation of examples for students who are working with beginning and Pashto Pohana I, by keeping the appearance of new vocabulary to a minimum. The same people and objects appear from example to example, and when possible, the same sentences appear from section to section with appropriate change in tense, number etc., to illustrate the point being made. The student is urged to remember that! This syllabus and other syllabus of Pashto, are much more tentative than are grammar of English or other language with long grammatical traditions. As we mention in chapter 1 Pashto grammatical studies are in their infancy, and such simple matters as the number of noun classes or names of the tenses are by no means definitely agreed on, as they are for languages that have been studied for a long time. We hope that this grammar corrects and refines previous studies of Pashto (including some of the analysis in beginning and Pashto Pohana I), and at the same time fully expect that subsequent studies of Pashto grammar will correct and refine our work.

### **PHIL 221 Medieval Islamic Philosophy; Credit hours: 3**

This course takes a historical, textual, and analytical approach to examine problems related to metaphysics, human nature, psychology, and the philosophy of religion discussed by both, the Medieval Islamic philosophers and the Kalam theologians. It will begin by providing an overview of the history of both traditions i.e., Kalam theology and philosophy, and expose students to their system of thought, which they have also studied briefly in *Hikma I*. In continuation to *Hikma I*, students will now be offered with an in-depth study of complex debates on topics such as existence, ontology, epistemology, proof of Creation, Eschatology, Providence and Prophecy. It will also provide students the opportunity to explore both the doctrines and the contrasting intellectual systems and methods of enquiry of both traditions. Attention will be given to some contemporary scholarly debates, and the methodologies that inform them, surrounding the interpretation of certain aspects of medieval Islamic thought. The broad purpose of the course is to make students aware that while the compatibility





of reason and religion may still be a topic of debate amongst contemporary intellectuals, the rich intellectual traditions of Islam valued rational faculty, and logic to a greater extent in understanding the creation, the creator and their relationship. By exposing students to some primary texts, students will also become familiar with style and language of the medieval works of philosophy and kalam and would learn the skill of decoding the language of primary texts.

### **PHIL 200 What is Philosophy? Credit hours: 4**

Taking a comparative approach to the subject matter, this course investigates the original writings of a range of contemporary philosophers, where they have problematized and responded to the “what is philosophy?” question. The writings under consideration help us grapple with differing frameworks and conceptual lenses, for understanding approaches to the complex, fundamental question of philosophy, and the process, work, purpose, and history of philosophy. This course calls for consistent focus on careful reading, writing, research, presentation assignments, and intensive class participation commitment. The philosophers whose writings we consider this semester include: Anne Dufourmantelle, Martha Nussbaum, Jacques Derrida, Alain Badiou, Louis Althusser, Gilles Deleuze, Jean Francois Lyotard, and Reza Negarestani.

### **LIT 233 The Subversive Muse: Contemporary Urdu Prose Poem; Credit hours: 3**

Urdu prose poem became a significant genre since the early 1970s with the emergence of a group of poets, who embraced the new form as the most suitable to express the crude, fragmented realities of our times. Infused with postmodern sensibility and with an understanding of the complex new poetics devoid of lyricism of rhyme and meter, the clique found its aesthetics initially unacceptable for the literary establishment of Urdu, but the genre soon developed as the mainstream poetic expression and a challenge to the previously existing forms. For the younger poets now, prose poem is aesthetically as much enthralling to be experimented with as the other more established forms.

With a strong grounding in historicity of literature, the genre of prose poem in Urdu abounds in mini-narratives of the dispossessed and uses diction based on their vernacular. An understanding of this genre will enable the students to develop a critical social consciousness along with an understanding of aesthetically sublime literature of resistance and protest. Thus, the course will enrich students' minds and lives, helping them contribute positively to larger community.

This is an Urdu Literature course with Urdu texts as prescribed readings. The students enrolled in this course must have proficiency in Urdu language and interest in Urdu literature. The students will be exposed to literary masterpieces of Urdu prose poetry, and the discussions will entail close readings of the texts as well as analyses of sociopolitical and existential issues, faced by us every day.

### **MUS 221 Humari Meeraas: History & Discourse of South Asian Music; Credit hours: 3**

A common perspective about South Asian “classical” music is that it’s a static form of music, innovated by Mughal patrons and only accessible to a particular class. A lot of these perceptions stem from the modern politicized vision of history as well as the discourse of this music’s Orientalist other—Western classical music. This is the first assumption we will unravel; in the context of South Asian music, what does “classical” actually mean? What influenced aesthetic principles? Who were the early practitioners? Why did this music gain popularity in the courtly setting? Which milieu did it thrive and flourish in? How does it reflect various socio-historic contexts? How does modern day nationalism shape discourse on music? Not only can this historical and critical inquiry inform us about the musical system, but the musical system itself can challenge our ways of understanding history, cultural practices and societal interactions.

### **MUS 222 Sound and Subjectivity; Credit hours: 3**

Every known human culture and community has produced music or exhibited sonic practices, that

can be classified as 'music'. Music is immensely meaningful and moving for the communities that it belongs to. However, the experience of listening to sound and music from cultures and contexts that are unfamiliar to us, can be both blissful and elating, as well as bizarre and alienating. The affect produced by strange sounds and foreign musical structures is determined by the subjectivities, that constitute our own ways of listening. What then, is the nature of listening? How should we listen to, engage with, and understand music from other cultures, contexts, and traditions? How have disciplines like anthropology, musicology, and ethnomusicology historically addressed and understood non-western music? What are the variety of meanings- social, cultural, religious, and political- that music continues to be imbued with? What does our experience of listening to the others, tell us about ourselves? These questions form the core basis of inquiry in this course. This is a survey course of selected musical cultures and traditions of the world that is organized through an aural geography, that takes the subjectivity of our listening as its point of departure.

### **REL 222 Introduction to Islamic Law; Credit hours: 3**

This course provides an overview of Islamic law in its historical and evolutionary perspective. It aims at developing an in depth understanding of legal history, jurisprudential development, the schools of Islamic law, classical and modern theories, evolution of the law up to the present, and its contemporary applications. The course engages with both classical and contemporary scholarship and current critical theoretical debates ongoing in the field.

### **HIST 225 Contemporary History of Latin America; Credit hours: 3**

Whenever we talk of "America," people usually think of the United States almost instantaneously. However, south of the Rio Bravo lies another America. Stretching all the way from Mexico to Chile, this "other" America differs a lot from the so-called Anglo-Saxon America and is usually referred to as Latin America, due to its former Iberian colonization. As the Spanish and Portuguese colonial empires crumbled in the first half of the 19th century, new States emerged across Latin America, but the Latin American political elites were soon caught on a dilemma. On the one hand, their language, religion, and political institutions were the same as of their former colonizers, and yet they were not recognized as Europeans, since they were born in the "New World." On the other hand, although born in the other side of the Atlantic, they despised the indigenous people who originally inhabited the region. What are the differences between Latin America and Anglo-Saxon America? How the concept of Latin America did was born and what diversities does it conceal? How to get over this feeling of being an exiled in one's own land? And how to forge an identity in a melting pot that comprised European, indigenous, and African influences? These are some of the many questions that shall guide our study on Latin American Contemporary History. The course will start by approaching the national independences in the early 19th century and the challenges the forging of national identities posed to the national leaders and intellectuals. Thereafter, we shall approach the growing European and North American imperialistic influences in the late 19th century, the industrialization processes in the interwar period, the establishment of military regimes during the Cold War, and the democratization processes in the 1980's. As we move from the independences to the democratizations, we ought to learn the political, economic, and social transformations Latin America has experienced.

The course is in line with one of the main concerns of Habib University's Liberal Studies: its simultaneous focus on Pakistani intellectual inheritance and on the legacy of Western knowledge, from which Latin America is a part. Furthermore, as we shall see, the course demonstrates how regions like Pakistan and Latin America, although geographically and culturally distant, share similar political, social, and economic problems. As relevant issues such as colonization, decolonization, periphery, national identity, and economic dependence come up throughout the classes and assigned readings, students will realize how Pakistan and Latin American have much more in common than they could imagine.

### **HIST 226 Russia and the World: Global Interactions from Peter I to Putin; Credit hours: 3**

Teaching a history of Russia through its interaction with the "West" and the "East," focusing on how



external influences shaped Russian history and how Russia influenced the world (particularly the late-19th through the 21st centuries). Explore the problematic dichotomies of “East” and “West” and the non-linear exchange of politics, ideas and culture with Europe, Asia and the Middle East.

1. Pre-Petrine Russia
2. Russia in the Age of the Enlightenment
3. Empire and Expansion
4. Ideas and Imperialism in the 20th Century
5. Post-Socialism

### **PHIL / RELS 327 Spirituality, Philosophy and Science; Credit hours: 3**

Knowledge never is a definitive achievement and its production is determined by multiple factors (political domination, social and cultural conditions, fashions, inertia.) This course aims at offering a fresh analysis of the complex interactions between three dynamic fields of knowledge: science, philosophy and spirituality. Numerous scientific questions have stemmed from philosophical or spiritual reflexion, and conversely many scientific results have called for philosophical insights.

Historically intertwined, the three have become distinct from each other in the past few centuries. The calls for a dialogue between them have allowed numerous epistemological issues to be recently addressed. By embracing different perspectives across disciplines and regions (as traditions of thought both East and West have interacted and been plural), this course will call into question rationalism and materialism by introducing students to works, authors and research programs proposing alternative ways of looking at the world and man.

The philosophical issues that bear on spiritual beliefs have recently attracted the growing curiosity of philosophers and scientists on key topics such as free will, the nature of consciousness, healing or the physical nature of reality. Many think that a joint effort between disciplines could benefit knowledge in the broader sense of the term. Without positing a miraculous reconciliation, this course will offer a space for the discussion and re-assessment of the relationships between science, spirituality and philosophy. Didn't the Physicist Abdus Salam claim that Rumi inspired the theory that made him win the Nobel Prize? “All atoms dance like a single sun”

### **LIT 332 The World of Quratul Ain Hyder; Credit hours: 3**

Quratul Ain Hyder is indisputably one of the best Urdu fiction writers of the twentieth century and is often placed at par with Gabriel Garcia Marquez and Milan Kundera when viewed in a global context. With her erudite upbringing, she gained a sagacious insight into human predicaments and developed a profound passion for encompassing culture and history in her fiction. Quratul Ain Hyder's major works are of epic proportions – covering a period from Budha to the present.

She developed an impeccable and inimitable diction for her narrative. “Hyder's prose is lyrical and witty; occasionally idiosyncratic, it is always alluring and allusive” says one of the critics.

This course draws upon the creative genius of Quratul Ain Hyder and offers a better understanding of her novels, short stories and travelogues while tracing her onward journey into the postmodern and postcolonial global ethics and aesthetics. The course will provide the students glimpses into her very diverse and fascinating characters, her portrayals of amalgamating civilizations, and stream-of-consciousness narratives, leaving a lifelong impact on them.

### **LIT 328 Iqbal: What else is the Reality of Philosophy and Poetry; Credit hours: 3**

Shaikh Muhammad Iqbal (1877-1938) is the national poet of Pakistan and one of the most revered poets in the Middle Eastern Islamic world. However, the state's patronage has hurt Iqbal's poetic distinction,

for much emphasis has been laid on his philosophical thoughts, his role as a reformer; his portrayal as a mystic and his political vision: the dream of Pakistan—all eclipsing him as a poet. This course will explore Iqbal's concept of self-identity, nationalism, patriotism, and his views on classical Islamic traditions. The course will then expand on Iqbal's relevance to the present world particularly through his verses on man versus the universe. This course will aim at unraveling the exquisiteness of Iqbal's poetry by an in-depth study of its themes, diction, metaphors, images, allusions and melodiousness.

Iqbal produced twice as much work in Persian than he did in Urdu. The course will introduce a substantial number of his Persian poems (through Urdu translation), thus providing an opportunity to the students to appreciate Iqbal's work in his totality.

### **LIT 331 The Memsahib and her World: 19th Century British Women's Lit; Credit hours: 3**

This course contributes to the fields of colonial, postcolonial, and gender studies as it explores the ambivalent relations of women and British imperialism through literary texts of the 19th century. Drawing on a substantial body of lesser-known primary works like letters, travelogues, short stories and novels of imperial women writers, and a flourishing subset of secondary scholarship on empire and women, the course presents a variety of viewpoints, identities, and experiences of the Memsahibs or the European women in India as they celebrated Victorian ideals of family and empire and placed domesticity at the center of their narratives. Ambivalent in their authoritative, relentless and domineering domestic administrator's role and an idealized middle-class femininity, the memsahibs shouldered the "white woman's burden" by uplifting downtrodden native women, projected their colonial homes as microcosms of the empire reinforcing patriarchal and racial hierarchies, maintained a distance with the colonial "other" and romanticized the exotic foreign space of India through their writings for an enamored readership back home.

The course will examine diverse and powerful voices of British women writers that highlight various themes like women's roles in society, male/female relationships, the domestic versus the public sphere, the liminal social and political spaces of existence, the implications of colonialism, the roles of British women in familiarizing the exotic, the rights of modern women and many more.

### **PHIL 375 Philosophy in the Anthropocene; Credit hours: 4**

This course examines the writings of contemporary philosophers who provide us with frameworks for thinking and acting in the context of the Anthropocene problematic. The philosophical texts under consideration raise fundamental questions on the crisis of knowledge (in Humanities and Sciences), the understanding of nature, ethics, ontology, the critique of political economy, the critique of contemporary apocalyptic discourses, and the possibilities of intellectual and political praxis. The philosophers under consideration come from a broad array of discursive terrains and traditions in philosophy, including Amerindian indigenous ontologies and cosmologies, Phenomenology, Marxism, and Philosophy of Science. The philosophers whose books we will be reading this semester include, Catherine Malabou, Donna Haraway, Deborah Danowski, Bernard Stiegler, John Bellamy Foster, Viveiros de Castro, and others. This course requires consistent focus on careful reading, research, presentation assignments, and, intensive class participation commitment.

### **LANG 302 Introduction to Punjabi III; Credit hours: 4**

Intro to Punjabi-III (Punjabi Rachna-3) is an optional course offered to students of Habib University. It aims to enable students to develop a basic understanding of Punjabi language in context to Punjabi culture, idiom, linguistic and literature. This course initiates a learning module, which will evolve in three semesters; each interlinked in a systematic flow starting with emphasis on linguistics to literature, and finally history of Punjabi language. This is the Advanced level of this course. Contents of the course have been designed to ensure that students may acquire the following fundamental skills with special emphasis on speaking:

Speaking: Simple language interaction with correct pronunciation, intonation and appropriate 3



expression.

**Listening:** Familiarities with alphabets, articulation of sounds, correct pronunciation, vowel harmony, including phrases and expressions.

**Reading:** Correct reading for understanding Punjabi language script.

**Writing:** Short paragraphs, situational dialogues and simple compositions.

### **LANG 301 Sindhi Sikhiya III; Credit hours: 4**

Sindhi Sikhiya III - LANG 301 will help students learn more about Sindhi language which they had opted to learn and comprehend to read and write. The objective of this course is to help students learn more about language, which they had previously opted to learn and comprehend to read and write. This course will introduce a galaxy of modern writers of Sindhi language and learn more through a selected version of poets and writers of modern period from:1947-1997, with a revision of basic concepts of language. There will be a practical part of this course, which enables students to read and understand Sindhi language through reading daily newspapers like "Kawish" and "Awami Awaz", and making a practical journal of "news cuttings" with a weekly briefing of the current issues. Watching various relevant videos will help students to catchup the course more interestingly. These practices will facilitate students with more understanding and contextualizing of the text on reading list.

# Computer Science

## BS in Computer Science

### **FACULTY MEMBERS:**

#### **Full-time faculty**

- a. Abdul Samad, Assistant Professor
- b. Akhlaque Ahmad, Assistant Professor
- c. Ayaz-ul-Hassan Khan, Assistant Professor
- d. Shah Jamal Alam, Associate Professor
- e. Shahid Hussain, Assistant Professor (Program Director, CS)
- f. Syeda Saleha Raza, Assistant Professor
- g. Musabbir Majeed, Assistant Professor
- h. Nadia Nasir, Lecturer
- i. Waqar Saleem, Associate Professor (Assistant Dean, DSSE)

### **VISION:**

Computer Science (CS) is the study of computation - what can and cannot be computed, how can computation be made more efficient, how to build machines that can compute, and which spheres of human activity can benefit from computational approaches. It is deeply rooted in logic and mathematics. Theoretical Computer Scientists push frontiers of computation by inventing new computational approaches. Practical Computer Scientists apply the theory of Computer Science to different application areas like science, finance, medicine, business, transportation, entertainment, education, communication, engineering, arts, and the humanities.

Interventions stemming from CS are just beginning to disrupt and reinvent Pakistani society. The CS program provides students the intellectual and technical foundation to assess these interventions and to contribute meaningfully and thoughtfully to the transition of our society to the information age. With an education grounded in Liberal Arts, our graduates have an unrivalled understanding of our society and the ethical ramifications of technology.

A major in the program educates students in the theory, systems, and applications of CS so that they are able and willing to make impactful contributions to society, and are prepared for success in industry, entrepreneurship, and higher education.

### **REQUIREMENTS FOR THE MAJOR - Class of 2024**

All students majoring in *Computer Science (CS)* must obtain a minimum grade of *C+* in *each CS Foundation and Kernel course* in order to graduate with this degree.

Students must also meet all other requirements set by Habib University and by Dhanani School of Science and Engineering. Some of these may overlap.

The number of credit hours required to be completed in each category are listed below followed by a list of courses that fulfil each category. Any change in the following will be duly communicated formally to the enrolled students.





Course Category	Number of Courses to complete <sup>+</sup>	Number of credit hours <sup>*</sup>
<b>University Requirements</b>		
Habib Liberal Core	10	40
<b>School of Science and Engineering Requirements</b>		
Natural Science	2	7
Mathematics	2	6
Computing	1	3
Design	1	4
Entrepreneurship	1	3
<b>Prerequisite Courses</b>		
Math and EE	4	13
<b>Computer Science Requirements</b>		
Foundation	3	10
Kernel	7	24
Other Requirements	2	1
Systems Requirement	1	4
Elective	5	15
Capstone Project (Kaavish)	2	6
<b>Other Graduation Requirements<sup>^</sup></b>		
Free Electives	2	6
<b>Overall</b>	<b>43<sup>+</sup></b>	<b>142<sup>*</sup></b>

+ - Courses in the various categories may overlap leading to a different total number of courses.

\* - Because of course overlap and depending on the choice of courses, the total number of credit hours may vary.

<sup>^</sup> - A minimum of 130 credits are required for graduation. A sufficient number of extra courses must be taken to meet any credit shortfall.

Students are advised to consult their advisor regarding choice of courses.

**REQUIREMENTS FOR THE MINOR** (if applicable and approved)

The following details must be included:

- Title: Minor in Computer Science
- The CS minor requires successful completion of 7 courses as follows.

- All 3 courses from CS Foundation.
- Any 2 courses from CS Kernel or approved by the program.
- Any 2 CS courses of level 300 or above.



Students pursuing a minor are advised to consult the CS program director regarding choice of courses taken in fulfillment of the minor.

## **COURSE CATEGORIES**

### **Habib Liberal Core**

The courses satisfying Habib Liberal Core are described in the section above on Habib Liberal Core.

### **Natural Science and Mathematics**

These courses are offered by the program on Integrated Science and Mathematics and are described in the program's section below. Students pursuing a CS major are required to complete any 2 Natural Science courses, at least one of which includes a lab component. They are also required to complete the following 2 Mathematics courses.

- MATH 202 Engineering Mathematics
- MATH 205 Linear Algebra

### **Computing**

Students majoring in CS fulfil this requirement through the following course from CS Foundation which is described further below.

- CS 101 Programming Fundamentals

### **Design**

This requirement is fulfilled partially by each of the following courses that CS students are required to take. Completing all of these courses fulfils the Design requirement completely. These courses are described further below.

- CS 201 Data Structure II
- CS 412 Algorithms Design and Analysis

*\*More courses could be added to this list*

### **Entrepreneurship**

This requirement is met by the following course, which is described further below.

MGMT 301 Technology Management and Entrepreneurship

### **CS Foundation**

CS Foundation prepare students coming out of high school to tackle CS concepts. It comprises the following 3 courses.

- CS 101 Programming Fundamentals
- CS 102 Data Structures and Algorithms
- CS 113 Discrete Mathematics



## CS Kernel

CS Kernel covers concepts, skills, and techniques that are fundamental to the pursuit of most disciplines and practices within CS. It comprises the following 6 courses.

CS 201 Data Structures II

CS 212 Nature of Computation

CS 224 Object Oriented Programming and Design Methodologies

CS 232 Operating Systems

CS 353 Software Engineering

CS 355 Database Systems

CS 412 Algorithms: Design and Analysis

## Other CS Requirement

CS students must complete the following 2 courses.

CS 100 Computer Science Freshman Seminar

CS 290 Khidmat

## CS Systems Requirement

Students are required to take following course that further explores aspects pertaining to computing system:

CS 330 Computer Architecture

## CS Electives

Students are required to complete five (05) courses that explore various disciplines and practices within CS. Some courses that fulfil this category are (other courses might be added to this list):

- CS 261 Understanding Social Networks
- CS 262 Introduction to Computational Social Science
- CS 311 Introduction to Cryptography
- CS 314/PHY 300 Quantum Computing
- CS 316 Introduction to Deep Learning
- CS 317 Combinatorial Machine Learning
- CS 326 Mathematics for Machine Learning
- CS 336 Introduction to Computer Security
- CS 340 Geometrical Modelling and Analysis
- CS 342 Game Development
- CS 351 Artificial Intelligence
- CS 363 Networks, Games, and Collective Behavior
- CS 370 Web and Mobile Development
- CS 400 CS Senior Seminar
- CS 415 Computational Complexity Theory
- CS 416 Algorithms for Machine Learning
- CS 421 Compiler Construction
- CS 432 GPU Accelerated Computing
- CS 440 Computer Graphics
- CS 451 Computational Intelligence
- CS 457 Data Science Techniques
- EE 424 Data Communications and Networking
- EE 451 Digital Image Processing
- EE 442 Embedded Systems
- EE 375 Microcontrollers and Interfacing

### Capstone Project

CS students in their final year undertake a year-long project as the culmination of their studies in the CS major. This is completed as the following 2 courses.

- CS 491 Kaavish I
- CS 492 Kaavish II

### Free Elective

Any course offered at Habib university can be attempted as a free elective.

**Required Courses** (approved as per the HU Curriculum Review Policy)

### CS 100 Computer Science Freshman Seminar

**Credit Hours:** 1+0

**Fulfils:** CS Major Requirement

**Prerequisite:** None

Provides a broad overview of theory and practice of Computer Science.

### CS 101 Programming Fundamentals

**Credit Hours:** 2+1

**Prerequisite:** None

**Fulfils:** CS Foundation, Formal Reasoning

Motivates computer programming as a means to solve problems; introduces the basic components of problem solving: repetition, decision making, data storage and manipulation, input/output, modularity, top-down design; develops expertise in the corresponding constructs – variables, data types, iteration, conditionals, functions, file and console I/O, and recursion – in a high-level programming language.

### CS 102 Data Structure and Algorithms

**Credit Hours:** 3+1

**Prerequisite:** CS 101

**Fulfils:** CS Foundation

Motivates design of algorithms by exploring various algorithms for a single task: linear search and binary search, bubble sort, insertion sort, selection sort, merge sort, quick sort; introduces techniques to reason about and compare algorithms: asymptotic analysis and notation, Master theorem; introduces frequently used data structures: list, tree, graph, stack, queue; discusses and analyzes basic operations on the data structures: infix, postfix, and prefix traversal, breadth-first and depth-first search, computation of graph properties.

### CS 113 Discrete Mathematics

**Credit Hours:** 3+0

**Prerequisite:** None

**Fulfils:** CS Foundation, Formal Reasoning

Equips students with essential mathematical tools that will be encountered in future Computer Science courses; develops a capacity for formal mathematical manipulation and abstract thought; topics include: propositional logic, predicate and quantifiers, sets, functions, sequences, summations, relations, partial orderings, proofs, mathematical induction, pigeonhole principle, permutations and



combinations, graphs, graph isomorphism, Euler and Hamiltonian paths, trees.

### **CS 201 Data Structures II**

**Credit Hours:** 3+0

**Prerequisite:** CS 102 and CS 113

**Fulfil:** CS Kernel

Imparts proficiency in the use of commonly used data structures; introduces a few higher-level data structures; develops critical judgment regarding the choice of data structures for a given situation; topics include: abstract data type, complexity, stack, queue, list, amortized analysis, array-list, linked list and skip list, hashing, binary tree, binary search tree (BST), randomized BST and treap, self-balancing in trees, AVL tree, B-tree, red-black tree, binary heap and meldable heap, Fibonacci heap, graphs and their representations, graph algorithms, trie, inverted index.

### **CS 212 Nature of Computation**

**Credit Hours:** 3+0

**Prerequisite:** CS 113

**Fulfil:** CS Kernel

Develops foundations for theoretical computer science; investigates fundamental challenges at frontiers of theoretical computer science; provides opportunities to develop rigorous mathematical arguments; engages with classical ideas from theoretical computer science; topics include: proofs, languages, finite automata, grammars and push-down automata, turing machines and halting problem, oracles and computability, Gödel's completeness and incompleteness theorems, circuit complexity, polynomial time and its justification, reduction, P, NP, and NP-completeness, Cook-Levin theorem, hardness of the P versus NP problem, randomness, P versus BPP, interactive proofs, zero-knowledge proofs, quantum computing, DNA computing, biological computing, physical limits of computation.

### **CS 224 Object Oriented Programming and Design Methodologies**

**Credit Hours:** 3+1

**Fulfil:** CS Kernel

**Prerequisite:** CS 102

Introduces object oriented and related memory concepts; motivates C++ as the language of choice; topics include: pointers and structs, objects, heap allocation, data encapsulation, classes, namespaces, constructors and destructors, virtual functions and destructors, operator overloading and standard input/output, inheritance and polymorphism, templates, standard library containers, and software design using UML 2.0.

### **CS 232 Operating Systems**

**Credit Hours:** 3+1

**Fulfil:** CS Kernel

**Prerequisite:** CS 102

The student will be taught principles of modern operating systems. In particular, the course will cover details of concurrent processes, multi-threads, CPU scheduling, memory management, file system, storage subsystem, and input/output management. This will be accomplished by integrating theory and practice, through coordinated lecture and lab hours.

### **CS 330 Computer Architecture**

**Credit Hours:** 3+1

**Prerequisite:** CS 130

**Fulfil:** CS Systems Elective

Studies the architecture of RISC-V processor that enables general purpose computing; develops hands-on expertise in developing complex logical components; topics include: instruction set architecture, addressing modes, processor design and computer arithmetic, pipelining, memory systems, fetch-execution cycle, processor implementation on FPGA using Verilog HDL.

### **CS 353 Software Engineering**

**Credit Hours:** 3+0

**Prerequisite:** CS 224 and CS 355

**Fulfil:** CS Kernel

Approaches, software engineering as the study and practice of a collection of concepts, techniques and tools which enable programmers to design, build, and maintain large software systems in a reliable and cost effective way; develops skills and understanding that function as the basis for many of the more advanced analysis and design practices encountered in the industry; topics include: systems development process, stakeholders and their roles, systems development project needs, software process methodologies, spiral and RUP, software analysis and requirement discovery, data modelling, SAD and OOAD, UML, use case diagrams, software project management, project scope, network diagrams and CPM, agile methodologies, XP, Scrum and FDD, class diagrams, realization of use cases, object oriented design, sequence diagrams, activity diagrams, state transition diagrams, user interface design, software testing, software construction and maintenance.

### **CS 355 Database Systems**

**Credit Hours:** 3+1

**Prerequisite:** CS 102

**Fulfil:** CS Kernel

Explores in detail the theoretical and practical aspects of Relational Database Management Systems (RDBMS); develops an understanding of database modeling, relational algebra, structured query language (SQL), components of Database Management System (DBMS), transaction management and concurrency control, database fine-tuning via indexing and partitioning, and database connectivity with front-end applications; discusses administrative aspects of database systems including database security, database management vs data warehousing vs data mining, and big data and its challenges.

### **CS 412 Algorithms: Design and Analysis**

**Credit Hours:** 3+0

**Prerequisite:** CS 201 and MATH 310

**Fulfil:** CS Kernel

Develops tools and techniques that aid in designing correct, efficient algorithms for computational problems and analyzing their correctness and running time; some of the discussed techniques are: greedy method, divide-and-conquer, dynamic programming, hashing, randomization, network flows, linear programming, Fast Fourier Transform, and techniques for thinking about solving problems in parallel; analysis tools include: recurrences, probabilistic analysis, amortized analysis, and potential functions.



### **CS 491 Kaavish I**

**Credit Hours:** 0+3

**Prerequisite:** CS 353

**Fulfil:** Capstone Project

Self-directed final year project carried out under the supervision of a faculty member; emphasizes solving a real-world problem; integrates knowledge and skills accumulated over the entirety of the degree; first of a 2-part sequence.

### **CS 492 Kaavish II (0+3)**

**Credit Hours:** 0+3

**Prerequisite:** CS 491

**Fulfil:** Capstone Project

Self-directed final year project carried out under the supervision of a faculty member; emphasizes solving a real-world problem; integrates knowledge and skills accumulated over the entirety of the degree; second of a 2-part sequence.

### **Elective Courses:**

#### **CS 262 Introduction to Computational Social Sciences**

**Credit Hours:** 3+0

**Prerequisite:** None

**Fulfil:** CS Elective

Computation social science focuses on synthesis of modeling & simulation, network sciences, computer science and sociology to produce a hybrid methodology that could be an effective tool for understanding and managing complex social systems. This is a cross-disciplinary course. It is intended for students with background and interest in social sciences, and application of computational methods in this domain.

#### **CS 314/PHY 300 Quantum Computing**

**Credit Hours:** 3+0

**Prerequisite:** Math 101, Math 102 and Math 205

**Fulfil:** CS Elective

By the end of the course, students will have an understanding of discrete quantum mechanics, quantum circuit model of computation, important quantum algorithms, quantum error correction, basic quantum complexity theory and the current state of technological progress, towards the building of quantum computers. The course will prepare students to write programs for quantum computers. No prior knowledge of physics is required for this course.

#### **CS 316 Introduction to Deep Learning**

**Credit Hours:** 3+1

**Prerequisite:** Math 101, Math 205, and Math 310

**Fulfil:** CS Elective

The goal of this course is to give learners an understanding of modern neural networks, their applications in different domains such as computer vision, natural language processing, etc. This course aims to provide expertise to develop intelligent systems using deep learning from scratch, using best practices to solve real-world problems.

### **CS 326 Mathematics for Machine Learning**

**Credit Hours:** 3+0

**Prerequisite:** MATH 205 and MATH 310

**Fulfil:** CS Elective

This course looks at machine learning from a mathematical point of view. It reviews linear algebra, probability, statistics, and optimization in the context of specific machine learning algorithms, with emphasis on design and analysis of these algorithms.

### **CS 340/Math 321 Geometrical Modelling and Analysis**

**Credit Hours:** 3+0

**Prerequisite:** Math 205, Math 202, and CS 224

**Fulfil:** CS Elective

This course will cover foundations of geometrical modelling and analysis, with examples from elasticity, electrostatics, and computer science. The course content can broadly be divided into three categories: fundamentals of geometrical modelling, discretizing a partial differential equation, and stability of solutions.

### **CS 351 Artificial Intelligence**

**Credit Hours:** 3+0

**Prerequisite:** CS 201 and CS 224

**Fulfil:** CS Elective

Studies major areas of artificial intelligence (AI): problem-solving, decision-making, learning, planning, and reasoning; topics include: intelligent search techniques, games and adversarial search using minimax and alpha-beta pruning, supervised learning via decision trees, naive Bayes, artificial neural networks, K-means clustering, reasoning via first-order logic, Bayesian networks, evolutionary algorithms; explores areas of computer vision, robotics, and deep learning; applies the covered AI techniques to real-world problems.

### **CS 363 Networks, Games, and Collective Behavior**

**Credit Hours:** 3+0

**Prerequisite:** CS 102 and CS 113

**Fulfil:** CS Elective

This course brings an interdisciplinary perspective by combining foundations of network science, game theory, and computational social choice, to study social, technical, and natural systems exhibiting collective behavior, and thus aims at exploring the micro macro link from a theoretical and an applied lens. The course covers topics including models of social dilemma, auctions, voting behavior, contagion, diffusion, and coalition formation.

### **CS 370 Web and Mobile Development**

**Credit Hours:** 2+1

**Prerequisite:** CS 224 and CS 355

**Fulfil:** CS Elective

Develops expertise in current web and mobile development tools; topics include: HTML, CSS, JavaScript, building an HTML website, animation and effects, Visual Studio and C#, .NET and MVC, views, controllers, models, working with databases, authentication and authorization, security, mobile development, Ionic.





### **CS 400 Computer Science Senior Seminar**

**Credit Hours:** 1+0

**Prerequisite:** None

**Fulfil:** CS Elective

Provides insight into a few current research areas in Computer Science; develops skills in reading, understanding, and presenting research papers and presentations in Computer Science.

### **CS 432 GPU Accelerated Computing**

**Credit Hours:** 3+0

**Prerequisite:** CS 232 and Math 205

**Fulfil:** CS Elective

This course teaches the fundamental tools and techniques for accelerating C/C++ applications to run on massively parallel GPUs with CUDA®. Students will learn how to write code, configure code parallelization with CUDA, optimize memory migration between the CPU and GPU accelerator, and implement the workflow that they have learned on a new task—accelerating a fully functional, but CPU-only, particle simulator for observable massive performance gains.

### **CS 440 Computer Graphics**

**Credit Hours:** 3+0

**Prerequisite:** CS 224, CS 412, and MATH 205

**Fulfil:** CS Elective

This course presents some of the basic techniques in Computer Graphics and focuses on two particular rendering approaches: pipeline, rendering using a graphics API and realistic rendering, using ray tracing.

### **CS 451 Computational Intelligence**

**Credit Hours:** 3+0

**Prerequisite:** CS 351

**Fulfil:** CS Elective

Studies different nature-inspired computational methods; provides hands-on experience of applying these techniques to solve complex optimization problems; topics include: evolutionary computation, swarm intelligence, reinforcement learning, fuzzy logic, and artificial neural networks.

### **CS 457 Data Science Techniques**

**Credit Hours:** 3+0

**Prerequisite:** CS 355 and MATH 310 / EE 354

**Fulfil:** CS Elective

Develops skills to leverage statistics and programming to make predictions, optimize outcomes, and help guide business decisions using data; explores techniques for drawing conclusions and predicting outcomes from data; provides hands-on exposure to an ecosystem of powerful tools that apply data science techniques to real data sets; topics include: data manipulation, data visualization, supervised and unsupervised learning, descriptive and inferential statistics, and data visualization.

# Electrical and Computer Engineering (ECE) Program

**Offers two majors -  
BS in Electrical Engineering\*,  
BS in Computer Engineering**

**Minor in Electrical and Computer Engineering**

## **Faculty Members**

### **Full-time Faculty**

Shafayat Abrar, Associate Professor

Muhammad Moiz Anis, Assistant Professor

Saad Baig, Lecturer

Muhammad Farhan, Assistant Professor

Aamir Hasan, Associate Professor (Associate Dean Undergraduate Education & Accreditation)

Ishtiyaq Ahmed Makda, Assistant Professor

Abdul Basit Memon, Assistant Professor (Program Director)

Junaid Ahmed Memon, Lecturer

Tariq Mumtaz, Lecturer

Mohammad Shahid Shaikh, Associate Professor (Associate Dean for Academic Systems & Operations)

Owais Talaat, Assistant Professor

Ahmad Usman, Assistant Professor

### **Adjunct Faculty**

Abdullah Bajwa, Assistant Professor

Adnan Aslam, Assistant Professor

Khurram Rehman, Assistant Professor

Muhammad Wamiq, Assistant Professor

## **About**

The ECE program offers a robust and multidisciplinary curriculum that includes strong theoretical fundamentals and practical problem-solving. The program is recognized for shaping students to be the next leading engineers to integrate in the creative world of evolving technological landscape. The uniqueness of our engineering program hinges on sound and contextualized liberal arts exposure that provides the mold for a 'great engineer'.

Today, electrical and computer engineering intersects from miniaturized integrated electronics to large-

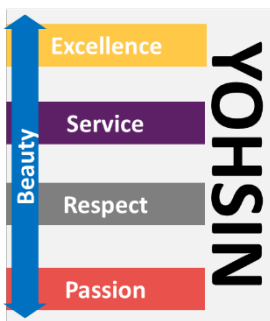
scale power plants; from single-transistor devices to networks comprising a billion nodes. ECE offers a diverse set of exciting sub-disciplines like digital and analog electronics, instrumentation, machine vision, communications, control systems, robotics, wireless devices, embedded controllers, networking, software development, biomedical devices, artificial intelligence, and computer architecture.

## Vision

To be an agent of positive change in society through excellence in locally contextualized and globally competitive liberal-arts and discipline-specific education and research, and imparting an understanding of contemporary issues and challenges facing the society.

\* EE major is accredited by PEC at Level II (Highest level of accreditation in Pakistan)

## Program Educational Objectives (linkages with YOHSIN)



The Electrical and Computer Engineering program at Habib University aims to produce competent electrical and computer engineers who:

1. Exhibit broad-based **technical excellence** in their engineering practice and in other professional dealings.
2. Are aware of the impact of their work on **society and environment**.
3. Are capable of leading through a **pluralistic approach**.
4. Engage in the lifelong process of **independent and reflective learning**.

## Program Learning Outcomes

Following Program Learning Outcomes (PLO) are designed to prepare graduates to attain program educational objectives and subsume the PLOs of Pakistan Engineering Council (PEC) and Accreditation Board for Engineering and Technology (ABET).

ECE program at Habib University aims to produce electrical and computer engineers who, at the time of graduation, have

- i. An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization, to the solution of complex engineering problems
- ii. An ability to identify, formulate, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering
- iii. An ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations
- iv. An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information, to derive valid conclusions
- v. An ability to create, select and apply appropriate techniques, resources, and modern engineering tools, including prediction and modelling, to complex engineering activities with an understanding of the limitations
- vi. An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems;
- vii. An ability to understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate knowledge of and need for sustainable development
- viii. The ability to apply ethical principles and commit to professional ethics, responsibilities, and norms of engineering practice
- ix. An ability to work effectively, as an individual or in a team, on multifaceted and/or multidisciplinary settings
- x. An ability to communicate effectively, orally as well as in writing, on complex engineering activities with the engineering community and with society at large
- xi. An ability to demonstrate management skills as a member and/or leader in a team, to manage projects in a multidisciplinary environment
- xii. An ability to recognize importance of, and pursue lifelong learning in broader context of innovation and technological developments.

## The Academic Program

The academic training of Electrical and Computer Engineering (ECE) majors is based on a rigorous multidisciplinary curriculum, which aims to build strong theoretical fundamentals, practical problem-solving skills, and ability to solve broad-based problems. Students are required to take courses in natural sciences, mathematics, computing, foundational courses in ECE, courses exposing them to the breadth of Electrical Engineering or Computer Engineering, and a number of courses to establish depth in their chosen major. Additionally, students necessarily take courses in humanities, social sciences, management, entrepreneurship, and even engineering disciplines outside their major. ECE students also have the opportunity to obtain a minor in a number of disciplines.



## Requirements for the Electrical Engineering (EE) Major – Class of 2024

All students majoring in Electrical Engineering are required to complete 42 courses and a minimum of 134 (on average, 137) credit hours of course work, and achieve a minimum CGPA of 2.33. The course categories are shown in the table below:

Course Category	Number of Courses to complete	Credit hours
<b>University Requirements</b>		
Habib Liberal Core	10	30 <sup>1</sup>
<b>Engineering Sciences and Computing</b>		
Computing	3	11 <sup>2</sup>
Mathematics	4	12 <sup>3</sup>
Natural Sciences	2	7 <sup>4</sup>
<b>Electrical Engineering – Foundation</b>		
Introduction to Electrical and Computer Engineering	1	4
Circuits and Electronics	3	12 <sup>5</sup>
Systems and Signal Processing	2	7 <sup>6</sup>
Digital Systems Design	1	4 <sup>7</sup>
Electromagnetic Theory	1	3 <sup>8</sup>
<b>Electrical Engineering – Breadth</b>		
Embedded Systems	1	4 <sup>9</sup>
Communication and Control	2	8 <sup>10</sup>
Power and Energy Systems	2	8 <sup>11</sup>
Electrical Engineering Seminar	1	1
<b>Electrical Engineering – Depth</b>		
Electives	5	15-20 <sup>12</sup>
<b>Engineering Breadth</b>		
Interdisciplinary Engineering Electives (IDEE)	1	3
<b>Professional Practice</b>		
Economics, Management, and Entrepreneurship	2	5-6
<b>Design in Engineering</b>		
Engineering Workshop	1	1
Engineering Innovation and Design	1	2 <sup>13</sup>
Senior Capstone Design Project	2	6
<b>Overall</b>	<b>42</b>	<b>134-140</b>

<sup>1</sup> Course credits may differ depending on the offerings. Details of courses are provided in the section above on the Habib Liberal Core.

<sup>2</sup> CS 101, CS 102, and CS 224. CS 101 can also be counted towards meeting the university form of thought requirement in Formal Reasoning.

<sup>3</sup> MATH 101, MATH 102, MATH 201, and MATH 205.

<sup>4</sup> PHY 101 and any natural science elective offered by ISciM program.

<sup>5</sup> EE 111, EE 212, and EE 213.

<sup>6</sup> EE 252 and EE 354. EE354 can also be counted towards meeting the university form of thought requirement in Quantitative Reasoning.

<sup>7</sup> EE 172.

<sup>8</sup> EE 241.

<sup>9</sup> EE 375.

<sup>10</sup> EE 322 and EE 361.

<sup>11</sup> EE 331 and EE 335.

<sup>12</sup> Elective courses could be offered with or without labs (3 or 4 credits). Labs are mandatory, if offered.

<sup>13</sup> EE 391. This course can also be counted towards meeting the university form of thought requirement in Creative Practice.

### Electrical Engineering Thrusts

Through Electrical Engineering breadth courses, every student is exposed to various concentrations within Electrical Engineering. The program further offers students flexibility to specialize in one of the following thrust areas, by appropriately choosing electives in these areas. The elective courses can be selected in consultation with their academic advisor. Additionally, the Electrical Engineering seminar is offered in students' junior year to expose them to a diverse set of specializations within EE.

- **Controls and Robotics**

Control technology exists in the background in airplanes, spacecraft, factories, cell phones, and even communication networks. Control theory helps us understand how systems (engineered and natural) behave, and essentially allows us to design means to control them and make them act in the desired manner. It is also at the heart of any robotic system. Robotics is in fact an interdisciplinary area involving Electrical and Computer Engineering, Mechanical Engineering, and Computer Science. Robotic systems are increasingly being employed in all areas of life: they exist as self-driving cars on our roads, surgical robots in healthcare, special purpose arms in industries, space exploration rovers, disaster handlers, and hopefully as service robots in our homes. With the ever-increasing utilization of robotic systems, the demand for properly trained engineers in robotics is also increasing.

- **Electronics and Embedded Systems**

Electronic systems are ubiquitous in today's consumer, industrial, automotive, medical, commercial, and military devices. The percentage of electronics in even traditionally mechanical systems, such as automobiles, has steadily increased to more than 30% and is expected to increase further. This trend of 'electronification' of society, coupled with the availability of inexpensive but powerful embedded systems, opens up a huge valley of opportunities for well-trained electronic engineers and entrepreneurs.

- **Power and Energy Systems**

Ready availability of electrical power at a reasonable price is essential for the economic development of a country. In order to come out of the current energy crisis, Pakistan needs thoughtful electrical engineers with technical expertise in the area of energy systems (power generation, transmission, and distribution), and contextual awareness to develop the best possible solution to our crisis.

- **Telecommunications & Networks**

Cellular mobile phone networks, satellite and fiber-optics communication systems, and global positioning systems are playing a fundamental role in increasing the quality of life and





improving the efficiency of service sector. A well-knit telecommunications infrastructure is essential for economic development of a country. In Pakistan we are witnessing introduction of 4G LTE and 5G cellular phone systems, proliferation of data networks, and a shift towards electronically facilitated services by both the public and private sector. Telecommunications thrust is intended to sustain the positive growth in this industry by providing adequately trained technical managers, leaders, and entrepreneurs.

### Requirements for the Computer Engineering Major – Class of 2024

A major in Computer Engineering requires completion of 43 courses with a minimum of 137 (on average, 139) credit hours of coursework, and a minimum CGPA of 2.33. The course categories are shown in the table below:

Course Category	Number of Courses to complete	Credit hours
<b>University Requirements</b>		
Habib Liberal Core	10	30 <sup>1</sup>
<b>Engineering Sciences</b>		
Mathematics	4	12 <sup>2</sup>
Natural Sciences	1	4 <sup>3</sup>
<b>Computer Engineering – Core</b>		
Introduction to Electrical and Computer Engineering	1	4
Computing and Algorithms	4	13 <sup>4</sup>
Circuits and Electronics	2	8 <sup>5</sup>
Systems and Signal Processing	3	11 <sup>6</sup>
Digital Systems Design	2	8 <sup>7</sup>
Computer Networks	1	4 <sup>8</sup>
Embedded Systems	1	4 <sup>9</sup>
Computer Organization and Architecture	1	4 <sup>10</sup>
Engineering Workshop	1	1
Project Engineering	1	2 <sup>11</sup>
Systems Resource Management	1	4 <sup>12</sup>
Software Design	2	7 <sup>13</sup>
Computer Engineering Seminar	1	1
<b>Computer Engineering – Depth</b>		
Electives	5	15-20 <sup>14</sup>
<b>Engineering Breadth</b>		
Interdisciplinary Engineering Elective (IDEE)	1	3
<b>Professional Practice</b>		
Economics, Management, and Entrepreneurship	2	5-6
<b>Design Project</b>		
Senior Capstone Design Project	2	6
<b>Overall</b>	<b>43</b>	<b>137-143</b>

<sup>1</sup> Course credits may differ depending on the offerings. Details of courses are provided in the section above on Habib Liberal Core.

<sup>2</sup> MATH 101, MATH 102, MATH 201, and MATH 205.

<sup>3</sup> PHY 101.

<sup>4</sup> CS 101, CS 102, CS 113, and CS 201. CS 101 can also be counted towards meeting university form of thought requirement in Formal Reasoning.



<sup>5</sup> EE 111 and EE 213.

<sup>6</sup> EE 252, EE 354, and EE 453. EE354 can also be counted towards meeting the university form of thought requirement in Quantitative Reasoning.

<sup>7</sup> EE 172 and CE 475.

<sup>8</sup> EE 424.

<sup>9</sup> EE 375.

<sup>10</sup> EE 371.

<sup>11</sup> EE 391. This course can also be counted towards meeting the university form of thought requirement in Creative Practice.

<sup>12</sup> CS 332.

<sup>13</sup> CS 224 and CS 353.

<sup>14</sup> Elective courses could be offered with or without labs (3 or 4 credits). Labs are mandatory, if offered.

### Computer Engineering Electives

The Computer Engineering program will offer electives in the following concentrations<sup>2\*</sup>:

1. **Computer Networks:** Analyze and design computer networks that help us connect all devices to each other today.
2. **Embedded Systems:** Analysis and design of application-specific computers that run smartphones, appliances, medical devices, and vehicles.
3. **Computer Architecture:** How to design modern microprocessors and microprocessor-based systems from logic gates.
4. **Signal Processing:** Understand how to manipulate and communicate video, audio, and other digital signals.
5. **Robotics and Vision:** How to design robots and computer vision systems to interact with environment and act on it.
6. **Operating Systems:** Building software that interacts heavily with hardware, keeping in view memory, power, security, and processing speed.
7. **Digital VLSI Circuits:** Analysis and design of high-performance, low-power, and reliable ICs that are fundamental to modern computers.

### Minor in Electrical and Computer Engineering

The increasingly blurring boundaries between various disciplines in the present world have placed students interested in multiple areas in the difficult position of choosing between those areas. The minor in ECE provides an opportunity to students enrolled in other programs at HU, to be exposed to the extensive breadth of ECE discipline areas, without a substantial investment of time on their part. The minor has been designed such that the students have reasonable academic preparation in terms of the foundations of ECE, but then have the option to create their own path through the different concentrations within ECE, including Communications, Power and Energy, Signal Processing, Control and Robotics, Analog Circuits, Digital Circuits, Electromagnetics, and Embedded Systems.

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2 \* Electives will be offered based on the availability of faculty.

## Learning Outcomes

A student successfully completing the minor requirements will be able to:

1. Construct circuits and test them in the laboratory using basic test equipment or simulation tools, with intermediate level of proficiency;
2. Analyze the behavior of electric circuits and systems, and reach substantiated conclusions using mathematical techniques;
3. Design ECE systems, components or processes that meet specified needs at beginner level of proficiency
4. Either apply knowledge from one technical discipline within ECE, or comprehend knowledge from a few technical disciplines within ECE.

## Requirements

The ECE minor requires successful completion of a minimum of 22 credit hours of coursework and seven (7) courses as described below:

Course or Course Category	Credit Hours	Prerequisite(s)/ Corequisite(s)
<b>ECE General Foundation</b>		
EE 101: Introduction to Electrical and Computer Engineering	4	CS 101
EE 111: Electric Circuit Analysis	4	None
EGR 291: Engineering Workshop	1	None
<b>ECE Concentration Foundation. Choose one of the following courses:</b>		
EE 213: Basic Electronics	4	EE 111
EE 172: Digital Logic and Design	4	None
EE 212: Electric Network Analysis	4	EE 111
EE 252: Signals and Systems	4	MATH 101
<b>Additional Courses (Electives)</b>		
Two ECE courses (300 level or higher)	6-8	
One ECE course (any level)	3-4	
<b>Overall</b>	<b>22-25</b>	

## Further Requirements

- A minimum grade of C+ is required for all four foundation courses.
- At most one of 300 level courses and a maximum of three courses in total can be cross listed with the student's major.
- Before enrolling in any course for the ECE minor, student must have obtained a passing grade in the respective prerequisite courses.



## Electives

1. EE213 Basic Electronics
2. EE172 Digital Logic and Design
3. EE212 Electric Network Analysis
4. EE213 Basic Electronics
5. EE241 Electromagnetic Theory
6. EE252 Signals and Systems
7. EE331 Electrical Machines
8. EE322 Analog and Digital Communication
9. EE361 Principles of Feedback Control
10. EE371 Computer Architecture
11. EE373 Microcontrollers and Interfacing
12. EE335 Power Generation, Transmission, and Distribution
13. EE365 Industrial Instrumentation and Measurement
14. EE366 Introduction to Robotics
15. EE468 Mobile Robotics
16. EE451 Digital Image Processing
17. EE452 Computer Vision
18. EE453 Digital Signal Processing
19. EE422 Wireless and Mobile Communication
20. EE424 Data Communication and Networking
21. EE427 Cellular Internet of Things in 5G
22. EE441 Antennas and Wave Propagation
23. EE432 Power Electronics
24. EE433 Power Electronics – System Design
25. EE442 Embedded Systems

## Electrical and Computer Engineering courses offered:

### Required Courses

**EE 101 Introduction to Electrical & Computer Engineering; Credit hours: 2+2**

**Fulfil:** EE foundation, CE Core, Minor foundation

Through a series of projects, this course aims to expose students, having little or no prior exposure, to the fascinating world of electrical and computer engineering. The course will allow students to gain an appreciation for the history and possible futures of various disciplines, within electrical and computer engineering. Students will spend most of their time in the lab working on these projects with classroom instruction for support. The course will introduce basic electrical concepts including charge, voltage, current, energy, power, resistance, capacitance, inductance, and Kirchoff's laws. Practical digital and analog electronic systems will also be introduced to illustrate advanced topics that are treated completely in subsequent electrical engineering courses.

**EE 111 Electric Circuit Analysis; Credit hours: 3+1**

**Fulfil:** EE Foundation, CE Core, Minor Foundation

This course introduces basic DC and AC steady-state analysis for linear circuits. Topics discussed in this course include circuit elements, Ohm's law and Kirchhoff's laws, node and mesh analysis, energy storage elements, Thevenin and Norton theorems, Phasors and sinusoidal steady state analysis. Computer applications in circuit simulation and numerical solution is also discussed.

**EE 172 Digital Logic and Design; Credit hours: 3+1**

**Fulfil:** EE Foundation, CE Core, Minor Concentration Foundation

Introduction to the design of digital hardware, realization of computation with logic gates; Boolean algebra, design of combinational logic circuits, and analysis and design of clocked sequential logic circuits, circuits for arithmetic operations; introduction to hardware description language and its application to logic design. (Cross-listed with CS 130.)

**EE 212 Electric Network Analysis; Credit hours: 3+1**

**Fulfil:** EE foundation, Minor Concentration Foundation

**Prerequisite:** EE 111

This course is a continuation of Electric Circuit Analysis. The course discusses DC and AC transient analysis, sinusoidal steady state analysis of RC, RL, and RLC circuits, AC circuit power analysis, polyphase circuits and magnetically coupled circuits. The course then introduces students to s-domain analysis techniques and ends with a discussion of frequency responses.

**EE 211 Basic Electronics; Credit hours: 3+1**

**Fulfil:** EE foundation, CE Core, Minor Concentration Foundation

**Prerequisite:** EE 111

The course aims to introduce students to semiconductor devices, with emphasis on application of these devices in realizing analog and digital electronic circuits. The course starts with an introduction to semiconductors, energy bands, valence bonds, doping, n-type and p-type semi-conductors. The electronic devices, such as PN junction diode, bipolar junction transistor (BJT) and Metal-oxide semiconductor field-effect transistor (MOSFET), along with their applications are discussed in detail. Biasing circuits, single transistor amplifiers and their frequency are also discussed. Circuit simulations using PSpice (OrCAD) forms an important bridge between the theory discussed in class and lab experiments.

**EE 241 Electromagnetic Theory; Credit hours: 3+0**

**Fulfil:** EE Foundation, Minor Elective

**Prerequisite:** MATH 202

The study of electrostatic and magneto-static fields in free and material spaces; solving boundary-value problems; extension of static fields to time-varying fields and electromagnetic waves; Maxwell's equations; propagation of electromagnetic waves through different types of media (unbounded media and guided structures) and their behavior at the interfaces.





### **EE 252 Signals and Systems; Credit hours: 3+1**

**Fulfil:** EE Foundation, CE Core, Minor Concentration Foundation

**Prerequisite:** MATH 101

The topics covered in this course include types of signals; unit impulse and unit step functions; linear time invariant (LTI) systems and their properties; convolution sum and convolution integral; Fourier series, Fourier, Laplace and Z transforms; analysis and characterization of LTI systems using various transforms, Sampling.

### **EGR 291 Engineering Workshop; Credit hours: 0+1**

**Fulfil:** EE Foundation, CE Core, Minor Foundation

This course aims to introduce students to hands-on engineering skills, necessary for creating their own prototypes. Topics covered in this course include introduction to engineering design process, shop safety, engineering drawing, solid modeling (CAD), 3D printing, effective use of basic hand tools such as saws and files, machining (Lathe, Milling, Drill press), CNC machining, soldering techniques, and PCB design and printing. The course work emphasizes practical skills through lab activities and project. The students will be required to work with different materials including metal, wood, and plastic.

### **EE 322 Analog and Digital Communication; Credit hours: 3+1**

**Fulfil:** EE Breadth, Minor Elective

**Prerequisite:** EE 252

Introduction to fundamental principles underlying the analysis, design and optimization of analog and digital communication systems; modulation techniques for analog and digital communication; effects of interference and noise and their suppression.

### **EE 331 Electrical Machines; Credit hours: 3+1**

**Fulfil:** EE Breadth, Minor Elective

**Prerequisite:** EE 212, EE 241

This is the first course on DC and AC electromechanical systems. Specific topics include single-phase and three-phase transformers, general structure and physical principles underlying electric drive systems, brushless, stepper and switched reluctance DC motors, DC generators, Induction and Synchronous AC motors and generators, torque-speed characteristics of motor drives. Mathematical modeling and speed control of electrical machines will also be discussed.

### **EE 335 Power Generation, Transmission, and Distribution; Credit hours: 3+1**

**Fulfil:** EE Breadth, Minor Elective

**Prerequisite:** EE 211, EE 212

The development of electrical power systems has immensely contributed to the technological advancement of humankind over the past century. Electrical power provides clean and convenient energy to the modern society, which is necessary for the realization of the luxuries we are enjoying in this world today. In summary, the modern world and society does not exist without the availability of electricity. The purpose of this course is to provide the students with a complete flavor of the full-spectrum of electric power generation, transmission, and distribution systems.

**EE 354 Introduction to Probability and Statistics; Credit hours: 3+0**

**Fulfil:** EE Foundation, CE Core

**Prerequisite:** MATH 102

Set theory and counting principles, axiomatic definition of probability, independence and conditional probability, Bayes' theorem; random variables (RVs) and their cumulative distribution function, probability mass functions, probability density functions and moments; joint RVs; limits theorems; statistics; applications.

**EE 361 Principles of Feedback Control; Credit hours: 3+1**

**Fulfil:** EE Breadth, Minor Elective

**Prerequisite:** EE 252, MATH 202

Topics include: Models of dynamic systems, linear time-invariant (LTI) and transfer function models; impulse, step, transient and steady-state response; root locus technique, Bodé plots, Nyquist criterion; gain and phase margins, Nichols charts, lead, lag compensation; state-space techniques; simulation and controller design using Matlab and Simulink.

**EE 371 Computer Architecture; Credit hours: 3+1**

**Fulfil:** EE elective, CE Core, Minor Elective

**Prerequisite:** EE 172

Studies the architecture of processors that enable general purpose computing and develops hands-on expertise in developing complex logical components. Topics include instruction set architecture, addressing modes, processor design and computer arithmetic, pipelining, memory systems, fetch execution cycle, processor implementation on FPGA using Verilog HDL.

**EE 375 Microcontrollers and Interfacing; Credit hours: 3+1**

**Fulfil:** EE Breadth, CE Core, Minor Elective

**Prerequisite:** EE 172

Microcontrollers play a central role in modern life, controlling everything from the engine of a car, to domestic and office machinery. Microcontroller fundamentals including architecture, assembly language programming, and interfacing. Applications of industry-standard microcontrollers in embedded systems. Employs software design tools, simulators, and hardware trainers. Will focus on interfacing the ARM RISC processor to motors, actuators and sensors.

**EE 391 Engineering Innovation and Design; Credit hours: 0+2**

**Fulfil:** Design in Engineering, CE Core

This course aims to cultivate skills needed to produce great designs, be a more effective engineer, and

communicate with high emotional and intellectual impact. This is accomplished by working on projects centered around a locally contextualized wicked problem and students are expected to develop a solution to their identified problem by the end of semester. During the semester, students will study and apply techniques suited for various steps of the design process. Students will come to appreciate that a design problem involves multiple stakeholders, come to terms with the ambiguity that shows



up in design problems, make decisions in presence of multiple conflicting objectives and constraints, handle uncertainty, think as part of a team, learn how to manage the progress of their project, and communicate their design effectively.

**EE 424 Data Communication & Networking; Credit hours: 3+1**

**Fulfil:** EE Elective, CE Core, Minor Elective

It is the first course on networking therefore no prior background is expected. This course will not only introduce students to the basics of communication of data in the networks of computer, but will also enable to develop some insight towards the core issues related to the communication models, and different network devices.

**EE 453 Digital Signal Processing; Credit hours: 3+1**

**Fulfil:** EE Elective, CE Core, Minor Elective

**Prerequisite:** EE 252

Introduction to digital signal representations in time and frequency domains; signal manipulations via filters and resampling; signal creation and capture and processing with real-time computing machinery.

**EE/CE 491. Capstone Project I; Credit hours: 0+3**

**Fulfil:** Design in Engineering, Design Project

**Prerequisite:** EGR 291, EE 375, EE 391, Approval from respective capstone committee

**EE/CE 492. Capstone Project II; Credit hours: 0+3**

**Fulfil:** Design in Engineering, Design Project

**Prerequisite:** EE/CE 491

This year-long sequence represents culmination of study towards the BS degree. Students work individually or in small teams on a project in which they utilize the knowledge acquired during the first three years of education. Each project is closely supervised by a faculty member and each team produces a comprehensive report at the end of the project.

**Elective Courses**

**EE 366 Introduction to Robotics; Credit hours: 3+1**

**Fulfil:** EE Elective, CE Elective, Minor Elective

**Prerequisite:** MATH 205

Robotics is a multi-disciplinary area involving ideas from mechanical engineering, electrical and computer engineering, and computer science. This course is a breadth-first course designed to be the first course in the series of robotics courses. The goal of the course is to acclimatize the students with the area of robotics and to get them started on building robots. Topics covered include: forward and inverse kinematics, velocity kinematics, singularities, trajectory generation, actuation mechanisms, robot vision, feedback control, motion planning, control architectures, perception, localization, and locomotion.

**EE 365 Industrial Instrumentation & Measurements; Credit hours: 3+1**

**Fulfil:** EE Elective, CE Elective, Minor Elective

**Prerequisite:** EE 111

In this course, students will learn measurement techniques applied to instruments used both in laboratory and industry with more focus on fundamentals principles which are key to modern day instrumentation. This course will introduce the function, operation, and application of common electrical/electronic instruments, measurement principles, and statistical analysis. Students will investigate the fundamental limitations of data acquisition systems, and recognize and predict aliasing and quantization errors associated with digital representation of analog signals.

**EE 422 Wireless and Mobile Communication; Credit hours: 3+0**

**Fulfil:** EE Elective, CE Elective, Minor Elective

**Prerequisite:** EE 322

This course aims to introduce wireless communication to EE students. The route to this introduction is through concepts of the most pervasive wireless communication system - Cellular Mobile Networks. The course comprises of wireless communications basics, systems standards, architecture and topologies. The course includes cellular concepts, traffic engineering, radio waves propagation, study of different propagation Models and coverage analysis under different types of channel models, fading and Multipath scenarios.

**EE 427 Cellular Internet of Things in 5G; Credit hours: 3+1**

**Fulfil:** EE Elective, CE Elective, Minor Elective

This course is designed to introduce and deepen student's understanding on essentials of Internet of Things (IoT) Devices communicating with and without being attached to cellular Networks, specifically with the Fifth Generation (5G) Cellular Networks. Moreover, dealing with IoT devices as the terminals, would expose students to the entire stack of protocols i.e from Physical to the Application layer. The course is aimed to inculcate a deep understanding about the Cellular Internet of things (IoT) Networks, lay the foundation of Machine Type Communications (MTC) by framing different IoT scenarios and expose students to evolution of MTC into a massive MTC use case for 5G.

**EE 432 Power Electronics; Credit hours: 3+1**

**Fulfil:** EE Elective, Minor Elective

**Prerequisite:** EE 111, EE 211

This course aims to familiarize students with the power semiconductor devices (power diodes and transistors), their construction, electrical characteristics, operating-principle, and their various industrial and commercial applications. Along with good mathematical skills, students must be familiar with a fundamental understanding of electronic components; for instance, an inductor and a capacitor. The topics covered in the course are: Power Semiconductor Devices; AC to DC Converters (Uncontrolled Rectifiers); AC to DC Converters (Controlled Rectifiers); AC to AC Converters; DC to DC Converters; DC to AC Converters (Inverters).

**EE 433 Power Electronics – System Design; Credit hours: 3+0**

**Fulfil:** EE Elective, Minor Elective

Power electronics is widely used in automotive, industrial and renewable energy applications; for



instance, electrical vehicles, uninterruptible power supplies, and fuel-cell application. High-efficiency, low cost, and small size are some of the important design goals for any converter design; however, they of course need to comply with the electromagnetic interference (EMI) requirements. High efficiency in power converters can only be achieved by means of optimized converter design (specially the magnetic components) which then further calls for a well-engineered EMI filters. This course is mainly divided in to two parts. The first part deals with basic circuit operations of various well-known power converters, and their analysis and design. Next, EMI noise issues in power converters will be treated in extensive details. EMI noise models for isolated power converters will be established and analyzed to build optimized EMI filters.

### **EE 451 Digital Image Processing; Credit hours: 3+1**

**Fulfil:** EE Elective, CE Elective, Minor Elective

**Prerequisite:** CS 224

This course is developed for EE, CE, and CS students to introduce them to the fundamental concepts, principles and techniques of digital image processing and their applications to solve real-world problems. After completing this course students will be familiar with the key components of image processing system starting from image acquisition to image enhancement and restoration to morphological processing and segmentation till image representation, description and object classification. The course offers great opportunities in Final Year Projects

### **EE 452 Computer Vision; Credit hours: 3+0**

**Fulfil:** EE Elective, CE Elective, Minor Elective

**Prerequisite:** EE 451, MATH 205

Have you ever wondered how a machine or computer is made capable of understanding, interpreting and giving semantics to an image/video? Have you ever thought how image/video could be used to automate processes in a wider application domain ranging from industry to biomedicine? The answer lies in image processing and computer vision. This course is a continuation of Digital Image Processing. In this course, the aim is to explore the field of computer vision and pattern recognition from an application perspective where the main focus will be on visual recognition and classification using deep neural networks. The students will learn and implement the state-of-the-art algorithms and techniques for gaining high-level understanding from images and videos. The course requires knowledge of linear algebra, probability and statistics along with the basics of image processing. The course contents are planned in a manner that enables students to undertake research projects.

### **EE 468 Mobile Robotics; Credit hours: 3+0**

**Fulfil:** EE Elective, CE Elective, Minor Elective

**Prerequisite:** EE 354 or equivalent

Robotics is the science of perceiving and manipulating the physical world through computer-controlled mechanical devices. In the field of robotics, regardless of the nature of applications, we inherently deal with machines that move. Real world is not ideal or deterministic in nature; it is full of uncertainties, and exhibits a stochastic or random behavior. Thus, it is important to offer a course to make ECE students understand this challenging task of state estimation in engineering applications. In short, we would introduce the classic and state-of-the-art estimation results and probabilistic algorithms for estimating state of robots in linear/nonlinear systems corrupted by Gaussian/non-Gaussian measurement noise for localization and mapping applications.

### **EE 441 Antennas and Wave Propagation; Credit hours: 3+0**

**Fulfil:** EE Elective, Minor Elective

**Prerequisite:** EE 241

The course is broadly divided into two major sections i.e., “Transmission Lines and Wave propagation” and “Antenna Theory”. This course teaches the fundamentals of antenna and propagation and shows the application in practical examples. The course covers the theory of radiation, fundamental antenna parameters and concepts, wire antennas such as dipoles and loop antennas, antenna arrays, aperture antennas (e.g., horns), microstrip antennas, numerical analysis, communication & radar systems and propagation effects.

**EE 472 Embedded Systems; Credit hours: 3+1**

**Fulfil:** EE Elective, CE Elective, Minor Elective

**Prerequisite:** EE 375

The basic aim of this course is to make students be able to demonstrate their abilities to design and develop an embedded system-on-chip. The goal is to introduce students a hardware description language (HDL) which they can use to develop embedded hardware on Field Programmable Gate Array (FPGA) chips. Furthermore, they will be introduced with the architecture of an ARM Cortex processor and how a software and hardware communicate at embedded level. This understanding can help the graduates of ECE/CS to become a part of a team of design engineers and developers of embedded applications in any organization.

**ENVS 301 Introduction to Environmental Engineering; Credit hours: 3+0**

**Fulfil:** IDEE

Environmental problems represent one of the gravest global challenges of the 21st century. Engineering sustainable solutions to these environmental issues is one of our most pressing needs. In this course, students will learn fundamental science and engineering principles needed for environmental engineering. Students will apply these principles to problems such as water supply and treatment systems, sewage treatment of municipal and industrial wastewaters, stream and air pollution, and disposal of solid waste materials.

In addition, this course will provide an overview of major themes in contemporary environmental engineering, including environmental impacts of socioeconomic changes, energy consumption and production, water supply and treatment, air pollution and global climate change.

**ME 302 Engineering Thermodynamics; Credit hours: 3+0**

**Fulfil:** IDEE

The course deals with the aggregate thermodynamic properties of matter and extends it to principles, which govern the design and functioning of energy convertors, thermodynamic cycles and heat pumps. A brief interlude into Statistical Thermodynamics would also be provided. This course will cover the fundamental aspects of classical thermodynamics with a focus on understanding the principles to design, implement and sustain a thermodynamic system. This course will also provide a rudimentary introduction to statistical mechanics to understand the connection between thermodynamics quantities and microscopic behavior of a many-particle system.

**ME 391 Computer Aided Engineering; Credit hours: 3+0**

**Fulfil:** IDEE

Fundamentals of Computer Aided Engineering (CAE) will be taught with the aim to equip students with modern design tools needed to effectively create, analyze, improve, and communicate their



designs. The skills acquired will help students in their capstone projects and other future design projects. The course will be divided into three main portions: fundamentals of engineering drawing, mechanical analysis techniques to evaluate the performance of the designed product, and using a Computer Aided Design (CAD) program to design parts and assemble them into required assemblies while being cognizant of practical design considerations like manufacturability and ease of assembly. The course, being an engineering design course, will have a heavy “hands-on” tilt, whereby student performance will depend on the successful completion of various project-based design assignments. A major (end-of-semester) project will require students to design and analyze a practical contraption that satisfies functional and design requirements provided to them.

### **ME 431 – Introduction to Engineering Materials; Credit hours: 3+0**

**Fulfil:** IDEE

This course will cover the fundamental aspects of Materials Science with a focus on the understanding of physics, related to the functioning and development of electronics. The course content is divided into three parts: I. Fundamentals of Materials Sciences relevant to electronics, II. Materials Processing & III. Materials Selection and Application.

### **ME 432 – Introduction to Nano-technology; Credit hours: 3+0**

**Fulfil:** IDEE

The course provides an understanding for the Nano-Fabricated devices’ novel electronic, magnetic, mechanical and physical properties that are not possible due to fabrication at the macroscale. With a broad range of applications in science and engineering, Nanotechnology uses the bottom-up to realize structures that benefit humanity. This course is divided into 3 generic parts, which includes (i) a brief introduction to the concept of properties acquired through matter manipulation at Nanoscale, (ii) fabricating and characterizing devices at the Nanoscale and (iii) investigating the applications of nanotechnology in our daily life.

### **EGR 301 Systems Engineering; Credit hours: 3+0**

**Fulfil:** IDEE

The course serves to enable students to understand how any project can be broken down into a variant of a System and what different process routes it has to adopt for its successful completion. This course will cover the fundamental aspects of Systems Engineering and its application to real world problems. The course content is divided into three parts: Concept Development Stage, Engineering Development Stage and Post Development Stage.

### **ECON 302 Engineering Economics; Credit hours: 3+0**

**Fulfil:** Professional Practice

Topics include: Application of economic principles to engineering solutions, time value of money, cash flow analysis, quantization of profitability, methods of evaluating investments, comparison of alternative investments, inflation, depreciation, resource depletion, economic analysis of projects, economic management of engineering projects.

### **MGMT 304 – Fundamentals of Intellectual Property; Credit hours: 3+0**

**Fulfil:** Professional Practice

Intellectual Property (IP) has grown from a narrowly specialized legal field into a major force in



global social and economic life today. Topics include: managing technological transitions, intellectual property, creating and managing an innovative organization, managing research and development, organizational learning, economist and sociologist views of entrepreneurship, the process and management of entrepreneurship, the importance of innovation, teamwork, financial and marketing aspects, product quality; study will be supplemented with case studies.

**MGMT 321 Engineering project Management; Credit hours: 3+0**

**Fulfil:** Professional Practice

Topics include fundamentals of Project Management, the processes, tools and techniques, modern tools, such as, MS Project, Agile (Scrum) applied to virtual project, soft skills, such as, Communication, leadership, team building, time management.

**MGMT 322 Operations Management; Credit hours: 3+0**

**Fulfil:** Professional Practice

Topics include: concepts such as bottleneck measurement, process improvement and synchronization, process measurement, service improvement, six sigma approaches, lean management, statistical quality control techniques and decision trees. Therefore, this course will essentially help to inculcate skills to produce well-rounded engineering professionals.

## **Integrated Sciences and Mathematics (iSciM)**

**Minor in Mathematics**

**Minor in Physics**

**Faculty Members:**

Sameena Shah Zaman	Assistant Professor of Physics, Director iSciM
Anzar Khaliq	Associate Professor of Physics
Associate Dean for Teaching, Learning and Research	
Humaira Qureshi	Assistant Professor of Microbiology
Hassaan Furqan Khan	Assistant Professor of Environmental Sciences
Humaira Jamshed	Assistant Professor of Biology
Abdullah Khalid	Assistant Professor of Physics
Sarah Hasnain	Assistant Professor, Biology
Yousuf Kerai	Lecturer of Mathematics
Carina Dreyer	Lecturer of Mathematics
Rameez Raghib	Lecturer of Mathematics

**Adjunct faculty**

Sajal Sohail Rana

Sarah Ashraf



## Vision:

Integrated Sciences and Mathematics (iSciM) at Habib University offers a diverse range of rigorous foundational and research-based courses, that allow students from all disciplines to broaden their understanding of natural science and mathematics. Our interdisciplinary offerings profiting from various forms of design and community-based projects allow students to develop essential hard and soft skills required to understand and address complex problems. Key thrust areas for the program include Energy, Environment, Climate Change, Bio Sciences, Theoretical Physics and Applied Mathematics. The program currently offers two academic minors in Physics and Mathematics.

## Educational Objectives

Through iSciM, based on their course selection, the graduating Habib students will:

- Understand foundations and applications of the scientific method;
- Understand the fundamentals of energy, environment, and global warming and learn key skills to address issues of present times;
- Develop experimental skills in physics, chemistry, and biology; develop a strong foundation in physics, chemistry, bio-sciences, environmental science, energy, and mathematics;
- Develop strong skills in data analysis with an ability to use various software tools;
- Develop a strong grasp on scientific writing;
- Develop the ability to understand current research in various fields of science;
- Read selected classical scientific literature.

## Physics Minor:

The Physics minor is designed to open the opportunity for students with a significant interest in physics, to deepen their understanding of the subject. This will provide a foundation for a broader range of technical fields, enhancing their ability to keep abreast of an ever-changing technological world.

Minimum Credit Hour Requirements: 20

Students can obtain a minor in Physics by satisfying the following requirements:

- Students must take all the foundational courses specified in Table 1 to qualify for the Physics minor.

Foundational Courses	Credit Hours	Prerequisite(s)
Mechanics and Thermodynamics	3	None
E&M or EMT	3	Calculus I
Modern Physics	3	Mechanics and Thermodynamics, E&M or EMT
Quantum Mechanics I	3	Modern Physics
Mechanics Lab	1	Mechanics and Thermodynamics
Advanced Physics Lab	1	E&M or EMT

Table 1: Foundational courses for the Physics Minor

- Students are required to take a minimum of three additional 300+ level courses.
- Students must earn a minimum of 20 credits.
- Students must earn a C grade or higher in all mandatory courses to continue with the minor.

A minimum of seven (07) students is required to offer a course. In case fewer students enroll, individual study courses may be offered by the program, subject to the availability of relevant faculty.

**Electives offered by the program that can fulfil the minor requirements:**

- Classical Mechanics
- Quantum Mechanics II
- Mathematical Methods for Physics (also valid for Mathematics Minor)
- Statistical Mechanics
- Solid State Physics
- Cosmology
- Introduction to Nanotechnology

Please note that the offering of electives is subjected to the availability of faculty, and is contingent on the number of students enrolled.

**Mathematics Minor:**

The Mathematics minor at Habib University offers an opportunity to students from all disciplines, with a significant interest in mathematics to develop strong foundations in key areas of mathematics. This optional field of study is designed to provide a foundation in Calculus, Linear Algebra, and basic modelling techniques, using differential equations. Convergent thinking is also developed through the analysis of quantitative problems directed towards the right procedure for the right outcomes. The choice of courses available within the minor allows students to take either a pure mathematics track, an applied mathematics track or a mix of the two.

Students can obtain a minor in mathematics by satisfying the following requirements:

- Students must take all the foundational courses specified in Table 2 to qualify for the Mathematics minor:

Foundational Courses	Credit Hours	Prerequisite(s)
Calculus II	3	Calculus I
Engineering Mathematics	3	Calculus I
Linear Algebra	3	Engineering Mathematics
Probability and Statistics	3	None

Table 2: Foundational courses for the Mathematics Minor

- Students are required to take three (03) additional courses with at least two of them of 300 or higher level.
- Students must earn a minimum of 20 credits.
- Students must earn a C grade or higher in all mandatory courses to continue with a minor.

**Note:**

Math 0xx level courses cannot be taken to satisfy the minor.

DSSE students have a mandatory requirement of MATH 101 but it can't be double counted towards the minor.

AHSS students can count MATH 101 towards the minor.

Students are free to choose electives either from Pure Mathematics or Applied Mathematics or both. Depending on the availability of the faculty, a variety of courses can be offered within Pure and Applied Mathematics. Please check with the program at the start of the academic year for the latest



list of elective offerings.

A minimum of seven (07) students is required to offer a course. In case fewer students enroll, individual study courses may be offered by the program subject, to the availability of relevant faculty.

**Electives offered by the program that can fulfil the minor requirements:**

Any one of these

- Music and Mathematics (100 level)
- History of Mathematics (100 level)
- The Art of Mathematics (100 level)

## 2020-2021 Offerings

### Natural Science:

#### **PHY 101, Mechanics and Thermodynamics; (3); Credit hours: 3**

Mechanics and Thermodynamics Topics include: Units and physical quantities, vectors, motion in 1-dimension, motion in more than 1-dimension, Newton's laws of motion and their applications, work and energy, potential energy and conservation law of energy, momentum and impulse, rotation of rigid bodies, dynamics of rigid bodies, gravitation, thermal properties of matter, laws of thermodynamics.

**Fulfil:** Natural Science Requirement – Mandatory for EE

**Prerequisite:** None

#### **PHY 101L, Mechanics and Thermodynamics Lab; (3); Credit hour: 1**

Experiments include: simple harmonic motion observed through webcam, waves and oscillations, standing waves, resonance, moment of inertia of a tennis ball, rotational mechanics, rotational inertia, rotational friction, conservation of energy, latent heat of liquid nitrogen, heat capacity of solids, determined from boil-off of liquid nitrogen, conservation of momentum - elastic and inelastic collision, rotational motion, mass on a spring, basics of uncertainty analysis, Maxwell's wheel, light polarization, heat transfer, conduction, convection, Newton's law of cooling, temperature oscillations, Fourier analysis.

**Fulfil:** Natural Science Requirement – Mandatory for EE

**Prerequisite:** PHY 101

#### **PHY 102, Electricity and Magnetism; (3); Credit hours: 3**

Electricity & Magnetism Topics include: Electromagnetism and electrostatics, electric charge, Coulomb's law, electric field, Gauss's law, electrostatic potential, magnetic fields, Biot-Savart law and Ampere's law, magnetic materials, time-varying fields and Faraday's law of induction, Hall effect, displacement current and Maxwell's equations.

**Fulfil:** Physics Minor Foundational Course

**Prerequisite:** PHY 101

#### **PHY 102L, Advanced Physics Lab; (3); Credit hours: 1**

Experiments include: determination of Curie point of a Ferro-magnet by controlled electric heating, observing Hall effect in semiconductors, magnetic moment of a conductor loop in a magnetic

field, determining Verdet's constant, Frank-Hertz Meter, determination of Planck's constant from the spectrum of a tungsten light bulb, optical activity of a chiral (sugar) solution, imaging electron trajectories using a magic eye, image analysis, Lenz's Law, band gap measurement of pure Ge, magnetic pendulum, exploring phase portraits, chaos, bifurcations, Spectral Lines of different gasses.

**Fulfil:** Physics Minor Foundational Course

**Prerequisite:** PHY 102

### **PHY 104, Introduction to Nano Science; (3); Credit hours: 3**

Nano-Science is a significant area of Science which deals with the understanding of the properties of materials at nano-nanoscale—the world where atoms, molecules (atoms joined together), proteins, and cells rule the roost. It is the place where science and technology gain an entirely new meaning. This course offers a basic introduction to understand nanoscience and explore its applications through nanotechnology: where we can put the science into action to solve our problems.

**Fulfil:** Natural Science requirement and university wide free elective

**Prerequisite:** None

### **PHY 201, Modern Physics; (3); Credit hours: 3**

Topics include: Review of basic mechanics, introduction to special relativity, relativity and Physics, Planck's radiation law, photo electric effect, Compton scattering, pair production, Bohr's theory of Hydrogen atom, basics in quantum mechanics, Schrodinger's equation and its applications, ideal gas equation, Maxwell's distributions, Boltzmann's distributions, Identical particles.

**Fulfil:** Physics Minor Foundational Course

**Prerequisite:** PHY 101, PHY 102, MATH 102, MATH 201/203

### **PHY 202, Quantum Mechanics; (3); Credit hours: 3**

Topics include: Particle aspects of radiation, wave aspects of particles, quantum systems and indeterminacy, quantization rules, wave packets, mathematical tools of quantum mechanics, postulates of quantum mechanics, one-dimensional problems in quantum mechanics, angular momentum, more than 1-dimensional problems, rotations and addition of angular momenta, time dependent and independent approximation methods in quantum mechanics, scattering theory.

**Fulfil:** Physics Minor Foundational Course

**Prerequisite:** PHY 101, PHY 201, MATH 201/203

### **PHY-300/CS-314, Quantum Computing; (3); Credit hours: 3**

Quantum computers are physical devices that exploit the laws of quantum mechanics to solve certain problems faster than Turing machines, and in doing so negate the extended Church-Turing thesis, a fundamental conjecture in traditional computer science. Computer science students will learn a new and promising model of computation, and physics students will learn to analyze physical theories in terms of information and computation.

**Fulfil:** CS Theory Elective; Physics Minor



**Prerequisite:** Calculus 1, Calculus 2, Linear Algebra, Data Structures and Algorithm, OR Quantum Mechanics I OR instructor permission

**PHY 301, Classical Mechanics; (3); Credit hours: 3**

Topics covered: Survey of elementary particles, variational principles and Lagrange's equations, 94 central force problem, kinematics of rigid body motion, the rigid body equations of motion, oscillations, the Hamilton's equations of motion, canonical transformations, and continuous classical systems.

**Fulfil:** Physics Minor Elective Requirement

**Prerequisite:** PHY 101, MATH 201/203

**PHY 302, Mathematical Methods for Physics; (3); Credit hours: 3**

Topics include: Tensors and their role in Physics, complex variable theory, linear integral equations, green's functions, and introduction to group theory.

**Fulfil:** Physics or Math Minor Elective Requirement

**Prerequisite:** MATH 201/203

**PHY 351, Introduction to Statistical Mechanics; (3); Credit hours: 3**

Statistical mechanics links the microscopic properties of physical systems to their macroscopic properties. Thermodynamics, which describes macroscopic properties, can then be derived from statistical mechanics with a few well motivated postulates. It leads to a microscopic interpretation of thermodynamic concepts, such as thermal equilibrium, temperature and entropy. In this course, the basic principles of statistical mechanics will be introduced with applications, to the physics of matter.

**Fulfil:** This course is designed as an **independent study** to meet the elective requirement for a Physics minor.

**Prerequisite:** PHY 201 – Modern Physics, PHY 202 – Quantum Mechanics, PHY 301 – Classical Mechanics, MATH 202 – Engineering Mathematics, MATH 205 – Linear Algebra, ME 302 – Engineering Thermodynamics, EE 354 – Probability and Statistics

**PHY 352/MATH 352, Group Theory for Physicists; (3); Credit hours: 3**

This course introduces students to group theoretic methods that allow them to analyze physical systems using symmetries. These methods are wide applicability in various branches of physics, as well as in Engineering and Computer Science. The identification of symmetries often lets one simplify a problem, and solve it in mathematically and conceptually elegant ways.

**Fulfil:** Physics Minor, Mathematics Minor, Free Elective

**Prerequisite:** Calculus 1, Linear Algebra OR Instructor Permission

**PHY 401, Quantum Mechanics II; (3); Credit hours: 3**

Topics include: Recapitulation of classical field theory, path integrals in quantum mechanics, relativistic scattering theory, Quantum Mechanics and relativity, Klein Gordon equation, Dirac equation and representations of its solutions, (discrete) symmetries, and a basic understanding of interactions in quantum field theory.

**Fulfil:** Physics Minor Elective Requirement

**Prerequisite:** PHY 202, PHY 301, PHY 302

**ENER 104, Renewable Energy: Why, What and How? (3+3); Credit hours: 4**

Our reliance on energy systems has been increasing consistently since the industrial revolution. This reliance has increased greatly with ongoing revolutions of infotech and biotech. While multiple alternate sources of energy are being used and researched, coal, oil and gas continue to be the world's top energy sources accounting for about 65% of global demand. This over reliance on fossil fuels has resulted in an unprecedented emission of CO<sub>2</sub> and other greenhouse gases, which has triggered the first man made geological age which can threaten the existence of all living species on earth. It is not likely that we will reduce our energy needs anytime soon which makes it critical to find alternate energy sources that can fuel our energy needs while avoiding any negative impact on our environmental ecosystems. Through this course, we will explore why do we need renewable energy sources, what's wrong with the current energy systems and what are the options available to us outside of regular sources of coal, oil and gas. We will study the operation of various renewable energy sources including, wind energy, solar energy, hydropower, biogas, hydrogen fuel cells and tidal energy. While using the current energy production and consumptions patterns, we will try to speculate the energy needs of Pakistan in the coming decades with a focus on energy needs by 2047. The course is supported through a lab where students will get to work with multiple renewable devices, and analyze their functioning and limitations.

**Fulfil:** None

**Prerequisite:** This course meets Natural Science requirements for DSSE students and can count as a free elective to students from all other majors.

**BIO 101+BIO 101 L, Cell Biology & Public Health; (3+3); Credit hours: 4**

This course provides an introduction to cellular and molecular biology and builds its connection with human biological processes; there will be a prime focus on developing skills to communicate biological concepts to laymen. Topics include: Prokaryotic and eukaryotic cells, structure and function of cellular organelles, cells tissues and organ systems, movement across cell membranes, cellular reproduction, DNA replication, transcription and translation, Mendelian genetics, blood groups, introduction to the immune system and vaccines, dengue viral infection, and cancer development. Workshops on communication design in public health will be integrated

**Fulfil:** Natural Science Requirement

**Prerequisite:** None

**BIO 102+BIO 102 L, The Secret World of Microbes; (3+3); Credit hours: 4**

This course explores the vast realm of tiny, clever little beings that are present everywhere but are easily ignored as they are not visible to the naked eye. Microbes are microscopic living organisms that were the first to colonize earth. They are present everywhere; in the soil, air, water, food, even on our bodies. In fact, you can find more microbes on your hand than there are people on the entire planet. Albeit tiny, their role is so much more important. Without them, we could not digest our food, garbage wouldn't decay, our ecosystems would collapse. Even NASA has a team researching on the microbial life that can survive in space. Understanding microbes is essential to understanding the past and the future of ourselves and our planet. The reason bacteria serve as a valuable model system is because: a) they are easy and relatively cheaper to maintain, b) they take just 20-30 minutes to divide so generations can be studied in a short amount of time and c) they possess simpler biological systems reflective of complex organisms.

The lab component of this course is meant to be easy and fun! Discover how many microbes reside on your cell phone, laptop, bean bags of student lounge, or in the cafeteria food! Test which hand sanitizer or detergent works best, or who provides the most hygienic 'gola ganda' (ice candy) in town!

**Fulfil:** Natural Science Requirement

**Prerequisites:** None





### **BIO 121, Introduction to Biochemistry; (3); Credit hours: 3**

Biochemistry is the study of life. This fascinating natural science will provide insights into the chemical processes driving biological systems. This course will immerse you in sub-cellular world, to understand the processes that are integral for life. You will develop an appreciation of the basic principles of biochemistry and workings of the biological networks. Since the field of biochemistry is continually evolving, through this course you will be introduced to the biochemistry underlying some concepts such as molecular biology, genetics, evolutionary biology, plant biology, human physiology and the current advancements in the field of medicine. You will develop problem solving, critical thinking and analytical skills. The class and lab sessions will embrace variable teaching and learning strategies for audio and visual learners, including but not limited to, flip classes, discussions, think-pair-share, activities, and video sessions, etc. Lab will include a combination of wet lab and virtual lab where the topics would range from detection and analysis of macromolecules, to isolating DNA from cells, testing blood sugars, and optimizing enzyme catalyzed reactions etc.

**Fulfil:** Natural Science Elective

**Prerequisite:** None

### **BIO 15, Learning Bioscience through Movie; (3); Credit hours: 3**

Are you interested in movies? Bioscience? Or both? This course is for you. Join Pakistan's pioneering course on learning bioscience through movies. This course intends to mitigate the dichotomy between science and the arts. The underlying theme of the course is to learn different aspects of biology through movies. The course will provide insights into myriad of biological processes governing our world. You will appreciate the power of movies in developing an understanding of various biological phenomena. The course will focus on the following major themes: 1) Infections, 2) Human/animal experimentation and ethics, and 3) Plant biology. Within these themes, you will learn about the scientific method, evolution and survival of the fittest, ecological sustainability, genetic engineering, disease outbreaks, our body's defense mechanisms, plant's defense mechanisms, how plants communicate, strategies of risk assessment and risk communication, and much more. By analyzing movies, you will develop critical thinking and analytical skills. The class sessions will embrace variable teaching and learning strategies for audio and visual learners.

**Fulfil:** Natural Science Requirement

**Prerequisite:** Interest in movies and bioscience

### **BIO/LIT 201, Digitally Yours Visual Novels About Diseases; (3); Credit hours: 3**

This interdisciplinary course explores digital narrative techniques focusing on key areas of disease/cell biology and empathy through storytelling. It examines the relationship between the afflicted and caregivers, the reader and the sufferer, through a mix of bioscientific knowledge and creative writing. The bio component of the course focuses on molecular and cellular functions during infectious and non-infectious diseases of contextual relevance. The course reconnoiters the rhetoric of empathy and elucidations of science and art through the modern technology of Augmented Reality and Ren'Py (visual novels), and how that has changed our perceptions in a global, connected world.

**Fulfil:** Natural Science Requirement

**Prerequisite:** None

### **ENV 200, Water is Fighting Over; (3); Credit hours: (3)**

This course will expose students to important concepts in water resources policy and management. It is designed to help students majoring outside of science and engineering develop an informed perspective on 21<sup>st</sup> century water challenges, and by extension, natural resource allocation problems.

No pre-requisites are needed for this course.

**Fulfil:** Quantitative Reasoning and Natural Science requirement

**Prerequisite:** Basic Math

### **ENVS 201, Science of Sustainability; (3); Credit hours: 3**

Environmental change as a result of human activities has emerged as the most pressing global challenge of our times, one with profound ecological, social and political implications and dire consequences. Addressing this challenge requires a rigorous understanding how natural systems operate and how human societies interact with these natural systems.

This survey course is designed to introduce the essential scientific concepts pertaining to sustainability. It is intended to be useful for both a broad-based introductory class on sustainability and as a useful supplement to specialist courses, which wish to review the sustainability dimensions of their areas of study. By covering a wide range of topics, review questions, case studies, and links to further resources, students will become conversant in the language and concepts of sustainability, and will be equipped for further study in sustainable management, planning, policy, economics, climate, ecology, infrastructure, and more.

**Fulfil:** Natural Science Requirement

**Prerequisite:** None

### **ENVS 251 Water, Science, Society and Policy; (3); Credit hours: 3**

Should water be released from a reservoir to generate electricity or be stored and used later for agriculture? Should river flows be maintained to preserve ecosystems or does domestic water consumption take precedence? How do droughts and shortage of freshwater exacerbate tensions between countries sharing water resources?

Water serves a diverse set of societal needs (economic, ecologic, cultural etc.), and in an increasingly water-stressed world affected by climate change, these needs are often in conflict. In this three-part course, we will tackle the afore-mentioned questions. Students will first be introduced to hydrological processes in the environment (aka the 'water cycle'). Next, we will focus on how various societies interact with the environment around them and in so doing, how they alter the hydrology around them. This will be done using case studies from around the world, to investigate how changing hydrology due to climate change, and the various ways different societies use water – lead to conflicts. Finally, in the third part, students will learn about various stakeholder perspectives on Karachi's water system. They will then use this information to present an equitable plan to better manage the City's water system.

This course will expose students to important concepts in water resources policy and management. It is designed to help students develop an informed perspective on 21<sup>st</sup> century water challenges, and by extension, natural resource allocation problems. No pre-requisites are needed for this course.

**Fulfil:** Natural Science Requirement

**Prerequisite:** None

### **ENVS 301, Introduction to Environmental Engineering; 3; Credit hours: 3**

Environmental problems represent one of the gravest global challenges of the 21st century. Engineering sustainable solutions to these environmental issues is one of our most pressing needs. In this course, students will learn fundamental science and engineering principles needed for environmental engineering. Students will apply these principles to problems such as water supply and treatment systems, sewage treatment of municipal and industrial wastewaters, stream and air pollution, and disposal of solid waste materials. In addition, this course will provide an overview of major themes in contemporary environmental engineering, including environmental impacts of socioeconomic changes, energy consumption and production, water supply and treatment, air pollution and global



climate change.

**Fulfil:** Natural Science Requirement

**Prerequisite:** Engineering Math

### **BTEC 101, Introduction to Biotechnology; 3; Credit hours: 3**

This course provides an introduction to the fundamentals of biotechnology and its applications. Topics include: an overview of biotechnology and its current importance in society, rapid growth of biotechnology in agriculture, environment, industry, and medicines, antibiotics/antibodies biotech. Emphasis will be placed on DNA manipulation sciences including genetic engineering, gene cloning, plasmids as cloning vectors, restriction enzymes, DNA ligase, PCR, biotransformation, E. coli host as model system, mutagenesis, manipulation of expression of desired DNA, strategies of protein purification, stem cell biotech, and ethics of biotechnology.

**Fulfil:** Natural Science Requirement

**Prerequisite:** School / college level Biology or chemistry or permission of instructor

### **BTEC 101L, Biotech Laboratory Practices; (3); Credit hours: 3**

This laboratory course provides practical insights into the role of DNA sciences in achieving and improving the technological applications, to develop products to improve quality of life. Topics include: basic operations used in biotech labs, DNA extraction from living organisms, DNA cut and clone, making lots of copies of DNA, overproduction of protein, purification, plasmid isolation, DNA manipulation by PCR, transformation of E. coli with a recombinant plasmid, DNA purification and quantification, calorimetric detection of DNA, visualizing of DNA on gel electrophoresis and DNA fingerprinting.

**Fulfil:** Natural Science Requirement

**Co-requisite:** BTEC 101

### **BIO 111 + BIO 111L, Food and Nutrition; (3+3); Credit hours: 4**

The course covers a wide range of knowledge from the basics of nutritional science, to the use of food for preservation and management of health. It provides an overview of the social and cultural shifts in food consumption that contributed to the modern epidemics of chronic conditions such as obesity, diabetes and cardiometabolic disorders.

The overarching aims of this elective course are:

- To provide an introduction to food sciences and nutrition research
- To evoke global thinking and international mindedness
- To critique on how you know what you know
- To experience the scientific method in action: Observe/Explore, Re-search, Conclude, Repeat
- To instill life-long learning

**Fulfil:** Natural Science Requirement

**Prerequisite:** None

### **BIO 103, Global Health and Disease; (3); Credit hours: 3**

The course covers a wide range of knowledge from the basics of global health and disease, to an overview of communicable and non-communicable diseases worldwide, to the role of life science technology and drug design in human development.

The overarching aims of this elective course are:

- To provide an introduction to global health and disease
- To evoke international mindedness
- To infuse a holistic transdisciplinary approach to tackle global issues
- To instill life-long learning and critical-thinking and problem-solving skills

**Fulfills:** Natural Science Requirement

**Prerequisite:** None

**SCI 101, Introduction to Sustainability; (3); Credit hours: 3**

This course is designed to introduce the essential concepts of sustainability. This subject is of vital importance as it seeks to uncover principles of the long-term survival and welfare of all the inhabitants of our planet. The course is intended to be useful for both a broad-based introductory class, on sustainability and as a useful supplement to specialist courses, which wish to review the sustainability dimensions of their areas of study. By covering a wide range of topics, review questions, case studies, and links to further resources, students will become conversant in the language and concepts of sustainability, and will be equipped for further study in sustainable management, planning, policy, economics, climate, ecology, infrastructure, and more.

**Fulfills:** This course is part of the Habib Liberal Core and meets the requirements for Quantitative Reasoning and Natural Science courses.

**Prerequisite:** None

**BIO 102+BIO 104L, Introduction to Ecology and Evolutionary Biology; (3+3); Credit hours: 4**

Understanding how nature functions is necessary in order to develop environmental protection, conservation and resource management policies that work. The goal of this course is to familiarize students to ecological and evolutionary concepts that govern natural systems, so that they are able to make informed decisions, on pressing social issues in Pakistan, such as global climate change, conservation of biodiversity, human population growth and resource management. This course is divided into two sections: 1) Evolution and Adaptation, and 2) Ecology and Biodiversity. Each lecture (3 hours) will be accompanied by a laboratory session (3 hour) where students will discuss and explore the concepts learned during lecture.

**Fulfills:** It fulfills Natural Science requirement for SSE students.

**Prerequisites:** None

**CORE 100, Climate Change and US; (3); Credit hours: 3**

We live in a world where climate change has become an inescapable reality. It's like the dice has been rolled and we can now only wait and see what consequences it brings. Climate change is starting to influence all areas of our lives from food production, melting icecaps to frequent natural disasters. This course will develop a conceptual understanding of all the issues, and impacts related to climate change and provide an opportunity to develop sustainable adaptation plans.

This course is designed to provide an introduction to climate change and its impacts on various aspects of our lives. The topic of climate change will be explored from different lenses, such as its effects on humans, water, food, melting glaciers, and oceans among others. The course hopes to not only engage student learning through traditional teaching strategies but to bring in the expert knowledge that documentaries, case studies and guest speaker sessions offer us to fully cover every aspect of this global issue.

**Fulfills:** "This course falls under the Form of Thought of Quantitative Reasoning. It also fulfills Natural Science requirement for SSE students."



**Prerequisites:** None

**SCI 122, Inventing the information Age; (3); Credit hours: 3**

Our current era is often referred to as the information age, because of widespread use of information processing capabilities, that are used for human benefit in a wide variety of ways. This era is enabled by a number of scientific and technological inventions such as computers and communication technologies. The effect of these inventions has been felt through significant social, economic and political change.

This course surveys the key physics, mathematics and computer science inventions that enable the information age. We will study the basics of important physical constraints and phenomena that are used to build information processing devices. We will understand how coding theory allows us to reliably transmit, store and compute information on error prone physical devices. We will also discuss essential cryptographic techniques to securely transmit and store important information. The course will end with an outlook of future innovations that will further enhance humanities' information processing capabilities.

**Fulfills:** Natural Science elective, CS elective

**Prerequisite:** None

**SCI 221, Design Thinking for Sustainability; (3); Credit hours: 3**

This course provides an introduction to the principles of design thinking and allows an opportunity to deploy these principles for solving a sustainability challenge. Design thinking offers a systematic approach to unleash the innovative and creative forces of individuals, in a collaborative space. It applies methodologies of design to solve challenges to the environment and society, and at the same time provides a more engaged and practical learning opportunity.

The course will involve a human-centered design process where the students will learn and work in a team-based community project throughout the semester. Their learning will be supported through readings, workshops, videos, discussions, in-class activities and reflection assignments. Students will also spend a significant amount of time observing, listening, analyzing, discussing, reflecting and engaging with their classmates as they design, develop and implement meaningful and innovative projects on sustainability

**Fulfills:** "This course falls under the Form of thought of Creative Practice"

**Prerequisites:** Introduction to Sustainability/Energy/Climate change & us

**Mathematics**

**MATH 012, Pre-Calculus; (3); Credit hours: 3**

Topics include: A revision of number systems and relations, functions, and polynomials with symbolic and graphic representations. These topics will cover a wide range of subtopics to bridge the gaps in high school mathematics, like rational functions, inverse functions, logarithmic and exponential Functions followed by trigonometric Functions with an extensive treatment in the course. As a learning outcome, students are expected to be able to analyze functions and their behaviors symbolically, numerically and graphically.

**Prerequisite:** High school mathematics of any level.

**MATH 101, Calculus I; (3); Credit hours: 4**

Topics include: An overview of functions and their behavior in terms of rates of change, average vs. instantaneous rates of change, the derivative and shortcuts to differentiation, optimization (finding relative extrema / critical points), related rates, area under a curve, Riemann sums and the definite integral, the general antiderivative, approximation of definite integrals, techniques of integration and improper integrals.

**Fulfills:** Mandatory Math requirement for all DSSE students

**Prerequisite:** None

**MATH 102, Calculus II; (3); Credit hours: 3**

Topics include: A look at finding volumes of revolution using a Riemann Sums approach to integration, an introduction to first order differential equations and slope fields, parametric equations and graphs and finding area and arc length of parametric curves, polar coordinates and polar functions with areas and arc length of polar curves, functions of severable variables, partial derivatives and the equation of a tangent plane to a surface, basic vector algebra with dot and cross product derivations, directional derivatives, optimization and the second derivative test for functions of two variables, optimization with Lagrange multipliers, integrating functions of several variables with double and triple integrals evaluated in Cartesian, cylindrical and spherical coordinates, parametrization of lines and curves in 3-space, vector fields, line integrals, and the fundamental theorem of calculus for line integrals.

**Fulfil:** Mandatory Math requirement for all DSSE students

**Prerequisite:** MATH 101

**MATH 105, The Art of Mathematics; (3); Credit hours: (3)**

This course will explore multiple theorems, arguments, and quantities that have been relevant to a variety of fields through history, such as art, architecture, astronomy, and the physical sciences. Tracing the birth of geometric reasoning from the time of Euclid to looking at the birth of trigonometry as a tool for astronomical calculations and models, students will be introduced to geometry, algebra, and topology through various contexts. Students will be expected to use these concepts to create culminating projects using design and mathematical software.

Note: This course will also fulfil one (01) of the math requirements for the students pursuing a Communication and Design major.

**Fulfil:** Elective for Math Minor and fulfils Quantitative Reasoning requirement for AHSS students

**Prerequisite:** None

**MATH 106, Music and Mathematics; (3); Credit hours: (3)**

This course will introduce the rudiments of Western and South Asian musical theory, with a focus on the mathematics incorporated in their development and overall structure. The course will explore the properties of the twelve-tone scale, the historical evolution of tuning and temperament, the idea of combinational tones and consonance, and the physics behind the construction of musical instruments. Looking primarily at South Asian and Western musical genres, students will also analyze the mathematics involved in music composition, for both melody and rhythm.

**Fulfil:** Elective for Math Minor and fulfils Quantitative Reasoning requirement for AHSS students

**Prerequisite:** None

**MATH 107, Lie Detector: An Introduction to the Practice of Statistics; (3); Credit hours: 3**

In the age of big data, it is difficult to differentiate knowledge from misinformation. Statistics, as a field, is concerned with quantifying uncertainty. Statistics are tools to summarize and describe patterns in reality and to explore the causal processes leading to these patterns. Understanding how statistics are used and misused is vital for assessing and assimilating information in any field. The goal of this course is to help students understand the philosophy of inference, develop a scientific process for posing questions, collecting and interpreting relevant data, and familiarize them with common statistical tools, so that they can apply evidence-based decision making in their lives. We will review core principle and concepts in probability and statistics, using project-based learning to focus on practical application rather than theory. All students are expected to attend three-hour computer labs every week, where they will be using the R statistical language to review statistical concepts and





principles learned during lecture. This course is aimed at all SSE and AHSS students, especially those who are intimidated by mathematics, working with numbers or programming.

**Fulfils:** It fulfills quantitative reasoning requirements for AHSS and SSE students

**Prerequisite:** None

### **MATH 202, Engineering Mathematics; (3); Credit hours: 3**

Topics include: Vector Calculus (vector functions, line and surface integrals). Elementary methods for solving first order ODEs (direct integration and substitution) with geometric interpretation and classification, separable ODEs, method of integrating factors. Vector algebra (including matrix algebra, eigenvalues and eigenvectors, quadric surfaces). Dynamical systems (linear systems of ODEs, stability and phase portraits of dynamical systems). Second, order ODEs - elementary methods including their classification, reduction of order techniques, linear second order ODEs with constant coefficients, and finding particular solutions. Orthogonal functions and Fourier series solutions (generalized and trigonometric methods), convergence in the mean and pointwise convergence, odd and even expansions, half-range expansions. Partial differential equations (PDEs) (wave, heat and Laplace equations), solutions using Fourier series and Laplace transforms, and Schrodinger equation.

**Fulfils:** Mandatory Math requirement for all DSSE students

**Prerequisite:** MATH 102

### **MATH 203, Advanced Differential Equations; (3); Credit hours: 3**

Topics include: A brief revision of first- and second-order ordinary differential equations (ODEs) with constant coefficients. Differential operators, Wronskian and linear independence. Numerical solution methods for ODEs: Euler method, Taylor series solution up to 2nd order, Runge-Kutta methods up to 2nd order; Cauchy-Euler equations; Power series and Frobenius' methods including Ordinary points, singular points, regular points, analytic functions, indicial equation. Bessel function and Bessel's equation, Legendre equations. Boundary value problems for homogeneous linear 2nd order ODEs: Boundary values, Sturm-Liouville problem, eigen functions and corresponding eigenvalues, Fourier Bessel series. Inner products and norms of functions. Self-adjoint operators, and Schrodinger equation.

**Fulfils:** Math Minor Elective

**Prerequisite:** MATH 201 for CS and EE students. MATH 102 with min 70% score for non-engineering students in MATH Minor.

### **MATH 205, Linear Algebra; (3); Credit hours: 3**

Topics covered: A brief revision of vector algebra including lines and planes in 3D and matrices, Determinants, Symmetric matrices, and quadratic forms; Elementary row and column operations of a matrix; Systems of linear equations and their solutions, existence, and uniqueness of solutions; Vector spaces; Inner products and ortho-normalization; Orthogonal transformations and rotations; Linear transformations, orthogonality, QR factorization, Hermitian and Unitary transformations; Least squares analysis and approximations; Singular value decomposition; Direct sum decomposition; and Caley-Hamilton Theorem.

**Fulfils:** Mandatory Math requirement for all DSSE students

**Prerequisite:** MATH 201

### **MATH 304, Real Analysis; (3); Credit hours: 3**

In this course, we try to understand and appreciate the rigor that mathematics is known for. For all its applications, we must be able to say with absolute certainty that, given a small set of axioms and the



rules of logic, our mathematics is consistent.

The course is intended to expose the students to the basic ideas of Real Analysis. Some of the questions that we address are as follows:

What are real numbers?

Is there a largest real number?

What is the real number that comes directly after 0?

Are there any 'holes' in the real number line?

Even numbers and odd numbers add up to form natural numbers, does that mean even numbers are less than natural numbers? What about the size of real numbers compared to the size of natural numbers? Is there more than one infinity?

What are sets? Functions? Measure and distance? Continuity?

**Fulfil:** This course meets elective requirements for EE and CS programs as well as minor in Mathematics.

**Prerequisite:** Math101, Math102

### **MATH 305, Complex Analysis; (3); Credit hours:3**

Specific topics covered in this course are: Complex Algebra and the Complex Plane and its Motivation, Polar Form, Complex Exponential, deMoivre's Theorem, Powers and Roots, Sets of Points, Complex Functions and Linear Mappings, Limits and Continuity for Real and Complex Functions, Differentiability and Analyticity, Cauchy-Riemann Equations, Harmonic Functions, Elementary functions (Exponential, Trigonometric and Logarithmic Functions and Complex Powers), Line & Contour Integrals, Complex Integration, Cauchy's Integral Formulas, Sequences and Series, Taylor Series, Power Series, Convergence, Laurent Series, Zeros and Poles, Newton's Method and Fractals, Residues and Residue Theorem

**Fulfil:** Math Minor Elective

**Prerequisite:** Calculus 1 (Math 101), Calculus 2 (Math 102)

### **MATH 333, History of Number Theory; (3); Credit hours: 3**

Number Theory, or arithmetic/higher arithmetic, as it was called in ancient times, is one of the oldest and most popular branches in mathematics, as its problems are easy to comprehend; yet sometimes incredibly hard to solve. Brahmagupta concluded over 2500 years ago, when studying arithmetic, that: "These problems are stated merely for pleasure. The wise man can devise a thousand rules or he can solve the problems of others by the rules given here. As the sun obscures the stars so does the man of knowledge eclipse the glory of other mathematicians in an assembly of people by proposing algebraic problems and still more by solving them."

Positive integers are seen to be the first mathematical creation of humans and we are going to start the course by introducing different ancient number systems in various civilizations and the first arithmetic operations. After this introduction, we are going to focus on mathematics in ancient Greece, mainly under Plato, Euclid and Diophantus and in particular the connection between geometry and number theory that they established (It will also be highlighted if similar discoveries were made for example in India).

The course will then continue with medieval Islamic mathematics, their appropriation of Greek, Indian and Persian texts resulting in the Hindu-Arabic number system and further studies on 'special' numbers, such as perfect numbers, primes, amicable numbers and their properties and the influence of al-Khwarizmi's introduction of Algebra on number theory problems. This will then segue into Europe in the late Renaissance, thanks to a renewed study of the works of Greek antiquity (often arriving in Europe in Arabic). A catalyst for this was the textual emendation and translation into Latin of Diophantus' Arithmetica leading to what is today called early modern number theory and



names like Fermat, Euler, Legendre, Lagrange, Gauss, Dirichlet, Riemann. Many of the most famous mathematicians of that time were actually (at least partially) studying number theory problems, as the German mathematician Carl Friedrich Gauss once said, “Mathematics is the queen of the sciences—and number theory is the queen of mathematics.”

As today Number Theory tends to be split in algebraic and analytic number theory, the course will also introduce some helpful algebraic and analytic ideas giving an insight into those disciplines. In addition, students will be expected to cover the history of cryptography from the Greeks to modern cryptography (using number theory) through project presentations, in order to get an idea of this famous application of number theory, in particular since the invention of computers.

**Fulfil:** Math Minor Elective

**Prerequisites:** N/A

### **MATH 351, Topology; (3); Credit hours: 3**

The independent study is designed to be a first introduction to Point-Set Topology. The last few weeks are dedicated to understanding the basics of another aspect of topology, namely Algebraic Topology.

The topics are particularly chosen in such a way as to equip the students to later diverge into different streams within topology according to their interests.

**Fulfil:** This course meets elective requirements for EE and CS programs as well as minor in Mathematics.

**Prerequisites:** Math101, Math102

### **EE 354/MATH 310, Introduction to Probability and Random Variables; (3); Credit hours: 3**

In the present world, we encounter situations where we have to make decisions on the basis of incomplete or imperfect information. The theory of probability helps provide a formal mechanism for understanding, quantifying, and dealing with uncertainty, which is ever present in our lives, pure science, or engineering applications. Simply, by uncertainty, we mean the condition when outcomes or future are not completely determined, or can be captured by a deterministic function; they depend on a number of factors and perhaps just on pure chance. Many of our present-day technologies will not be possible without an understanding of how to make decisions in presence of uncertainty. These technologies include all forms of wireless communication, servers, speech processing systems, network systems and so many more. Equipping yourself with tools to deal with uncertainty will help you with whatever you wish to pursue in life.

This course will cover the foundations of probability, random variables and statistics, with a plethora of examples from electrical engineering, computer engineering, computer science, and everyday life. The course content can broadly be divided into three categories: -

1. Fundamentals of probability,
2. Common probability models,
3. Inferences & statistics.

**Fulfil:** This course meets program requirements for EE & CS Majors & Quantitative Reasoning (QR) forms of thought for EE & CS Majors.

**Prerequisites:** Math 102, Basic knowledge of MATLAB or some other programming language, Rudimentary linear algebra.



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