PROSPECTUS

2016-2017

HITEC University, Taxila

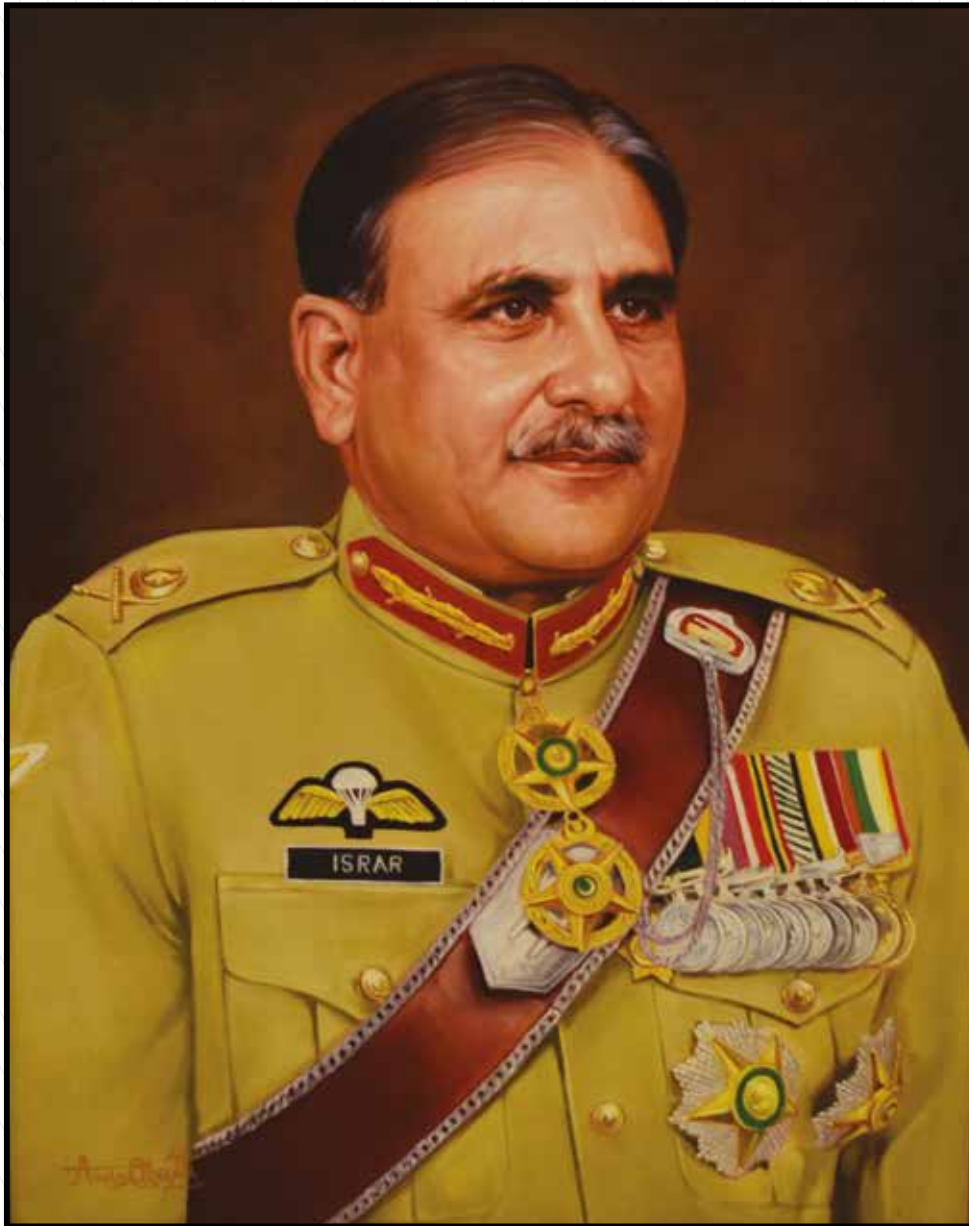Title designed by Mr. Athar Iftikhar, student of HITEC University.

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Founding Chairman, HIT Education Walfare Trust

Lt Gen Israr Ahmed Ghuman, HI, HI(M) Retd

Overview

Heavy Industries Taxila Education City (HITEC) is a comparatively new addition to the hallmarks of Taxila. Located at the foothills of Margalla, 30 km North West of Islamabad and Rawalpindi, it is an integrated and purpose specific complex, housing educational institutes, catering for pre-school to university level education.

In November, 2007, HITEC University, in affiliation with UET Taxila, commenced classes with an intake of 250 students. It was granted its own charter in November, 2009 by the Government of the Punjab. The University is sponsored by Heavy Industries Taxila Education Welfare Trust (HITEWT).

The University has a dynamic, industrious and highly committed full time faculty which keeps abreast with the latest development in teaching methodologies. In a short span of time HITEC University has emerged as a modern and vibrant place of learning and can be rightly called a citadel of knowledge. It hosts state of the art facilities and takes pride in offering learning environment having unmatched safety and security of the premises.

The University has spacious, air-conditioned and very well equipped classrooms, laboratories, library, auditorium and excellent allied facilities. A newly constructed hostel is available on first come first serve basis to accommodate over 300 students within the campus. Plans are also in hand to construct a state of the art library and an auditorium with over 1500 seating capacity.

Students get ample opportunities for internships and employment due to close proximity of the University to Heavy Industries Taxila (HIT), Pakistan Ordinance Factories (POFs), Heavy Mechanical Complex (HMC), Pakistan Aeronautical Complex (PAC) Kamra, Telephone Industries of Pakistn (TIP) and FECTO Cement etc.

The University, besides imparting quality education, assigns equal importance to character building, extra and co-curricular activities. We aim to make our students morally and physically sound individuals and responsible citizens of Pakistan with a strong urge of service to humanity, local and beyond.

Board of Governors

1. **Lieutenant General Syed Wajid Hussain, HI (M)**
   Chairman Heavy Industries Taxila Education Welfare Trust — Chairman

2. **Major General Dr Muhammad Muazzam Ali Goraya, HI (M)**
   Director General, Military Vehicles Research and Development Establishment — Member

3. **Major General Akbar Saeed Awan, HI (M) (Retd)**
   Chairman National Technology Council — Member

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   Vice Chancellor, University of Engineering & Technology Taxila — Member

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   Director Technical, Heavy Industries Taxila — Member

6. **Brigadier Tahir Islam**
   Managing Director, APC, Heavy Industries Taxila — Member

7. **Brigadier Ashraf Ullah Khan**
   Managing Director, HRF(M), Heavy Industries Taxila — Member

8. **Brigadier Faisal Abid**
   Director Administration, Heavy Industries Taxila — Member

9. **Dr. Mazhar Saeed**
   Director General Planning & Development, Higher Education Commission, Isb — Member

10. **Raja Abdul Hanif**
    Member Provincial Assembly of the Punjab — Member

11. **Mr. Ijaz Khan**
    Member Provincial Assembly of the Punjab — Member

12. **Mrs. Sobia Anwar Satti**
    Member Provincial Assembly of the Punjab — Member

13. **Mr. Irfan Ali**
    Secretary Higher Education Department, Punjab — Member

14. **Brigadier Qamar Zaman, SI (M) (Retd)**
    Vice Chancellor, HITEC University Taxila — Secretary

Message from the Chairman Board of Governors

HIT Education Welfare Trust, established the HITEC University in 2007. The University commenced educational activities by launching the BS Programs in Engineering, Business Administration and Islamic Studies. After the grant of Charter by the Government of the Punjab in 2009, the University has grown steadily and shown significant progress as centre of learning and research. In a short span of time, it has earned a good name, recognition and respect in the contemporary Higher Education Institutions of Pakistan. The achievement of this distinction was made possible by the commitment and dedication of the faculty, staff and students.

HITEC University is committed to provide excellent learning environment to its students. Special emphasis is being laid on continuously upgrading the on campus infrastructure, laboratories and other allied facilities with the changing trends and requirements. Construction of university's hostel is at the final stage and will be available to the new intake. University has also plans to construct a new purpose built library, catering for the needs of increase in the students' population.

HITEC University's collaboration with the local industry and foreign universities is also progressing well. This relationship not only helps in updation of curriculum according to growing needs but also enables the students to get a comprehensive understanding of current issues of industry.

I feel confident that the University is progressing towards becoming one of the best in the country.

May Allah Almighty grant success to the HITEC University in all its efforts.

Lieutenant General
Syed Wajid Hussain, HI (M)

Message from the Vice Chancellor

I am delighted to communicate with the aspiring students at this moment of making a wise choice for their future alma mater.

HITEC University, since its inception in 2007, is committed to impart high quality education in a safe, secure and conducive learning and teaching environment. We always aim to inculcate high moral values and strong sense of civic responsibility amongst our graduates to enable them to contribute positively in the progress and development of Pakistan. Our dedicated and experienced faculty, mostly foreign qualified; state of the art labs and internship programs for all students distinguish us from our contemporaries.

HITEC University offers undergraduate programs in Electrical, Mechanical and Computer Engineering and Computer Sciences duly accredited by Pakistan Engineering and National Computing Education Accreditation Councils. The University also offers admissions in MS/PhD in Electrical, Mechanical, Computer Engineering, Computer Science, Mathematics and Islamic Studies. I am happy to share the good news that first batch of PhD scholars have already received PhD degrees in Mathematics during the second convocation held on January 30, 2016.

HITEC University is ranked in category 'W' by the Higher Education Commission of Pakistan. The University, after meeting the required criteria, has recently qualified for HEC support through public funding in research, faculty development, foreign faculty hiring, digital library, internet services and infrastructure development.

Our students can also have an opportunity to study in top universities of the world through students exchange programs. The students can now opt for Strathclyde University's degree by studying two years in HITEC University and two years in Strathclyde University. Under the Memorandum of Understanding, our students can also avail an opportunity to study for one year in ITU without tuition fee. A similar arrangement also exists with University Technology Malaysia.

Conforming to the vision of the founders and by drawing our strength from our motto "In Truth I Triumph", we are determined to make this University a bastion of academic excellence.

May Allah bless you, Aameen.

Engr Qamar Zaman, SI (M)

Vision

HITEC University shall be a premier institution and bastion of academic excellence. It must become a citadel of our ideological moorings, national integration and socio-religious values. HITEC ought to trigger the human mind to think clearly perceiving the environment and issues confronting human beings, seeking intelligent, viable and practical solutions, leading to societal development and the overall betterment of human race. The campus shall provide our progeny the environment for intellectual flourishment, nurturing fertility of thought and creativity. HITEC University faculty will focus on preparing our youth to face the challenges of life with honor, confidence and fortitude through character building and grooming. In HITEC University merit, justice, honesty and adherence to moral and social values must prevail. The University shall provide a pedestal for fulfillment of our youth's aspirations and hopes to live an honorable life as citizens of Pakistan.

Mission

HITEC University will be a center of excellence in teaching, learning and research. We instill and inspire intellectual curiosity, lifelong quest for knowledge and a keen urge for social and moral responsibility. The University will establish strong linkages with industry, ensuring innovative research leading to economic prosperity of Pakistan.

Motto

The motto should guide the students in their future lives as a beacon of light and be a reflection of their character strength and grooming. 'Truth' is the key word in the selection of University's motto, for indeed it has been the virtue of the prophets and the object of pursuit of all great men, scholars, researchers and scientists. Finding and upholding truth is the purpose and spirit of real education. The most befitting inspiration was found in a Quranic verse, "Wa Qaulu Qaulun Saddeeda", (Ayat 70, Al-Ahzab) but to keep the sanctity of the divine words it has been replaced by a Hadith, carrying the same assertion "Assidqo Yunjee", meaning "In truth lies success". Its English equivalent " In Truth I Triumph" is the translation of a Latin slogan "In Veritate Triumpho" ascribed to Myddelton of Gwanynog (1638 AD).

Emblem

HITEC University emblem symbolizes Pakistan's national heritage, ideology, cultural values, and provides conviction and courage to its students. The University emblem is a roundel, in line with traditional Muslim shield. It has two rings; the outer ring contains the name of institution and its motto while the inner ring embodies a multi-layered insignia. On the top is the rising Sun signifying energy, hope and newness. At the bottom is a body of water which is source of all life. In the middle the white emerging lines stand for the earth which is the abode of all mankind. The blue lines show rivers on the Earth indicating that civilizations have grown on the bank of rivers. The pattern formed by white and blue lines alludes to an open book that represents all recorded human knowledge. The book is placed on the surface of the water, pointing to an eternal challenge we are confronted with. In the back drop of the book, emerges the golden Sun sending its rays across the universe. The rising Sun also represents the dawn of a new era where darkness is dispelled and brightness is ushered in.

Taxila

Taxila or Takshashila (city of cut stone) is a historical city, which is just 30 kms north of Islamabad, the capital of Pakistan. It is one of the most important archaeological sites in the country and was included as UNESCO World Heritage List in 1980.

Taxila, the main centre of Gandhara civilization has been an important Vedic/Hindu and Buddhist center of learning from the 6th century BC to the 5th century CE. During its peak period of glory, Taxila exerted "intellectual suzerainty" over other centres of learning in India, and its primary concern continued to be the higher education in various arts and crafts. This is the region from where Buddhism travelled to the Far East. Persians, Greeks under Alexander the Great and Central Asians invaded through the area and all subsequently left their mark.

Taxila is perhaps best known because of its association with Chanakya, also known as Kautilya, the strategist who guided Chandragupta Maurya and assisted in the founding of the Mauryan empire. The Arthashastra (Sanskrit for The knowledge of Economics) of Chanakya, is said to have been composed in Taxila. The Ayurvedic healer Charaka also studied here. The ancient grammarian Panini, who codified the rules that would define classical Sanskrit, has also been part of the community at Taxila.

In early 20th century, the British archaeologist Sir John Marshall conducted extensive excavations of Taxila. There are over 50 archaeological sites scattered in a radius of 30 kms around the city. Some of the most important sites are; Dhamarajika Stupa and Monastery (300 BC – 200 AD), Bhir Mound
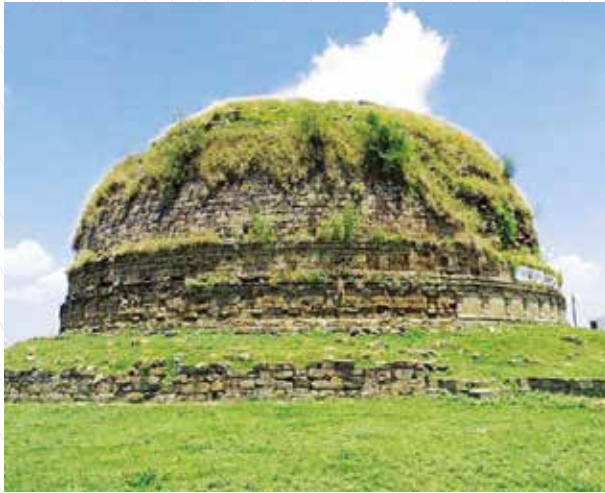
(600-200 BC), Sirkap (200 BC – 600 AD), Jandial Temple (c.250 BC) and Jaulian Monastery (200 – 600 AD).

Nicholson's Obelisk, a monument of British colonial era situated at the Grand Trunk road welcomes the travelers coming from Rawalpindi/ Islamabad to Taxila. The monument was built by

the British to pay tribute to Brigadier John Nicholson (1822–1857) an officer of the British Army who died in India during 1857.

In addition to the ruins of Gandhara civilization and ancient Buddhist/Hindu culture, relics of Mughal gardens and vestiges of historical Grand Trunk Road, which was built by Emperor Sher Shah Suri in 16th century, also exist in Taxila region.

Modern Taxila is heavily industrialized. Industries like HIT, PMO, HMC, HEC and POFs etc are located in this region.

How to Reach HITEC University

From Islamabad/Rawalpindi proceed on the GT road towards Peshawar. Only 10 km ahead of Sangjani Toll Plaza is the Taxila bypass. Those travelling on the motorway may use Tarnol or Bahter interchange to come on the GT road in order to reach the Taxila bypass. Turn towards the Taxila Museum, about 2 km on the Museum Road is HITEC University – a complex of huge buildings in red bricks and a prominent white mosque, all enclosed in black-stone boundary wall.

Location Map

Khanpur

Taxila Museum

Hattar

HIT

Wah Cantt

Taxila

HITEC University

Peshawar

G.T.Road

Taxila

Toll Plaza

G.T.Road

Railway Line

Taxila Bypass
(Tank Chawk)

Islamabad
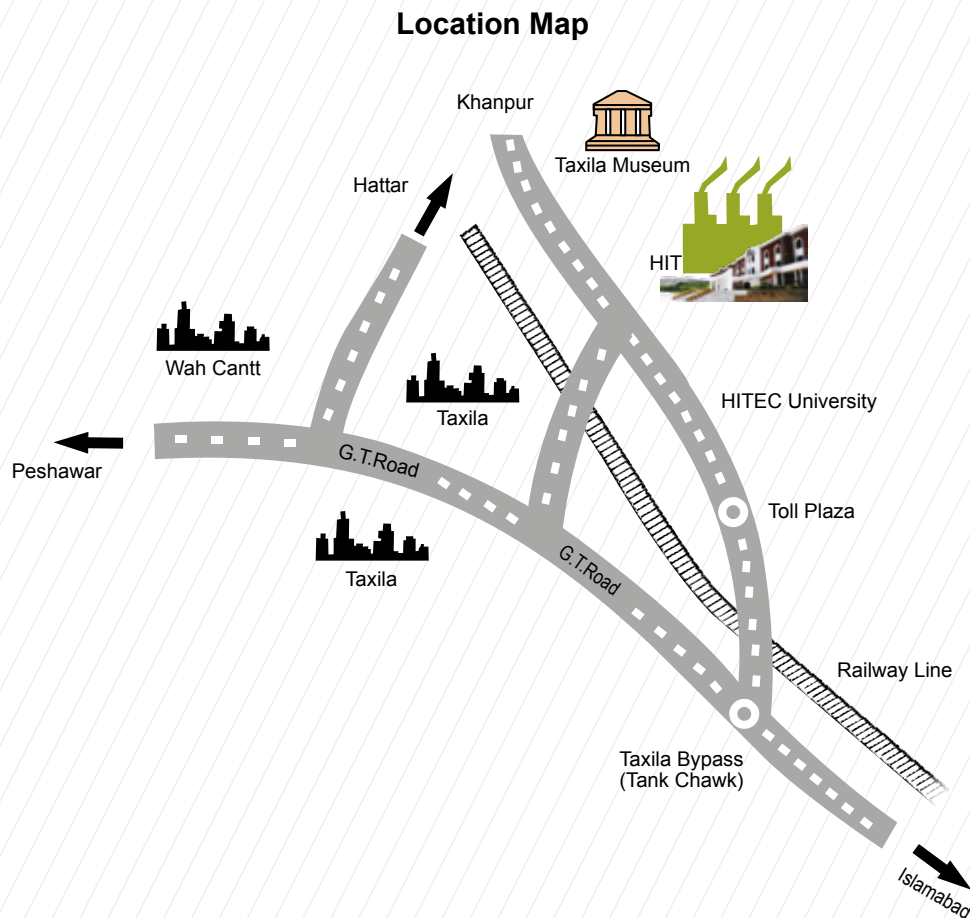
Faculty of Engineering and Technology

Dr. Muhammad Younus Javed
Professor & Dean

Vision
Endure to propagate knowledge and perpetuate with for prosperity

Mission
Produce engineers well-versed in the knowledge of their domain and its application in the service of industry and community for creating innovative solutions, keeping in view the ethical, environmental and societal concern

Faculty of Engineering and Technology (FE&T) comprises of three departments (i.e. Department of Electrical Engineering (DEE), Department of Mechanical Engineering (DME) and Department of Computer Science &Engineering (DCS&E)). DEE and DME offer Bachelor, Master and Doctoral academic programs in their respective areas of engineering. DCS&E has Computer Science (CS) and Computer Engineering (CE) programs. Currently, five programs (BSCS, BSCE, MSCS, MSCE and PhD in CS are being run by the DCS&E. All the BS programs are accredited and recognized by the relevant professional bodies (Pakistan Engineering Council – PEC and National Computing Education Accreditation Council - NCEAC) of the country and are strictly adhering to the guidelines of Higher Education Commission (HEC) of Pakistan for imparting quality education to our students. Outcome Based Education (OBE) system of education and assessment has also been adapted by all the departments

for their engineering programs in order to further enhance the quality and standard of education and to increase mobility of our graduates all over the world.

Highly qualified, professionally competent, research-oriented and experienced faculty has been employed to ensure effective teaching and meaningful R&D as per set standards and objectives of PEC, NCEAC and HEC. Majority of the faculty members have been educated from renowned institutions of high repute. Besides keeping abreast of the latest developments in the knowledge of their respective domains, the faculty members actively participate in the R&D activities. This stimulates new ideas and innovative thinking to guide our students in their research phase of studies. The minimum qualification for teaching undergraduate classes is an MS / M.Phil degree in the relevant field. Similarly, all MS and PhD level courses are taught by those faculty members who possess PhD qualification in their relevant areas of specialization.

Our students participate in a large number of academic, research and extra-curricular activities and competitions organized by the HITEC University and other institutions of the country and earn great honour for the university by winning prizes. So, if you aspire to be a competent Electrical, Mechanical, Computer Engineer or a skilled Computer Scientist, we are here to groom and equip you with requisite knowledge, skills and the attitude for your acceptance in the national and international job market.

Department of Electrical Engineering

Dr. Hafiz Ashiq Hussain
Chairman

The Department of Electrical Engineering came into being with the inception of the HITEC University in 2007. This Department aims at imparting quality education at undergraduate and postgraduate levels, thereby producing skillful engineers catering for societal needs of the country and abroad.

Electrical Engineering, one of the oldest fields of engineering, deals with the study and application of electricity and electromagnetism. Initially this field comprised study of electricity and was largely considered to be a subfield of Physics. However, it now covers a range of topics including power engineering, control systems, signal processing, electronics and telecommunications etc.

Continuous development in Electrical Engineering has produced more reliable communication systems, smart grid for efficient management of transfer of electrical power and intelligent control techniques for use in the industry.

Electrical Engineering is a diversified field that gave birth to many engineering disciplines over the decades; the most popular include electronics, telecommunication, computer systems and industrial electronics etc. The department currently offers BS, MS and Ph.D. in Electrical Engineering.

The objective of undergraduate program is to equip students with a concrete foundation in scientific and mathematical knowledge and in skills appropriate for practice in the field. It provides excellent platform for those who wish to embark on careers in the streams of electronic, communication and power engineering.

The postgraduate programs consist of advanced cources in communication, signal processing and control systems etc. Students are required to opt one of these specialization areas and undertake reseach in the chosen field.

The curricula and syllabi of BS, MS and Ph.D. programs are well-planned and designed according to recommendations and guidelines of Higher Education Commission (HEC) and Pakistan Engineering Council (PEC). The BS Engineering program is duly accredited by the Pakistan Engineering Council and our graduates are readily accepted in the market.

The Department of Electrical Engineering holds highly qualified, motivated and professionally competent faculty who not only excel in their respective areas of specialization but also keep themselves abreast of recent developments in teaching methodologies.

Faculty of Electrical Engineering

Faculty

Dr. Hafiz Ashiq Hussain

Designation:	Associate Professor, HEC Approved PhD Supervisor
Qualification:	Ph.D. (Physical Electronics) Telecom Engineering, BUPT China.
Areas of Interest:	Optical Fiber Communication, Silicon Photonics
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Dr. Ejaz Muhammad

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Dr. Fawad Ahmad

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Dr. Raza Ali Shah

Designation:	Assistant Professor, HEC Approved PhD Supervisor
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Dr. Sultan Shoaib

Designation:	Assistant Professor
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Areas of Interest:	Antennas systems, Antennas Design
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Engr. Ghulam Shabbir

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Mr. Irfan Qasim

Designation:	Assistant Professor
Qualification:	M.Phil (Physics), QAU, Islamabad
	PhD (in Progress)
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Engr. Obaid Sabir

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Engr. Zakaul Mustafa

Designation:	Assistant Professor
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Syed Kashif Imdad

Designation:	Lecturer
Qualification:	MS (Electrical Engineering), UET, Taxila
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Engr. Muhammad Farrukh Aftab

Designation:	Assistant Professor
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Engr. Talha Asghar

Designation:	Assistant Professor
Qualification:	MSc (Electrical Engineering), COMSATS, Islamabad, PhD (in Progress)
Areas of interest:	Antennas and Radio Wave Propagation, Wireless Communication
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Engr. Tehseen Ahsan

Designation:	Assistant Professor
Qualification:	MS (Electronics Engineering), University of Surrey, Guildford, UK
Areas of interest:	Communication Systems, Computer Networks, WiMAX, Network Security
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Engr. Tahir Ejaz

Designation:	Assistant Professor
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Area of interest:	Microwave Resonator, Semiconductor, Power Electronics
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Engr. Zeeshan Ahmad

Designation:	Lecturer
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Engr. Waqas Ahmed

Designation: Lecturer
Qualification: MS (Electrical Engineering), HITEC University, Taxila,
                      PhD (in Progress)
Areas of interest: Signal Processing, Communication
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Engr. Zeeshan Habib

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Engr. Fizza Khalid

Designation: Lecturer
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Areas of Interest: Quality Management, Production System Design
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Ms. Uzma Islam

Designation: Lecturer
Qualification: M. Phil English (Literature),Air University, Islamabad
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Engr. Adeel Ahmad

Designation: Lecturer
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Engr. Iftikhar Ahmed

Designation: Lecturer
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Engr. Menna Nawaz

Designation: Lecturer
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PhD (in Progress)
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Engr. Muhammad Shahbaz Khan

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Engr. Muhammad Shahzad

Designation: Lecturer
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Ms. Sana Khattak

Designation: Jr. Lecturer
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M. Phil English Linguistics (in Progress)
Areas of Interest: Discourse Analysis, Visual Analysis, Semiotics, Semantics, ELT
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Engr. Syed Qasim Abbas

Designation: Jr. Lecturer
Qualification: BS Electrical Engineering, HITEC University, Taxila.
MS Electrical Engineering (in Progress).
Areas of Interest: Digital Systems, Automation and Robotics
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Engr. Mamoon Riaz

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 MS Electrical Engineering (in Progress), HITEC University, Taxila
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Engr. Rehan Sadiq

Designation: Jr. Lecturer
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Areas of Interest: Power System Stability and Control, FACTS
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Engr. Safee Ullah

Designation: Lab Engineer
Qualification: BS Electrical Engineering, Wah Engineering College, Wah
 MS, Electronics System Design (in Progress)
Areas of Interest: DLD, VLSI Design, ASIC Design
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Engr. Shahid Latif

Designation: Lab Engineer
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 MS Electrical Engineering (in Progress)
Areas of Interest: Electronics System Design
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Ms. Sobia Raja

Designation: Academic Coordinator
Qualification: MS (General Management), COMSATS, Wah Cantt.
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BS Electrical Engineering

BS Electrical Engineering is a broad-based bachelor degree program which includes study of subjects like digital and analog electronics, electromagnetic field, control systems, communication systems, power engineering etc. The curriculum is in line with Pakistan Engineering Council (PEC) requirements and thus the program is duly accredited. Six batches have passed out till date. As a consequence, the curriculum is comprehensive enough to meet all challenges and requirements of the field of Electrical Engineering at national and international levels. The program provides students with the skills required for a broad range of jobs in industry, government, academia, business and R&D organizations.

In an attempt to better serve our undergraduate students and to shorten the time between their discovering a problem and getting advice on the solution, the department has setup an "open advising" system. This counseling and support help students get through academic and administrative issues and establish a smooth working relationship with the department at large. A faculty member is assigned the duty of a class advisor. The students are encouraged to interact with him/her as well as with the entire faculty, so that, after the completion of BS program, they have better understanding and exposure of their field of choice.

The initial two years (four semesters) of the program are common for all students; however, from fifth semester and onward, elective courses are offered to make provision for the two major streams i.e. electronic & telecom engineering and power engineering. To support these streams, state-of-the-art laboratories along with qualified staff are available in the department.

The courses are so designed that these establish strong academic foundation which ascertains candidates' knowledge and skills for specialized and career- oriented opportunities. After completion of the program, BS Electrical Engineering degree is conferred upon the students. However, the transcript of individual student reflects the sequence of subjects as per adopted stream. The program spans over four years (eight semesters) and comprises 136 credit hours. The semester-wise breakup of curriculum is given as follows:

Curriculum

Semester-1

Course Code	Course Title	Credit Hours
EE-101	Engineering Workshop	0+1
EE-102	Electric Circuit Analysis	3+1
MT-101	Calculus and Analytic Geometry	3+0
EC-110	Computing Fundamentals	2+1
HS-101	English	3+0
ME-210	Engineering Mechanics	3+0
	Total credits	17

Semester-2

Course Code	Course Title	Credit Hours
EE-103	Network Analysis	3+1
MT-102	Linear Algebra & Differential Equations	3+0
BS-101	Engineering Physics	3+0
ME-211	Computer-Aided Engineering Drawing	0+1
EC-230	Object Oriented Programming	2+1
EE-201	Basic Electronics	3+1
	Total credits	18

Semester-3

Course Code	Course Title	Credit Hours
EE-205	Electronic Devices and Circuits	3+1
EE-203	Digital Logic Design	3+1
MT-201	Complex Variables & Transforms	3+0
IS-211	Islamic Studies	2+0
EC-222	Data Structure & Algorithms	2+1
HS-103	Communication Skills	3+0
	Total credits	19

Semester-4

Course Code	Course Title	Credit Hours
EE-204	Electrical Machines-I	3+1
EE-302	Signals and Systems	3+0
MT-202	Numerical Methods	3+0
EE-304	Communication Systems	3+1
HS-102	Pakistan Studies	2+0
HS-201	Technical Report Writing	3+0
	Total credits	19

Semester-5

Course Code	Course Title	Credit Hours
EE-305	Linear Control Systems	3+1
EE-303	Microprocessor and Interfacing Techniques	3+1
EE-306	Digital Signal Processing	3+1
MT-302	Probability and Statistics	3+0
EE-3XX	Breadth Core I	3+0/1
	Total credits	18/19

Semester-6

Course Code	Course Title	Credit Hours
HS-402	Economics	2+0
EE-308	Instrumentation & Measurement	3+1
EE-3XX	Breadth Core II	3+1
EE-405	Power Electronics	3+1
EE-4XX	Depth Elective I	3+1
	Total credits	18

Semester-7

Course Code	Course Title	Credit Hours
EE-401	Project Part-I	0+3
HS-403	Management&Entrepreneurship	3+0
EE-4XX	Depth Elective II	3+1
EE-4XX	Depth Elective III	3+1
	Workshops on Emerging Technologies	
	Total credits	**14**

Semester-8

Course Code	Course Title	Credit Hours
EE-401	Project Part-II	0+3
EE-4XX	Depth Elective IV	3+1
EE-4XX	Depth Elective V	3+0 / 3+1
HS-401	Professional Values & Ethics	2+0
	Total credits	**12/13**

Total Credit Hours : 136

List of Electives (Power):

Course Code	Course Title	Credit Hours
EE-309	Electrical Machines-II	3+1
EE-310	Power Generation	3+1
EE-404	Power Transmission & Distribution	3+1
EE-423	High Voltage Engineering	3+1
EE-426	Renewable Energy Systems	3+0
EE-428	Electrical Machine Design	3+1
EE-429	Power Systems Analysis	3+1
EE-431	Power System Protection	3+1
EE-432	Power Systems (Operation & Control)	3+1

List of Electives (E&T):

Course Code	Course Title	Credit Hours
EE-301	Electromagnetic Theory	3+0
EE-307	Electronic Systems Design	3+1
EE-402	Wave Propagation & Antennas	3+1
EE-403	Computer Communication Networks	3+1
EE-411	Digital Communication	3+1
EE-409	Optical Communication	3+1
EE-417	Embedded Systems	3+1
EE-427	Wireless & Mobile Communications	3+1
EE-430	Telecom Transmission & Switching Systems	3+1

Course Contents

EE-101 Engineering Workshop:

Pre-Requisite: Nil

Electrical trauma and safety, wiring design, PCB design and fabrication, fabricating simple electronic circuits on breadboard, use of software tools for PCB design, assembling and soldering components on a PCB, soldering methods, etching, electronic house hold components repair/maintenance, use and understanding of data books, specification sheets, basic introduction, overview of MATLAB/Simulink product family and toolboxes.

EE-102 Electric Circuit Analysis:

Pre-Requisite: Nil

Two terminal circuits, resistor, capacitor and inductor, energy concepts, energy dissipated in a resistor, energy & energy transfer, electric current and potential difference concepts, power and energy, circuit theorems, periodic functions, magnetic effects of electric current, magnetic circuits with DC excitation, transformer, network responses, complex impedance and admittance functions, tuned circuits, quality factor.

EC-110 Computing Fundamentals

For contents please refer to page number 113

EE-103 Network Analysis:

Pre-Requisite: Electric Circuits

Inductors and capacitors as energy storage elements, natural response of first order circuits, transient and steady state response of a second order system. Introduction to Laplace and inverse Laplace transform, direct transformation of circuits from time domain to S-domain, AC steady state power, introduction to BODE plots.

BS-101 Engineering Physics:

Pre-Requisite: Nil

Crystal structure, packing fraction, X-ray diffraction and Bragg's law, categorization of solids, inter atomic forces, band theory of solids, semiconductor materials, PN-junction, electric field, Coulombs law & Gauss's Law with application, magnetic field and magnetic properties, BiotSavart's law, Ampere's circuital law with applications, induced EMF, Faraday's law of electromagnetic induction, electromagnetic spectrum, electromagnetic waves, interference and diffraction.

ME-210 Engineering Mechanics:

For contents please refer to page number 58

ME-211 Computer Aided Engineering Drawing:

For contents please refer to page number 56

EC-230 Object Oriented Programming:

For contents please refer to page number 115

EE-201 Basic Electronics:

Pre-Requisite: Engineering Physics

Introduction to semiconductor materials, energy levels in conductors, intrinsic and extrinsic semiconductor material, majority and minority carriers, theory of semiconductor diodes, forward and reverse biasing diode, Zener region of a semiconductor, diode specification sheets and testing methods, PN junctions, forward and reverse characteristics of a diode, ideal and practical diode concepts, series and parallel configurations with DC inputs, current equation of a diode, diode as a switch, half wave rectification, full wave rectification, clippers, clampers, breakdown diodes, voltage regulators, voltage multipliers, junction transistors, bipolar junction transistors (BJTs), DC operating point, fixed biased circuits, emitter

stabilized biased configuration, voltage divider biased configuration, voltage feedback biasing technique, introduction to JFET & MOSFET.

EE-203 Digital Logic Design:

Pre-Requisite: Nil

Review of number systems, theorems and postulates of Boolean algebra, simplification of switching function using graphical and tabular methods, combinational logic circuits, multiplexer, ROM, PAL, and PLA, sequential logic circuits, synchronous sequential machine, basic microprocessor designed conventions: register transfer, busing and sequencing of control.

EE-204 Electrical Machines-I:

Pre-Requisite: Circuit Analysis-II

Ideal and practical single-phase transformer,3-phase transformer connection, auto transformer and current & potential transformers, DC machines, motors & generators, three phase motors, fractional horse-power motors and servo motors, synchronous generator and synchronous motor, vector diagram of alternator, regulation, stepper motor, single phase motor, induction motor, repulsion motor.

EE-205 Electronic Devices & Circuits:

Pre-Requisite: Basic Electronics

BJT AC models and small signal amplifiers, FET AC models and small signal amplifiers, multistage amplifiers, Darlington configuration, frequency response of single-stage and multi-stage amplifiers, class A,B,C and D power amplifiers, feedback amplifiers, oscillators.

EC-222 Data Structures & Algorithms

For contents please refer to page number 114

EE-302 Signals & Systems:

Pre-Requisite: Complex Variables and Transforms, Circuit Analysis-II

Introduction to signals, classification of signals and systems, Laplace transform, properties of Laplace transform, inverse Laplace transforms, convolution, correlation functions, Fourier Series, frequency responses of system using Fourier transform, inverse Fourier transforms, Z-transform, inverse Z-transform, analog filter design, Butterworth, and Chebshev filter design techniques, MATLAB simulation.

EE-303 Microprocessor and Interfacing Techniques:

Pre-Requisite: Digital Logic Design

Architecture and programming technique, introduction to assembly language, 8086 pin-diagram and functions, interfacing ROM & RAM, peripheral programmable

interface (PPI), interrupt priority controller, universal asynchronous and synchronous receiver transmitter (UART and USART) and its configuration, interfacing hex keypad, servo meters, robots, various LED and LCD displays etc.

EE-307 Electronic Systems Design:

Pre-Requisite: Electronic Device and Circuits

Basic model of an operational amplifier, analysis of differential amplifier, Op-amp parameters, op-amp open-loop configuration, op-amp closed-loop configurations, active filters, integrators and differentiators, logarithmic and antilogarithmic amplifiers, Schmitt trigger, instrumentation amplifier, precision rectifiers, waveform generators and converters, timing circuits, sample and hold circuits, analog-to-digital and digital-to-analog converters, analog multiplexer and de-multiplexer, analysis and design of voltage regulators, three terminal voltage regulators, current limiting and boosting circuits,

timers and phase locked loops, switched mode power supplies.

EE-305 Linear Control Systems:

Pre-Requisite: Nil

Concept of feedback in control systems, modeling of electrical and mechanical systems, transfer function of systems, stability, evaluation of output of a system for various inputs, Root Locus, PID Controller, Bode plots and introduction to state space concepts.

EE-220 Fundamentals of Electrical Engineering:

Introduction to DC Circuits: Series and parallel circuits, DC circuit analysis. Theory of Alternating Current. Series and parallel circuits, resistance, inductance and capacitance of AC circuits, power factor, resonance in RLC circuits, single phase and polyphase circuits. Power and power factor measurement, current and voltage relationship in phase and line circuits.

Types, characteristics and testing of AC motors, motor starters and switch gears, electric traction and braking, solenoids. Transformers. Voltage and current relationship of primary and secondary types of transformers, losses and efficiency. Generators and motors. Types, construction and characteristics. Motor starters. Testing and efficiency of machines.

EE-306 Digital Signal Processing:

Pre-Requisite: Signals and Systems

Introduction to digital signal processing, discrete signals and systems, time-domain analysis of discrete-time signals, frequency-domain analysis, Fourier series and Fourier transform, system response and frequency response, z-transform and its properties, digital filter design, Finite Impulse Response (FIR) and Infinite Impulse Response (IIR), filters and their applications in signal processing, real time digital signal processing.

EE-308 Instrumentation and Measurement:

Pre-Requisite: Electronic Systems Design

Engineering units and standards, galvanometer, DC ammeters, DC voltmeters, ohmmeters, DC meter calibration, half-wave and full-wave AC voltmeters, energy measurement meters, transistor based electronic voltmeters, op-amp based electronic voltmeters, digital voltmeters and ammeters, frequency measurement, sensors and transducers, analog and digital interfacing of sensors and transducers, overview of measurement instruments.

EE-320 Analog and Digital Systems:

Covers both analog & digital signals & transmission; analog AM and FM; digital PCM, ADPCM & DM. Digital data transmission, data encoding, clock recovery and BER, modulation techniques such as ASK, FSK, PSK and QAM and the effects of noise and bandwidth. Addresses modern satellite, cellular and cable communication systems.

EE-405 Power Electronics:

Pre-Requisite: Basic Electronics

Principles of power electronics, power diode, power BJT, power MOSFET, IGBT and SCR, GTO and TRIAC and DIAC, half wave and full wave rectifiers with resistive and inductive loads, un-controlled, semi-controlled and fully controlled rectifiers, three-phase rectifiers: un-controlled, semi-controlled and full controlled, six-pulse, twelve-pulse and 24-pulse rectification, PWM converters, DC to AC converters, three-phase inverter, six-pulse, twelve-pulse inverters, PWM inverters, switching mode power supplies, DC to DC conversation, buck converter, boost converter and buck-boost converters, isolated converters, forward converters, flyback converters.

HS-201 Technical Report Writing

Introduction to technical writing basics, Definition and fundamentals, its purposes, top down method, use of headings, use of chunks, visual aids, consistent visual logic, plain and objective language, use of honest language and format, direct and simple expression, codes of ethical conduct, defining audiences and estimating the schemata, feelings of the audience, credibility, authority, the technical writing process, pre-writing, writing and post-writing stages, planning of the document, constraints, effective strategy, production schedule, context setting introductions, preview lists, repetition and sequencing, structural parallelism, editing, plagiarism, technical writing style, technical writing techniques, placing the main idea first, use of normal word order, use of active voice, employing parallelism, how to write clear sentences

and paragraphs, indefinite phrases, nominalizations, choppy sentences, wordiness and verbosity, redundant phrases, noun clusters, sexist and gender specific language, topic sentences, what is meant by tone and the use of correct tone, coherence, research and its purpose, discovering and formulating questions, interviewing, echo techniques, reformulations, surveys, abstracting, supporting information and main information, how to plan and write summaries, formal definitions, classification, differentiation, circular definitions, informal definitions, operational definitions, synonyms, extended definitions, explaining the derivation, explicating terms, use of examples, use of analogies, comparing and contrasting, explaining cause and effect, analyzing a term, describing, mechanism descriptions, process descriptions, description of a human system, elements of memos, memo heads, memo reports, formal report-sections and formats, external proposals, sections and format, user manuals, letters, elements and formats, technical writing applications, memorandums, project reports, proposals, user manuals and letters.

HS-103 Communication Skills

Definition of Communication, Importance, benefits of Communication, flow of communication in the hierarchy of an organization, vertical communication, horizontal communication, diagonal communication, grapevine, types of communication, verbal and non verbal communication, appearance, body language, facial expressions, eye contact, gestures, posture, smell and touch, voice and sound, paralingual aspect, rate, pitch, volume, tone, silence, space, time, context, dimensions of context, physical dimension, social/psychological dimension, temporal dimension, encoder, message, medium, decoder, feedback and kinds, potential problems in communication, distortion, noise, physical noise, technical noise, social noise, psychological noise, semantic noise, other potential problems and differences, cultural variations, the seven C's of effective communication, completeness, conciseness, consideration, concreteness, clarity, courtesy, correctness, intercultural communication, ethnocentrism, cultural differences, do's and don'ts of intercultural communication, four skills of communication, passive/receptive skills, listening, reading, active/productive skills, speaking, writing, listening process, receiving, interpreting, remembering, evaluating, responding, acting/feedback, barriers to effective listening, techniques for effective listening, reading skills, skimming, scanning, active reading, analytic reading, problems faced while reading, writing skill, idea generation, brain storming, prioritizing, composing, paragraphs, presentation skills, types of presentations and practices with prepared and extemporaneous presentations in classroom.

HS-101 English

Introduction to grammar, sentence, subject, object, predicate, phrase and the clause, types of sentences, parts of a sentence, kinds of sentences, Parts of speech, noun and its kinds, concept of gender and number, different cases of nouns, nominative case, objective or accusative case, possessive case, nouns in apposition, proper noun, common noun, concrete noun, abstract noun, collective noun, countable and uncountable nouns, pronoun, cases of pronoun, various kinds of pronouns, verb, irregular verbs, verbs of incomplete predication, transitive and intransitive verbs, voice of verb, active voice and passive voice, the preposition, kinds of preposition, abverb, kinds of adverbs, comparison of abverbs, formation of adverbs, position of adverbs, adjective, adjectives of quality or descriptive adjectives, adjectives of quantity, adjectives of numbers or numeral adjectives, definite and indefinite numeral adjectives, distributive numeral adjectives, demonstrative adjectives, interrogative adjectives,

emphasizing adjectives, exclamatory adjectives, comparison of adjectives, positive, comparative and superlative degrees of adjectives, irregular comparison, nouns used as adjectives, position of adjectives, formation of adjectives, articles, definite and indefinite articles and their uses, conjunction, classes of conjunctions, interjection, tenses, the infinitive, gerund, auxiliaries and modals, synonyms, homonyms, homophones, antonyms, acronyms, idioms, oxymorons, spellings, capitalization, punctuation, abbreviations, narration, direct and indirect narration, paragraph writing, composition, its kinds and how to compose an essay, comprehension and précis writing.

HS-401 Professional Values & Ethics

Introduction and meaning of ethics & professional ethics, historical background of professional ethics and its need in engineering practice, essentials of professional ethics, ethical issues in engineering practice, resolving ethical problems, engineers and environment, societal

concerns in engineering practice, plagiarism, Pakistan Engineering Council's Code of Ethics and case studies.

HS-402 Economics:

Introduction to economics, simple and compound interest, annual, net present and net future worths, rate of returns, internal rate of return (IIR) and external rate of return (ERR), financial statements, interpretation of financial statements, fundamental economic concepts, supply and demands principle, market, types of market and forecasting, ratios, accounting, cost benefit ratios, equities, interest versus equities, recently discovered advantages of equity over interest and their implementation in corporate & banking sectors.

EC-332 Computer Communication Networks:

HS-403 Management & Entrepreneurship:

Introduction to management, a manager, roles and responsibilities of manager, organizational structure and cultures, project management, technology management, strategic planning, SWOT Analysis, porter forces, design of goods and services, operations & production, workplace management, lean operations, Toyota production system, total quality management, 6 sigma quality, inventory management, process strategies, process of entrepreneurship, innovation concepts, factors influencing entrepreneurship.

EE-301 Electromagnetic Theory:

Pre-Requisite: Engineering Physics, Differential Equations

Vector analysis, coordinate systems, Coulomb's law and Gauss's law, electric field intensity and flux density, Greens theorems, energy and potential, conductors and dielectrics, boundary conditions,

capacitance, Poisson's and Laplace's equations, steady-state magnetic field, magnetic forces, materials and inductance, time-varying fields and Maxwell's equations, transmission lines, uniform plane waves, electromagnetic radiation and antennas.

EE-304 Communication Systems:

Types of signals, types of modulation and demodulation, digital communication systems, digital modulation and de-modulation, signal spaces, receiver structures, transmission media, radio systems, satellite communication systems, optical communication systems, introduction to information theory.

EE-309 Electrical Machines-II:

Pre-Requisite: Electrical Machines-I

Forces and torques in magnetic field systems, energy balance, multiple excited system, and dynamic equations, transformer fundamentals, importance of transformers, types and construction, ideal transformer, theory and operation of real single-phase transformers,

phasor diagrams, leakage reactance, voltage regulation and efficiency, autotransformers, tapping, three phase transformation using two transformers, induction generator.

EE-310 Power Generation:

Pre-Requisite: Electrical Machines-I

General parameters (loads and load curves), load factor, diversity factor, peak diversity factor, capital cost, operating cost, depreciation, spinning, cold, hot and firm reserves, hydroelectric power plants, types and classification of dams, advantages and disadvantages of hydro power plants, thermal power plants, steam plants, coal fired power plants, nuclear power plants, types of reactors, radiation damages, shielding, thermoelectric and MHD generators, renewable sources of energy, power factor.

EE-402 Wave Propagation & Antennas:

Pre-Requisite: Electromagnetic Theory

Radiation mechanism, elementary doublet antenna,

antenna gain, bandwidth, beam width, polarization, effects of ground on antennas, grounded and ungrounded antennas, directional high frequency antennas, dipole arrays and applications, microwave antennas, parabolic reflectors, horns and lens antennas, special purpose antennas, folded dipoles, helical, log periodic antennas, radio wave propagation, wave reflection, transmission of waves, transmission lines overview.

EE-404 Power Transmission & Distribution:

Pre-Requisite: Power Generation

Transmission and distribution schemes, ac and dc transmission systems, electrical and mechanical design of overhead systems. EHV AC transmission system, corona effect, HV cables, grounding systems.

EE-411 Digital Communications:

Pre-Requisite: Communication Systems

Pulse modulation, Pulse Amplitude Modulation (PAM), Time Division Multiplexing (TDM), pulse code coherent digital modulation schemes, coherent modulation schemes, non-coherent digital modulation schemes, performances & comparisons between the modulation techniques.

EE-417 Embedded Systems:

Pre-Requisite: Computing fundamentals, microprocessor and interfacing techniques

Design of embedded digital systems, microcontrollers, embedded programs, real-time operating systems, design methodologies, hardware-software design, hardware modeling and computer-aided design, prototyping with FPGAs.

EE-427 Wireless & Mobile Communication:

Pre-Requisite: Communication Systems

Introduction to Wireless communication systems, Cellular system design fundamentals, Wireless channel models: path loss, shadowing, multipath fading, wideband channel models. Capacity of wireless channels, digital modulation, performance in wireless fading channels. Diversity (time, frequency, space), equalization. Multicarrier modulation (OFDM), spread spectrum (CDMA), cellular concept, frequency reuse. Multiuser systems, wireless networks.

EE-429 Power System Analysis

Pre-Requisite: Power Distribution & Transmission

Power in single phase ac circuits, elements of power systems, y-bus model and network calculation, KRON reduction, z-bus model and network calculations, transients in RL and RLC circuits, symmetrical components, power system security, interconnected systems, power system operations and control, load frequency control, compensations in power system, load forecasting.

EE-431 Power System Protection

Pre-Requisite: Power Distribution & Transmission, Power Generation

Protection systems, types of faults, fuse as protective device, types of fuses, characteristics of fuses, current transformer and its operation, relay construction, electromagnetic relays, thermal relays, introduction to microprocessor based protective relays, protection of transformers, generator protection, classification of circuit breakers, operational mechanism and rating of circuit breakers.

EE-432 Power System Operation & Control

Pre-Requisite: Power Generation

Power system control and its importance, modes of power system operation, power system stability, active and reactive power, SCADA system*,* control

centers, controller tuning, communication sub system, data logging, economic dispatch, voltage, power and frequency control, load dispatch, unit commitment.

EE-426 Renewable Energy Systems

Pre-Requisite: Power Generation

Fundamentals and main characteristics of renewable energy sources and their differences compared to fossil fuels. Technological basis for harnessing renewable energy sources, recognize the effects that current energy systems based on fossil fuels have over the environment and the society, describe the main components of different renewable energy systems, compare different renewable energy technologies and choose the most appropriate based on local conditions, design renewable/hybrid energy systems that meet specific energy demands are economically feasible and have a minimal impact on the environment. Renewable energy technologies, solar energy, wind energy, biomass, hydropower, wave energy, ocean thermal energy conversion, tidal energy, geothermal energy.

EE-423 High Voltage Engineering

Pre-Requisite: Power Generation

Introduction to high voltage engineering,withstand levels, S curves; insulation coordination; breakdown mechanisms in solids, liquids, gases and vacuum. Testing Non-destructive testing of apparatus; insulation resistance, tan A, partial discharge measurements; life testing, accelerated life testing; Weibull statistics. System over voltages occurrence and characteristics; power frequency and harmonics, switching and lightning over voltages; transient calculations, Bewley lattice diagrams; wave tables; attenuation and distortion of surges; overvoltage protection devices; rod and expulsion gaps; surge diverters.

Circuit breakers Aims, types, general principles of operation. HV testing HV production for test objects; impulse generators; series resonant a.c. test sets; d.c. test sets; measurement of high voltages; absolute measurement methods; series impedance and meter methods; impedance dividers.

EE-428 Electrical Machine Design

Pre-Requisite: Electrical Machines-II

Industrial standardization, national and international standards, codes and testing laboratories, manufacturing and operating systems, design considerations forelectrical machines, properties and applications of materials for magnetic machine,insulation system and its design considerations, mechanical design considerations, specific loading and output, induction motor, introduction to computer aided design (CAD) and computer aidedmanufacturing (CAM).Safety precautions, troubleshooting and emergency repairs. Installation, commissioning, testing, maintenance, and troubleshooting of (i) power transformers and (ii) induction motors. (iii) AC generators.

EE-409 Optical Communication

Pre-Requisite: Communication Systems

Introduction to optical fiber communications, basic principles, Snell's law, numerical aperture (NA),Fresnel loss, fiber types, single mode and multimode, optical fiber losses, (attenuation, dispersion, polarization), special optical fibers, light sources (LED, LASER), light detection (pi-n and APD), components and connectors, Link budget calculations (power based and rise time based), receiver design considerations (IM/DD and coherent systems), modulation schemes, optical measurement (OTDR e.g.) optical DWDM systems, optical fiber preparation methods.

Laboratories

Students are provided with the opportunity of augmenting their theoretical learning through practical work in the state-of-the-art laboratories. These labs are fully equipped to carry out practical work and undertake research in the field of electronics, telecommunication, signal processing, control systems and power engineering etc. Furthermore, these labs are adaptable, reconfigurable and modular, making them ideally suited for research in the wide range of fields to understand fundamental electrical engineering concepts. Lab experiments are designed in coherence with theory. The Department of Electrical Engineering has following twelve well maintained laboratories for the subject programs.

Electronics Lab: Electronics lab is equipped with components such as diodes, transistors, operational amplifiers, oscilloscope, power supplies and function generators; required to practically implement the theoretical concepts of electronic systems.

Digital Systems Lab: Digital systems lab is designed for the understanding of digital logic concepts and consists of oscilloscopes, digital trainers, digital multi-meters, function generators, 8086 microprocessor kits and supporting accessories. This lab is also used to provide practical implementation of microprocessor and interfacing techniques.

Communication Systems Lab: Communication systems lab helps the students to envision the theoretical communication concepts of both analog and digital communication systems. This lab consists of different analog and digital communication trainers.

DSP & VLSI Lab: Digital signal processing and very large scale integration lab utilizes advanced signal processing tools such as MATLAB, Xilinx and LABVIEW to visualize various signal processing techniques including convolution, DFT, FFT and digital filters designing techniques. DSP kits TMS 320C6713 DSK are also provided for advanced stage practical implementations.

Wave-Propagation & Antennas Lab: Wave-propagation and antennas lab comprises various types of trainers including wave-propagation, microwave-communication, antennas, satellite-communication and waveguide trainers. These trainers are suitable for

the study of generation, propagation and reception of microwave signals.

Control Systems Lab: Control systems lab consists of multiple workstations, each equipped with an oscilloscope, digital multi-meter, PID trainers, control system trainers, inverted-pendulum, ball and beam control, magnetic-levitation trainers. This lab also covers the industrial implementation of advanced control systems via different computer tools such as MATLAB and Simulink.

Electrical Machines Lab: Electrical machines lab provides the essential opportunity to the students to augment their concepts about the fundamentals of transformers and rotating machines. The lab is equipped with DC series/shunt motor, compound motor, universal motor, single-phase induction motor, single-phase transformer, three-phase induction motor,

three-phase synchronous motor and three-phase transformer. The lab is equipped with various test and monitoring equipment also.

Computer Networks Lab: This lab offers students the opportunity to perform practical experiments on data communication techniques and networking methodologies. The lab is well furnished with data communication LAN, WAN, and MAN trainers.

Power Engineering Lab: Power engineering lab provides an opportunity to improve practical skills of students in the field of electrical power systems. The students perform practical for different subjects such as high voltage engineering, electrical drives, power systems generation, transmission, distribution and protection.

Electronic Workshop Lab: Electronic workshop laboratory provides hands on experience to students about different electronic measuring equipments such as oscilloscope, Megger, analog/digital multi-meter, single/three-phase watt-meters. The lab is also utilized for a variety of engineering subjects including engineering workshop, electric circuits, network analysis, instrumentation and measurement.

Computing Lab: It is a dedicated lab for computer programming-oriented subjects like structured C, object oriented programming, java, computer-aided engineering drawing etc. high speed computers are installed to provide efficient computing facility for the respective courses.

Information Technology Lab: This lab provides students with the facilities of high speed internet access, browsing, surfing and to carry out their assignments etc.

MS Electrical Engineering

The Department of Electrical Engineering also offers MS program of studies which essentially entails specialization in a specified area of the discipline of Electrical Engineering. Currently these areas comprise of Communication Systems, Digital Signal Processing and Control Systems.

The MS program in Communication Systems involves studying advanced courses in wireless communications, digital modulation techniques, secure communication, telecommunication and switching and cryptography. The MS program in Signal processing deals with advances courses in DSP, digital image processing, adaptive signal processing, computer and machine vision and advanced computer networks. The MS program in Control Systems exposes the students to linear control systems, robust control, adaptive control and fuzzy control systems.

A prospective student for any of these schemes is required to study eight advanced courses and completing a research thesis in the assigned topic for six credit hours. Although the department exhorts all MS students to opt for research thesis, still an option is available to study two addition courses at Master's level in lieu of thesis to qualify for the award of degree.

A student normally takes three to four courses in his / her major area and remaining may be selected from subjects being offered by the department.

An MS degree in Electrical Engineering from HITEC University opens the doors for excellent job opportunities in telecommunication and process industries as well as strategic organizations in the country and abroad. MS qualifies Electrical Engineering postgraduates are also readily accepted in academic institutions

Ph.D. Electrical Engineering

The PhD Electrical Engineering is offered as per the guidelines of Higher Education Commission (HEC). The desirous candidates for PhD program must possess 18 years MS degree with a minimum CPGA of 3.00 out of 4.00.

The program comprises 18 credit hours of coursework and 30 credit hours of research and doctorate dissertation. The courses are selected in consultation with the PhD supervisor from the list of graduate courses.

The completion of coursework is followed by a comprehensive examination for granting PhD candidacy. The PhD dissertation is evaluated by two experts of technologically advanced countries and one local expert. Subsequent to positive evaluation from these experts, the PhD scholar is required to undertake an open defense to fulfill the degree requirements.

A minimum residency of two years at the university campus and publishing at least one research paper in an impact factor journal of good repute is also an essential requirement to earn a PhD degree.

List and Contents of MS/PhD Courses

Course Code	Course Title	Credit Hrs
EE-811	Advanced Digital Signal Processing	3-0
EE-812	Digital Image Processing	3-0
EE-813	Real-Time DSP Design & Applications	3-0
EE-814	GIS and Remote Sensing	3-0
CS-829	Advanced Computer Vision	3-0
EE-817	Statistical Signal Processing	3-0
EE-818	Adaptive Signal Processing	3-0
EE-819	Array Signal Processing	3-0
EE-820	Advanced Computer Architecture	3-0
EE-821	Stochastic Systems	3-0
EE-822	Information Coding & Theory	3-0
EE-823	Advanced Digital Communication	3-0
EE-824	Secure Communication	3-0

Course Code	Course Title	Credit Hrs
EE-825	Fuzzy Control Systems	3-0
EE-826	Telecommunication & Switching Principles	3-0
EE-827	Optical Fiber Communication	3-0
EE-828	Smart Antennas	3-0
EE-831	Advanced Linear Control Systems	3-0
EE-832	Nonlinear Control Systems	3-0
CS-811	Advanced Computer Networks	3-0
EE-838	Modern Electrical Drives	3-0
EE-847	Special topics in Image and Video Processing	3-0
EE-849	Special topics in Wireless Communications	3-0
EC-802	Advanced Digital Systems Design	3-0

Contents

EE-811 Advanced Digital Signal Processing

Introduction, Discrete-time Signal and Systems, Time-domain Analysis, Frequency-domain Analysis, Z-transform and its properties, Solutions of Difference Equations using Z-Transform, Discrete-time Fourier Series (DTFS), Discrete-time Fourier Transform (DTFT), DFT and FFT Processing, Implementation of Discrete-Time Systems, FIR and IIR Filters Design, Random Digital Signals, MultiMate Digital Signal Processing, Linear Prediction and Optimal Filters, Power Spectrum Estimation.

EE-812 Digital Image Processing

Image processing fundamentals, basic grey level transformation, histogram processing, area processing,

spatial domain smoothing and sharpening filters, orthogonal and orthonormal basis functions, transform domain smoothing and sharpening filters, Discrete Cosine Transform, overview of information theory, lossless compression, lossy compression, overview of JPEG compression, morphological image processing, image segmentation.

EE-813 Real-Time DSP Design & Applications

Introduction, Discrete-time Signal Processing, Data Format, Microprocessor Architecture, Peripheral Components, Real-Time implementation issues.DSP Architecture: Introduction to DSP Architecture, Fixed-Point DSP, Floating –Point DSP, Software Development. Design & Implementations: Designing approach, Simulation, Verification, Final Implementation on Fixed and Floating-Point.

EE-814 GIS and Remote Sensing

Introduction to GIS and Remote Sensing, Basic Principles of Remote Sensing, Aerial Photography, Photographic Basics, Multiband Imaging, Photogrammetry, Sensing Systems; Multispectral, Thermal, and HyperspectralSensing, Earth Resource Satellites, Characteristics, Landsat and SPOT Programs, Visual Image Interpretation, Image Interpretation Keys, Applications, Essential Digital Image Processing, Computer Assisted Operations, GIS Data Models and Structures, Conversion, GIS and Remote Sensing Integration, Coordinate Space, Datum and Map Projections, GIS Operations, Challenges and Future Trends.

CS-829 Advanced Computer Vision
For contents please refer to page number 108

EE-817 Statistical Signal Processing

Introduction to Probability, Stationary Process ad

Models, Linear Systems, Spectral Representation and Eigen Analysis, Maximum Likelihood Estimation, Bayes Estimation, Wiener Filtering Theory, Adaptive Optimization (Steepest Descent Algorithm), Lease Mean Square Algorithm, RLS Algorithm, Blind Deconvolution.

EE-818 Adaptive Signal Processing

Introduction TO Adaptive Signal Processing, Adaptive Filter Theory, Discrete Time Signal Processing, Stationary Process, Power Spectral Density, Review of Linear Algebra, Linear Optimum Filter, Linear Prediction, Method of Steepest Descent, LMS Algorithm, Frequency-Domain Adaptive Filters, LS and RLS Filters, LMS and NLMS, Kalman Filters.

EE-819 Array Signal Processing

Introduction to Array Signal Processing, Propagating Waves, Wave number-Frequency Space, Apertures, Delay and Sum Beam forming, Filter-and-Sum Beam forming, Convolutional Narrowband Beam forming, Signal to Noise, Constrained Optimization, MVDR Beam forming, Eigen value Method and MUSIC, ESPRIT, Introduction to Cramer-Rao Bounds, Cramer-Rao Bounds for Arrays.

EE-820 Advanced Computer Architecture

Introduction to Multithreaded and Multicore Architectures, Memory Systems for Multicore architectures Programming Models and APIs: POSIX, MPI, Open MP, Network on Chip Introduction, NoC Architecture, Physical Layer, Data Link Layer, Network and Transport Layer, QoS, Network Interface Design

EE-821 Stochastic Systems

Definition of a Stochastic Process, Characterisation of a Stochastic Process, Discrete-time and continuous-Time Stochastic Process and their first & second order statistics, Continuity, Derivative and Integral of a Stochastic Process, Time – Averages and Ergodic Theorems, Stationarity, Power Spectral Density, Time – Series Analysis, Discrete – Time Markov Chains, Continuous – Time Markov Chains, Introduction to Queuing Theory (Subject to availability of time.)

EE-822 Information and Coding Theory

Information Theory, Source Coding, Channel, Channel Capacity, Channel-Coding, Linear block codes for Error correction, Cyclic Codes, Convolution Codes, Turbo Codes, Trellis Coded Modulation, Introduction to Cryptography, Symmetric Cryptography, Asymmetric Cryptography, Secure communication using Chass Functions.

EE-823 Advanced Digital Communication

Topics include in this course are focused on band-limited channels, intersymbol interference and equalization, fading channel characteristics and models, the effect of fading on digital communication system, and the ways of mitigating this effect. The course will also discuss multicarrier communications, spread spectrum and multiple access techniques, with special emphasis on CDMA schemes and multiuser detection.

EE-824 Secure Communications

Introduction, Communication and Security threats, Secure Communication Algorithms, Cryptography and Security, Conventional Cryptography, Private and Public Key Encryption, Encryption Algorithms, Key Distribution Problem, Authentication and Digital Signatures, Pseudo-random Number Generation and its Computational Complexity, Secure Speech Communication, Speech Scrambling Techniques,

Spread Spectrum, Secure GSM Systems, Recent Trends in Secure Communication.

EE-825 Fuzzy Control Systems

This is an advanced master level course which deals with application of Fuzzy Logic to analyse and design controllers for non-linear systems. In the first part, generic knowledge of Fuzzy Sets, Fuzzy Logic, Fuzzy Relations and Inference Engines is imparted. The later part deals with framing rules for designing Fuzzy Controllers and their simulations to ascertain their performance. The course mainly deals with Mamdani's and T-S-K's design approaches. The course offers a model-less design philosophy.

EE-826 Telecommunication & Switching Systems

Introduction to Telecommunication Systems, Channel Bandwidth, Processing power, Storage capacity, Public Switched Telephone Network (PSTN), Outside plant, Switching systems, Strowger switching systems, Crossbar Switching systems, Electronic space division switching, Time division switching, Signalling systems, SS7 Signalling, Optical Fiber transmission systems, Traffic Engineering, Broadband transmission systems, ISDN.

EE-827 Optical Fiber Communication

Introduction to Optical Fiber Communications, Optical Fibers and Lasers, Optical Transmitters, Optical Components, Optical Pulse Propagation in Fiber, Link Performance, Optical Modulation Formats, Modulation Formats and Performance, Wavelength Division Multiplexing, Subcarrier Multiplexing.

EE-828 Smart Antennas

Introduction to Smart Antennas, Fundamentals of Electromagnetic Waves, Antenna Fundamentals, Antenna Characteristics, Antenna Types and its Theory, Antenna Array Fundamentals, Array Signal Processing Fundamentals, Types of Array Processing, Propagation Channel Characteristics, Angle-of-Arrival Estimation Fundamentals, AOA Estimation Methods, Historical Developments of Smart Antennas, Beam forming Methods, Adaptive Beam forming.

EE-831 Advanced Linear Control Systems

This course deals with the advanced concept in linear control theory. Starting from the state-space formulation, embodying multi-input multi-output systems, the subject deals with state transformation and diagonalization to compute time response from the state questions. System's behaviour is investigated in terms of various stability criteria and its controllability and observabilityare discussed in details. The subject provides exposure to state-space design, using state feedback, pole-placement and integral control principles. The Linear Quadratic Regulator (LQR) and Linear Quadratic Gaussian (LQG) problems are also discussed. The course also deals with robustness in systems.

EE-832 Nonlinear Control Systems

This course highlighted the existence of various non-linearity's which are normally present even in linear systems, Details of common physical Non-linearities, like saturation , friction , Relay and Dead-Zone are ascribed. Non applicability of mathematical Tools like Laplace Transformation and Z-transformation to nonlinear Control problems is explained. This course mainly teaches the phase- plan and Describing Function methods to analyses given Non-linear Control systems. The existence of singular points and limit cycles is explained. This course mainly teaches the phase –plan nonlinear control systems. Liapunoves stability criteria

are described in details.

CS-811 Advanced Computer Networks

For contents please refer to page number 98

EE-838 Modern Electrical Drives

Analogue and digital instrumentation, motor instrumentation, hardware-in-the-loop, implementation of PID controllers, power semiconductor devices, DC motors and drives, electronic implementation of DC motor drives, induction and synchronous motors overview, characteristics and control strategies, Dynamic d-q model of induction and synchronous motors, MATLAB implementation of d-q models, scalar and vector control of AC motors, control and estimation of synchronous motor drives, phase-controlled converters, cyclo converters, voltage-fed converters.

EE-847 Special Topics in Image and Video Processing

Axes transformation, orthonormal bases and their applications, Discrete Cosine Transform and its applications, the JPEG image compression, wavelet transform and multi-resolution image processing, the MPEG video standard, image hashing and watermarking, shape analysis and classification, fuzzy image processing.

EE-849 Special topics in Wireless Communications

Introduction to Fading and Channel models, Bit Error Rate Analysis, Capacity Analysis, Outage Analysis, Space-Time Coding, Introduction to MIMO system, Multi-carrier Communications, OFDM, OFDM-A, Cooperative communications, Cognitive Radio.

EC- 802 Advanced Digital Systems Design

For contents please refer to page number 125

Research Groups

Following research groups are actively working in the Department in the respective research areas;

Signal Processing & Communication Systems (SPCS) Research Group.

Signal processing and communication systems have given a new horizon to research at universities in Pakistan over the last decade. This stems from growing market interest and rapid developments in industry. The prime objective of this group is to formulate and implement innovative mathematical and statistical theories related to signal processing and communication systems, evaluate and analyze by estimation and detection of problems. The major areas of interest include signal processing, secure communication, RF and microwave circuits analysis, image processing and computer vision, wireless communication, tracking, and encryption techniques.

Power & Control Systems (PCS) Research Group.

Multidisciplinary research in power and control systems establishes a constant attention on challenges being faced in this area at the national level. Core aim of the group is to conduct research in areas of power system and control theory, applications of control systems, analysis and design of future power generation and control system, power transmission and distribution, adaptive and robust control, renewable energy sources, optical networks capacity and control, optical routing and signal processing, industrial control and automation.

Department of Mechanical Engineering

Dr. S. Kamran Afaq
Professor & Chairman

It is a universally acknowledged fact that Mechanical Engineering is the mother of all engineering disciplines. The development on this planet owes a lot to Mechanical Engineering, which deals with designing, manufacturing, installation and operation of mechanical devices, machinery and systems. As one of the broadest and most vital branches of engineering disciplines, it mixes the core traditional engineering principles with emerging technologies to create innovative solutions of design problems.

Ever since its inception in 2007, the Department of Mechanical Engineering has been imparting quality education to students, with a view to produce engineers, who can contribute positively both at national and international levels. Our graduates are very well placed in a variety of industries like automobile, power sector, transportation, consumer products, sports goods and strategic organizations. Owing to the broad-based curriculum, a degree in Mechanical Engineering enables our graduate to seek and secure job almost anywhere in the country or abroad.

The Department has a team of highly qualified, motivated and experienced faculty, which remains involved in multifarious teaching and research activities. Various on job trainings and professional development courses keep the faculty abreast of the latest trends in teaching and research around the world.

The Department offers BS, MS and PhD programs in Mechanical Engineering. The BS Engineering Program is duly accredited by the PEC. Similarly, the curricula of our BS, MS and PhD programs are very well designed according to the recommendations and guidelines of HEC and PEC. Students are involved in research projects in collaboration with various industries including Heavy Industries Taxila (HIT). The patronage of experienced supervisors ensures that students learn to execute their projects with a sense of responsibility.

The undergraduate program equips students with a solid foundation in basic scientific and mathematical knowledge, whereas the graduate program offers advanced knowledge in various specializations. The Department is actively involved in research in fields like thermo fluids, structures and materials, production and manufacturing and renewable energy resources. The Department of Mechanical Engineering was the first to follow and be part of the Washington Accord, being an emerging and standardized concept in teaching and learning.

Education is more than just the human interaction with books and machines. We believe that it is the discovery of the self and soul and the seeking of truth as our motto says, "In Truth I Triumph". The Department lays an equitable emphasis upon all those pursuits, in which students find opportunities of discovering themselves and polishing their latent skills and abilities. It results in cultivating positive attitudes, values and soft skills, which prepares them for competitive industrial environment as responsible and positive citizens.

Faculty of Mechanical Engineering

Faculty

Dr. S. Kamran Afaq (HEC Registered Supervisor)

Designation:	Professor and Chairman
Qualification:	PhD University of Toulouse III, France
Areas of Interest:	Composite Material Structures (Design & Testing), Heat Transfer, Finite Element Analysis
Contact:	kamran.afaq@hitecuni.edu.pk

Dr. Abdul Munem Khan (HEC Approved Supervisor)

Designation:	Associate Professor (H)
Qualification:	PhD Aerospace Engineering, Iowa State University, USA
Areas of Interest:	Solid Mechanics, Finite Element Analysis, Mechanical Vibrations, Aerospace Structures
Contact:	abdul.munem@hitecuni.edu.pk

Dr. Rizwan Saeed Choudhry (HEC Approved Supervisor)

Designation:	Associate Professor (H)
Qualification:	PhD Mechanical Engineering, University of Manchester, UK
Area of Interest:	Design, Testing and Characterization of Composite Materials and Structures
Contact:	rizwan.choudhry@hitecuni.edu.pk

Dr. Fahad Sarfraz Butt (HEC Registered Supervisor)

Designation:	Assistant Professor
Qualification:	PhD University of Manchester, UK
Areas of Interest:	Computational Fluid Dynamics, Bluff-Body Flows, Boundary Layer and Shock Wave Interaction, Supersonic Flows
Contact:	fahad.butt@hitecuni.edu.pk

Dr. Muhammad Farhan Ausaf (HEC Registered Supervisor)

Designation:	Assistant Professor
Qualification:	PhD Huazhong University of Science &Technology, China.
Areas of interest:	Optimization, Process Planning & Scheduling and Advance Heuristic Algorithms
Contact:	farhan.ausaf@hitecuni.edu.pk

Dr. Abdul Waheed Badar (HEC Approved Supervisor)

Designation:	Assistant Professor
Qualification:	PhD Technical University of Berlin, Germany
Areas of Interest:	Solar Thermal Systems, Heat Transfer, Refrigeration Systems
Contact	abdul.waheed@hitecuni.edu.pk

Dr. Atta Ur Rehman Shah

Designation:	Assistant Professor
Qualification:	PhD Mechanical Engineering, Changwon National University, Korea
Areas of interest:	Composite Materials, Natural Fiber Composites, Polymer Composites, Mechanics of Materials
Contact:	atta.shah@hitecuni.edu.pk

Syed Maaz Hasan

Designation:	Assistant Professor
Qualification:	MS Mechanical Engineering, NUST, Islamabad PhD In Progress
Areas of interest:	Design, Modeling and Simulation, Manufacturing
Contact:	syed.maaz@hitecuni.edu.pk

Mr. Saad Arif

Designation:	Assistant Professor
Qualification:	MS Mechatronics Engineering, NUST, Islamabad PhD In Progress
Areas of interest:	Robotics, Embedded Control Systems, Intelligent Automotive Systems
Contact:	saad.arif@hitecuni.edu.pk

Mr. Tanveer Ahmed

Designation:	Assistant Professor
Qualification:	MS Manufacturing Engineering, NUST, Islamabad PhD In Progress
Areas of Interest:	Manufacturing Management, Renewable Energy Systems
Contact:	tanveer.ahmed@hitecuni.edu.pk

Mr. Naeem Jan Amin

Designation:	Assistant Professor
Qualification:	MSc Military Vehicle Technology, RMCS Shrivenham, Cranfield University, UK
Areas of interest:	Internal Combustion Engines, Renewable Energy Resources
Contact:	naeem.jan@hitecuni.edu.pk

Ms. Huma Fawad

Designation:	Assistant Professor
Qualification:	MS, UET, Taxila, MBA, PIMSAT, Karachi, BS Mechanical Engineering, UET, Lahore
Areas of Interest:	Engineering Management, Engineering Entrepreneurship, Marketing, Sales, Engineering Economics, Project Management, Community Services through Social Entrepreneurial Platforms
Contact:	huma.fawad@hitecuni.edu.pk, dsa@hitecuni.edu.pk

Syed Adeel Akhtar Shah

Designation:	Assistant Professor
Qualification:	MA. English Literature, University of Peshawar, MBA (Marketing), Preston University, Islamabad, LL.B, University of Peshawar
Areas of Interest:	Creative Writing, Report Writing, Communication Skills
Contact:	adeel.akhtar@hitecuni.edu.pk

Mr. Athar Hameed

Designation:	Lecturer
Qualification:	MSc Mechanical Engineering, UET, Taxila PhD In Progress
Areas of interest:	Applied Mechanics and Design Engineering, Theory of Machines & Mechanisms, Design of Machine Elements, Materials Engineering
Contact:	athar.hameed@hitecuni.edu.pk

Mr. Luqman Ahmad Nizam

Designation:	Lecturer
Qualification:	MSc Mechanical Engineering, UET, Taxila PhD In Progress
Areas of interest:	Vibrations, Structural Design of Heat Exchanges, Condition Monitoring
Contact:	luqman.ahmad@hitecuni.edu.pk

Mr. Zarak Khan

Designation: Lecturer
Qualification: MS Design & Manufacturing Engineering, NUST, Islamabad
                      PhD In Progress
Areas of Interest: Additive Manufacturing, CAD/CAM, Smart Materials
Contact: zarak.khan@hitecuni.edu.pk

Mr. Muhammad Talha Jamal Solaija

Designation: Lecturer
Qualification: MS Mechatronics Engineering, NUST, Islamabad
Areas of Interest: Instrumentation, Intelligent systems
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Mr. Anees Ur Rehman

Designation: Lecturer
Qualification: MS Mechatronics Engineering, NUST, Islamabad
Areas of Interest: Robotics, Motion Planning, Computer Vision, Programming, Biomedical Instrumentation
Contact: anees.ur.rehman@hitecuni.edu.pk

Mr. Moeen Mahboob

Designation: Lecturer
Qualification: MS Mechatronics Engineering, NUST, Islamabad
Areas of Interest: Robotics, Instrumentation, Computer Vision and Controls
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Ms. Hadia Khan

Designation: Lecturer
Qualification: MS English Literature
                      PhD In Progress
Areas of Interest: Language & Literature
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Mr. Imran Sajid Shahid

Designation:	Junior Lecturer
Qualification:	MS Mechanical Engineering, HITEC University, Taxila
	PhD In Progress
Areas of Interest:	Composite Materials, Reverse Engineering & Aerospace Structures, Tribology
Contact:	imran.saijd@hitecuni.edu.pk

Ms. Munazza

Designation:	Junior Lecturer
Qualification:	BSc Mechanical Engineering, UET, Taxila
	MS In Progress
Areas of Interest:	Energy Engineering, Heat and Mass Transfer, Fluid Mechanics
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Mr. Anique Mukhtar

Designation:	Junior Lecturer
Qualification:	BS Mechanical Engineering, HITEC University, Taxila
	MS In Progress
Areas of interest:	Heat Transfer, Fracture Mechanics
Contact:	anique.mukhtar@hitecuni.edu.pk

Mr. Yasir Hamid

Designation:	Junior Lecturer
Qualification:	BSc Mechanical Engineering, HITEC University, Taxila
	MS In Progress
Areas of interest:	CFD, Finite Element Analysis, IC Engine, Non Newtonian Fluid Mechanics
Contact:	yasir.hamid@hitecuni.edu.pk

Mr. Hafiz Abdullah Zafar

Designation:	Junior Lecturer
Qualification:	BSc Mechanical Engineering, UET, Peshawar
	MS In Progress
Areas of interest:	Solar Thermal Systems, Heat Transfer, Thermodynamics, I.C. Engines, CFD
Contact:	abdullah.zafar@hitecuni.edu.pk

Mr. Salman Khalid

Designation:	Junior Lecturer
Qualification:	BSc Mechanical Engineering, NUST, Islamabad
	MS In Progress
Areas of interest:	Fiber Reinforced Composite Materials, Finite Element Modeling & Simulation, Fluid Mechanics.
Contact:	salman.khalid@hitecuni.edu.pk

Ms. Atiya Sadiq

Designation:	Junior Lecturer
Qualification:	BSc Mechanical Engineering, UET, Taxila
	MS In Progress
Areas of interest:	Thermodynamics, Heat and Mass Transfer
Contact:	attiya.sadiq@hitecuni.edu.pk

Mr. Rasikh Tariq

Designation:	Lab Engineer
Qualification:	BS Mechanical Engineering, Mohammad Ali Jinnah University, Islamabad
Areas of interest:	Heat Transfer, Thermodynamics, Turbo Machinery, CFD.
Contact:	rasikh.tariq@hitecuni.edu.

Mr. Danish Ali Khan Tanoli

Designation:	Academic Coordinator
Qualification:	MS (Management Science), COMSATS, Wah Cantt
Contact:	coordinatormed@hitecuni.edu.pk

BS Mechanical Engineering

"Education is not the filling of a pail, but the lighting of a fire"

William Butler Yeats

BS Mechanical Engineering is an undergraduate academic degree conferred upon successful completion of four year of studies at HITEC University. The curriculum is in line with the guidelines and requirements set by PEC as well as HEC.

The four year studies are split into eight semesters. It is a broad-based scheme and the curriculum, which culminates with a final year project, gives students a background that is essential to an engineering career. Mechanical engineering students take courses in statics, dynamics, theory of machines, vibrations, mechanics of materials, manufacturing processes, control systems, fluid mechanics, thermodynamics, IC engines, heat transfer and many more.

Students are taught the latest in Mechanical Engineering that is well supported by six courses in Mathematics, two courses in Electrical and Electronics Engineering and one in Computer Engineering. All engineering subjects are fully complemented by requisite lab work to train the students on modern equipment and machinery. In Mechanical Engineering Department, the focus is on 'learn by doing'. Our labs are at the core of this philosophy where students receive hands-on training in various fields along with application of software such as CAD/CAM/CAE/CNC ANSYS, MATLAB and computational fluid dynamics.

In pursuance of its policy to keep the students abreast of the latest technological developments, the Department continuously upgrades its labs by adding new equipment and instruments. In many respects, we excel and stand higher than many mechanical engineering departments of other engineering institutes in the country.

Curriculum

Semester-1

Code	Course Title	Cr. Hr.
MT 101	Calculus & Analytic Geometry	3 + 0
BS 103	Applied Engineering Physics	2 + 0
BS 102	Engineering Chemistry	2 + 0
HS 101	English	3 + 0
EC 110	Computing Fundamentals	2 + 1
ME 101	Workshop Technology	1 + 2
HS 102	Pakistan Studies	2 + 0
	Total Credit Hours	18

Semester-2

Code	Course Title	Cr. Hr.
MT 103	Differential Equations	3 + 0
IS 211	Islamic Studies	2 + 0
HS 103	Communication Skills	3 + 0
EE 220	Fundamental of Electrical Engineering	3 + 1
ME 104	Engineering Drawing & Graphics	1 + 2
ME 105	Engineering Statics	3 + 0
	Total Credit Hours	18

Semester-3

Code	Course Title	Cr. Hr.
MT 201	Complex Variables & Transforms	3 + 0
ME 102	Thermodynamics-I	3 + 0
ME 103	Fluid Mechanics-I	3 + 0
ME 201	Engineering Dynamics	3 + 0
ME 202	Material Science & Engineering	2 + 0
ME 205	Mechanics of Material-I	3 + 0
ME201L	Engineering Mechanics Lab	0 + 1
ME205L	Mechanics of Material Lab	0 + 1
	Total Credit Hours	19

Semester-4

Code	Course Title	Cr. Hr.
MT 202	Numerical Methods	3 + 0
EE 320	Analog and Digital Systems	3 + 1
ME 203	Fluid Mechanics-II	3 + 0
ME 204	Thermodynamics-II	3 + 0
ME 301	Mechanics of Material-II	3 + 0
ME 204L	Thermodynamics Lab	0 + 1
ME 203L	Fluid Mechanics Lab	0 + 1
	Total Credit Hours	18

Semester-5

Code	Course Title	Cr. Hr.
MT 303	Applied Linear Algebra	2 + 0
ME 206	Heat & Mass Transfer	3 + 0
ME 302	Theory of Machines	3 + 0
ME 303	Manufacturing Process	2 + 0
ME 304	Design of Machine Elements-I	3 + 0
ME 307	Mechanical Vibrations	3 + 0
ME 307L	Theory of Machines/Vibrations Lab	0 + 1
ME308L	Design of Machine Elements Lab	0 + 1
	Total Credit Hours	18

Semester-6

Code	Course Title	Cr. Hr.
MT 302	Probability & Statistics	3 + 0
ME 305	Refrigeration & Air Conditioning	3 + 0
ME 308	Design of Machine Elements -II	3 + 0
HS 401	Professional Values and Ethics	2 + 0
ME 403	Control Systems	3 + 0
ME 405	Instrumentation & Measurement	2 + 0
ME 305L	Heat Transfer & Refrigeration Lab	0 + 1
ME 403L	Instrumentation & Control Systems Lab	0 + 1
	Total Credit Hours	18

Semester-7

Code	Course Title	Cr. Hr.
HS 402	Economics	2 + 0
HS 201	Technical Report Writing	3 + 0
ME 306	I.C Engines	3 + 0
ME 401	Design Project-I	0 + 2
ME 404	CAD/CAM	2 + 0
ME306L	I.C Engines Lab	0 + 1
ME405L	CAD/CAM (Lab)	0 + 1
	Total Credit Hours	14

Semester-8

Code	Course Title	Cr. Hr.
HS 403	Management & Entrepreneurship	3 + 0
ME 401	Design Project-II	0 + 4
ME 4XX	Elective-I	3 + 0
ME 4XX	Elective-II	3 + 0
	Total Credit Hours	13

List of Elective Courses

Code	Course Title	Cr. Hr.
ME 402	Power Plant	3 + 0
ME 410	Gas Dynamics	3 + 0
ME 411	Computational Fluid Dynamics	3 + 0
ME 412	Industrial Engineering	3 + 0
ME 413	Finite Element Analysis	3 + 0
ME 415	Optimization	3 + 0
ME 416	Renewable Energy Resources	3 + 0
ME 418	Tribology	3 + 0
ME 421	Advanced Manufacturing Techniques	3 + 0
ME 422	Advanced Stress Analysis	3 + 0
ME 423	Experimental Stress Analysis	3 + 0
ME 425	Engineering Entrepreneurship	3 + 0
ME 426	Mathematical Modeling and Simulation	3 + 0
ME 427	Robotics	3 + 0

Course Contents

BS-103 Applied Engineering Physics

Introduction to units and their inter-conversion, dimensionless quantities, vectors, centroids/areas/volumes, moments of inertia, simple harmonic motion, waves and oscillations, electricity and magnetism, waves and acoustics, introduction to industrial electronics, use of polarized light in instruments, magnetism and electromagnetism, nuclear fission, solid state physics, crystals and non-crystals.

BS-102 Engineering Chemistry

Thermochemistry, Electrochemistry, Laws of electrolysis, Organic chemistry, Production and uses of hydrocarbons, Production and uses of minerals, Extraction of metals and their properties, Corrosion, Cement industry, Production of cement and its testing, Production and uses of rubber, Polymers and elastomers, Coolants and their uses, Production of rocket fuel/propellant and types of propellants, Type of alloys and their uses, Pollution and environmental chemistry.

EC-110 Computing Fundamentals
For contents refer to page number 113

ME-101 Workshop Technology

Introduction to various mechanical workshops and their safety instructions, introduction to various measurement tools, Soldering, brazing and welding, Welding types, welding methods and processes, introduction to machine tools, basic lathe operations, basic processes in metal shop, forging tools and accessories, drilling machines and their types, milling machines and their types, milling processes, indexing, shaper machines and their processes.

ME-102 Thermodynamics-I

Introduction and basic concepts, Zeroth law of thermodynamics, Energy, Energy transfer, First law of thermodynamics, Properties of a pure substances, Evaluating properties and property diagrams, Energy Analysis of closed systems, Energy analysis of control volumes, The Second Law of Thermodynamics, Entropy, Introduction to thermodynamic gas power cycles.

ME-103 Fluid Mechanics-I

Introduction, fluid statics, elementary fluid dynamics, the Bernoulli equation, fluid kinematics, differential analysis of fluid flow, similitude, dimensional analysis and modeling, viscous flow in pipes.

ME-104 Engineering Drawing and Graphics

Introduction, dimensioning, sheet planning, use of drawing instruments, orthographic projection, engineering geometry, fits and tolerances, geometrical dimensioning and tolerances, practice of using different drawing tools e.g. pencil, scriber, T-square etc., attachment of drawing sheet on board and division of sheet. drawing of a cycloid, epicycloids, hypocycloid and involutes to a given circle, drawing the views of 3-D models using the concepts of 1st and 3rd angle projections, introduction to auto-CAD, basic commands and functions, drawing view in 1st and 3rd angle projections, introduction to 3-D modeling

ME-105 Engineering Statics

Introduction to statics, force systems, equilibrium, structures, distributed forces, friction, difference between kinematics and kinetics, trusses.

ME-201 Engineering Dynamics

Difference between Kinetics and Kinematics problem, Identification of direct approach for solution of dynamics problem, Solution of both linear and rotational Kinematics problem, Solution of Kinematics problem by combining Newton's law and Kinematics equation, Solution of Kinetics problem using the principle of work and energy, Solution of Kinetics problem using the principle of impulse and momentum, Identification and solution of Kinetics problem for which energy or momentum is conserved.

ME-202 Material Science and Engineering

Introduction, the structure of crystalline solids, imperfections in solids, diffusion, mechanical properties of metals, dislocations mechanisms, failure, phase diagrams, development of microstructure and alteration of mechanical properties, applications and processing of metal alloys, ceramics, polymer structures, composites, corrosion and degradation of materials, electrical properties, thermal properties, magnetic properties, optical properties, materials selection and design considerations, smart materials and structures.

ME-203 Fluid Mechanics-II

Boundary layer flow, boundary layer equation, separation and wake, lift and drag of immersed bodies, airfoil theory, numerical analysis, flow through open channels, uniform flow, specific energy, hydraulic jump, compressible flow, adiabatic isentropic steady flow, converging and diverging flow, hydraulics.

ME-204 Thermodynamics-II

Gas Turbine Cycle, The Brayton Cycle with Intercooling, Reheating and regeneration, The Rankine Cycle, Energy analysis of the Ideal and actual Rankine, Combined gas-vapor power cycles, Nozzles

and Diffusers, Critical pressure ratio, Maximum mass flow condition, Nozzles pressure ratio design, Nozzle efficiency, Supersaturation, The impulse steam turbine, Pressure and velocity compounded impulse steam turbines, Axial-flow reaction turbines, Losses in turbines, stage efficiency and reheat factor, Reciprocating compressors, Multistage compression, Rotary compressors.

ME-205 Mechanics of Materials-I

Concept of stresses, axial loading, normal stresses, shearing stresses, stress strain diagram, Poisson's ratio, thermal stresses, elasto-plastic behavior, torsion and bending moments, stresses in torsion and bending, angle of twist in the elastic range, beam under pure bending, residual stresses, analysis and design of beams for bending, shear force and bending moment diagrams, Mohr's circle for two-dimensional loading, deflection of beams.

ME-206 Heat and Mass Transfer

Concept of heat flow, conduction, convection and radiation heat transfer, free and forced convection, heat transfer from extended surfaces, mass transfer, Fick's law, analogy between heat and mass transfer, the overall heat transfer co-efficient, log mean temperature difference, heat exchanger types, the effective NTU relations.

ME-211 Computer Aided Engineering Drawing

Pre-Requisite: Nil

Drawing basics, various views of a three dimensional object and their importance, AUTOCAD basics starting to draw, drawing in two dimensions and sketching, working with data, drawing in three dimensions, basics of 3D-drawing, drawing isometric view and section, plan and elevation views of various electrical and electronic devices in AUTOCAD, solid projection modeling, projects.

EE-220 Fundamentals of Electrical Engineering

Pre-Requisite: Nil

For contents please refer to page number 28

ME-301 Mechanics of Materials-II

Equation of elastic curve for beams, statically indeterminate beams, singularity function to determine the slope and deflection of beam, method of superposition, moment-area theorems, impact loading, stresses in thin-walled pressure vessels, transformations of stresses and strains, Mohr's circle for two and three dimensional stresses, general state of stress, theories of failure, fatigue failures, measurements of strain, strain rosette.

ME-302 Theory of Machines

Linkages synthesis and analysis, position, velocity and acceleration analysis, turning moment diagram, flywheels, valve diagrams, static and dynamic balancing, worm and worm gear analysis, cam designing, belts and rope drives, chains and sprockets, brakes, governors, effort and power, sensitivity, gyroscope, geometry of gears.

ME-303 Manufacturing Processes

Introduction to manufacturing technology, plastic deformation, metal forming processes: forging, rolling, extrusion, drawing, sheet metal forming, casting manufacturing of ceramics, glass and plastics, complex manufacturing processes and core technologies, advanced manufacturing process design, raw materials and energy requirements of manufacturing processes.

ME-304 Design of Machine Elements-I

Basic criteria of the performance and design of machine parts, determination of permissible and actual stresses, design of simple element, design of keys and couplings, design of welded, riveted, and bolted joints, design of helical springs and leaf springs, design of shafts, design standard (ISO, ASME, ANSI, ASTM etc), metal fit and tolerances

ME-305 Refrigeration and Air-Conditioning

Introduction to basic principles of refrigeration and air conditioning systems, Reverse Carnot Cycle, Co-efficient of Performance, working principle and basic components of vapor compression cycle classification of refrigerants, their properties and the negative effects of banned refrigerants on humans and the environment, Function and operation of the basic components of vapor absorption as well as adsorption systems, Psychrometric analysis of various air conditioning systems, application of CIBS/CLTD Method for calculation of cooling and heating loads as applied to air conditioning systems and estimating cooling requirement for a given space.

ME-306 Internal Combustion Engines

Introduction to various types, and designs of Internal Combustion Engines, their basic working principles, classification and configurations and relative

advantages/disadvantages of petrol/diesel and four stroke/two stroke engines, Engine design and operating parameters and efficiencies, mean effective pressure, various types of fuel injection systems including single point and multipoint gasoline injection systems for SI engines, supercharging technologies and comparison of turbochargers and mechanical compressors, Thermo-chemistry of fuel and air mixtures involving stoichiometric ratios, employment of dynamometers to calculate various kinds of engine performance given basic parameters, evaluation of different engines' performance and fuel economy and cognizance of the need to reduce pollution.

ME-307 Mechanical Vibrations

Oscillatory motion, equation of motion, viscously damped free vibration, logarithmic decrement, forced harmonic vibration, two degree of freedom system,

normal modes of vibration, vibration absorber, vibration damper, vibration of elastic bodies, critical speed of rotating shafts with single rotor and two rotors, Vibration measurement, Holzer method, Electrical and Mechanical analogies.

ME-308 Design of Machine Elements- II

Design of spur, helical, bevel and worm gears, design of fly wheel, design of brake/clutches, design of power screws/translation screws, design of belt and chain drive, selection of bearings.

EE-320 Analog and Digital Systems

For contents please refer to page number 29

ME-210 Engineering Mechanics

Pre-Requisite: Engineering Physics

Fundamental concepts and principles of mechanics, force factors, resultants, equilibrium of rigid body, kinetics and kinematics of particles, relative motion, curvilinear motion, basic thermodynamics laws and cycles, processes and PV-diagrams, heat transfer modes and heat transfer through walls and circular pipes.

ME-403 Control Systems

Feedback concepts and its terminology, modeling of systems having translatory movements, modeling of rotary systems, modeling of thermal systems, review of Laplace transformation, derivation of transfer function, computing the output of a system for a given input, block diagram, signal flow graph, stability and its types, response of the first order systems, response of the second order systems, type of the second order systems, performance specifications of a typical second order systems, root locus techniques, introduction to AVR microcontroller and its components, AVR timer/

counter programming and PWM generation, ADC, DAC, sensors, relays, BJTs, MOSFETs, interfacing with AVR, DC servomotor interfacing and control with AVR

ME-404 CAD/CAM

computer in industrial manufacturing geometric modeling system, rapid prototyping, concurrent engineering, numerical control systems, automation, computer aided quality control, cellular manufacturing system, flexible manufacturing system, group technology and CAPP, implementation of a CAD/CAM system, computer integrated manufacturing.

ME-405 Instrumentation and Measurements

Introduction, sensor/transducer technologies and characteristics, temperature measurement system, flow and level measurement systems, displacement, velocity, and acceleration measurement both linear and rotational, optical encoders and optical tachometer,

signal conditioning and data acquisition. Introduction to biomedical instrumentation.

HS-201 Technical Report Writing
For contents please refer to page number 29

HS-103 Communication Skills
For contents please refer to page number 30

HS-101 English
For contents please refer to page number 30

HS-403 Management & Entrepreneurship
For contents please refer to page number 31

HS-401 Professional Values & Ethics
For contents please refer to page number 31

HS-402 Economics
For contents please refer to page number 31

Elective Courses

ME-402 Power Plants

Steam power plants, steam generators, engines and auxiliary components, losses in pipes, turbine, pump and condenser, gas turbine power plant, the practical gas turbine cycle, jet propulsion plant, aircraft jet engine, subsonic and supersonic propulsion, propellants and combustion, thrust chamber, nuclear power plant, nuclear reactions as energy sources, moderators and reflectors, nuclear hazards and safety practice.

ME-410 Gas Dynamics

Introduction, basic governing laws of conservation of mass, momentum and energy, sub-sonic and supersonic gas flow, isentropic flow, normal and oblique shocks, Rayleigh flow and Fanno flow, Prandtl-Meyer compression and expansion.

ME-411 Computational Fluid Dynamics

Introduction, partial differential equation, basics of finite difference methods, concepts of error, consistency and stability, momentum and energy equations, diffusion equations, turbulence modeling, boundary layer computational methods, hyperbolic equations, grid systems.

ME-412 Industrial Engineering

Production management and decision making, analytical and quantitative methods of management, planning organization and control of production systems, plant layout, work and method study.

ME-413 Finite Element Analysis

The stiffness method and the plane truss, integral formulations and variational methods, weak boundary value problem, Rayleigh–Ritz method, error analysis, Eigen value problem, two and three dimensional problems, plane elasticity, bending of plates, beams, use of commercial FEA codes, applications of FEA in the relevant fields of study.

ME-415 Optimization

Introduction to optimization with reference to engineering design, operation research and management problems, Kuh-Tucker conditions, linear programming applications for design, sensitivity analysis with application to engineering design, nonlinear design optimum problems and their solutions with numerical techniques, case studies with application of optimum techniques to machine components.

ME-416 Renewable Energy Resources

Introduction to renewable energy resources, energy mix of world, energy and environment, solar energy, solar thermal, solar PV, wind energy, wind turbine design specifications, geothermal energy, biomass energy , Kyoto protocol.

ME-418 Tribology

Tribology history and applications, theory of friction, contact mechanism, study of surfaces, roughness measurements, mechanism of wear and types of wear, lubricants and its properties, study of seals, its design and wear phenomenon, temperature distribution study on contacting surfaces, study of bearing and its types, tribology study in polymers and composites.

ME-421 Advanced Manufacturing Techniques

Principles of manufacturing, resources planning, operations management, forecasting techniques, production planning and scheduling procedures,

analysis of manufacturing resources, material inventory activities, facilities and physical plant layout, production process and equipment, manufacturing automation, productivity, quality, team projects using computer modeling software.

ME-422 Advanced Stress Analysis

Elasticity field equations, methods of solution, 2D problems, plane stress and plane strain, axi-symmetric problems, thick-walled cylinders, rotating, discs, stress concentration around circular inclusions, 2D problems in rectangular, coordinates, corrective solutions, end effect, self-similar problems, singularities, elastic indentation, introduction to plasticity: stress-strain, idealization, yield function, hardening rules, total and incremental models, residual stresses, Bauschinger effect, Autofrettage cyclic plasticity, normality rule, back, stress, movement of yield surface, numerical implementation of cyclic, plasticity.

ME-423 Experimental Stress Analysis

Stress optical law-polarized light, effect of stressed model in a plane polariscope, effect of stressed model in circular polariscope, isochromatic fringe patterns, isoclinic fringe patterns, materials for three-dimensional photo elasticity, resistance strain gauges, parameters influencing behavior of strain gauge, introduction to

polariscope and basic experiments on polariscope.

ME- 426 Mathematical Modeling and Simulation

Modeling multi-domain engineering systems for design and control system implementation. Network representation, state-space models, multiport energy storage and dissipation, Legendre transforms, non-linear mechanics, transformation theory, Lagrangian and Hamiltonian forms, control- relevant properties. Application examples like electro- mechanical transducers, mechanisms, electronics, fluid and thermal systems, compressible flow, chemical processes, diffusion, and wave transmission.

ME-427 Robotics

Coordinate frames, homogeneous transformations, introduction to forward kinematics, inverse kinematics, dynamics, velocities, static forces, and Jacobeans, trajectory planning, mechanical design of robots.

Laboratory Courses

Undergraduate Laboratories

Mechanical Engineering program at HITEC University is very well supported by laboratory work. Experimental work related to different subjects is carried out in our relevent teaching labs.

ME 101 Workshop Technology

Introduction to measuring tools like vernier caliper, micrometer screw gauge etc., machining of cylindrical job as per given drawing contains facing, turning, center drilling, taper turning, grooving, chamfering, outer and inner threading, boring, shaping of jobs as per given drawings which include, square, rectangular, hexagonal, key way shapes, introduction to electric arc welding, gas welding and gas cutting process, different types of flame, shaper machine, milling machine, drilling machine, power hacksaw.

ME-201L Engineering Mechanics

Vectors and equilibrium of forces, spring compression apparatus, spring extension, moments, reactions of beams, frame structure, center of gravity, statics and dynamics coefficient of friction, measurement of centrifugal force, governor, gear, rolling disc on inclined plane apparatus, moment of inertia apparatus.

ME-205L Mechanics of Materials

Hardness measurement, determination of fatigue life and endurance limit, modulus of rigidity and maximum shear strength, load of spring under certain deformation, modulus of elasticity, elastic limit, yield point, tensile strength of different materials, flexural strength, buckling; strain measurement under tensile, torsion and bending load.

ME-203L Fluid Mechanics

Viscosity of liquids, gauge calibration, hydrostatic

pressure, metacentric height, Bernoulli's theorem, impact of jet, flow through orifice, free and forced vortex, flow visualization, Osborne Reynolds's number, pipe friction apparatus, head loss in fluid friction, pelton turbine, characteristics of pump in series and parallel configuration, losses in bends.

ME-204L Thermodynamics

Change in boiling point of a fluid at different pressures, study of boiling by increasing the flow rate of heated water, study of Diesel and Otto cycle during the two and four strokes, study of all components of turbo jet engine, study of Wankel engine, study the working and thermodynamics of steam engine and the thermodynamics of Rankine cycle and derivation of its efficiency as applicable to steam power plant.

ME-305L Heat Transfer and Refrigeration

Thermal conductivity of different materials, linear and radial, interface temperature and thermal resistance concept, coefficient of heat transfer and efficiency in free and forced convection for flat plate, fins and pipe bundle, NUSSELT number, Reynolds number, log mean temperature difference (LMTD), study and the flow rate effects on heat transfer for shell and tube, spiral, concentric and plate heat exchanger, Stefan Boltzmann law of thermal radiation for black, grey and polished surfaces, demonstrate the working of refrigeration and air-conditioning unit, thermal conductivity of air and water.

ME-306L I.C Engine

Measurement of torque and speed, calculation of brake mean effective pressure, measurement of air and fuel consumption, drawing engine performance curves, calculation of volumetric and thermal efficiencies, plotting of PV diagram, calculation of indicated mean effective pressure and indicated power, cut away model of four-stroke diesel and two-stroke petrol engine, cut-away models of fuel injection pump gear box and air/ fuel filter.

ME-307L Theories of Machines and Vibrations:

Application of Grashof condition on a slider-crank mechanism and study the variation in velocity and acceleration, slotted link slider-crank mechanism, static and dynamic balancing, gyroscopic effect at first, second and third moments, working of gears, belt assembly, car differential and fly wheel. Natural frequency of the

system (with and without damper), torsional stiffness and the natural frequency of the given bar. Compare theoretical natural frequency with values obtained by measurement. Forced oscillations and the phenomena of resonance.

ME-308L Design of Machine Elements

Basics of programming in MATLAB, programming flow control in MATLAB, graphics in MATLAB, machine design examples in MATLAB. Introduction to ANSYS, basics of finite elements analysis, two dimensional trusses, plane stress brackets, solid modeling, effect of self-weight, cantilever beam with concentrated and distributed load, thermal analysis in ANSYS with different boundary conditions, design optimization using ANSYS, composite modeling, fluent (laminar and turbulent flow in pipe), mechanics and optimization.

ME 403L Instrumentation and Control

Introduction to sensors and transducers, study of sensor behavior, properties and characteristics of strain gauges, linear and rotary potentiometers, LVDT, a variable-area capacitor, optical encoders, opto-reflector, tacho-generators, reed switch, variable reluctance probe, thermocouples, RTDS and thermistors, pressure control sensors and transducers. Characterization of PID and PID controllers in flow, level, pressure and temperature control processes.

ME-404L CAD/CAM

Introduction to Pro E, extrusion, hole , round and chamfer fillet, shell, revolve, ribs , pattern, sweep, blend and engineering design, swept and blended features, helical sweep features, drawing layout, advanced mechanism, detailing, final assembly. Introduction to machining and CNC technology, coordinate systems and basic programming codes used in CNC milling/ lathe machines, introduction to rapid traverse, linear and circular interpolation, introduction to work coordinate offset, tool length and cutter radius compensation, write and execute the programming on CNC milling machine of given figures.

Lab Upgrades

The Labs of Mechanical Engineering Department undergo continuous up gradation. Some of the prominent equipment, machines and instruments that have recently been introduced into the existing labs are listed in the following:

1. Cross Flow Heat Exchanger (Heat Transfer / Refrigeration & AC Lab)

2. Cluster Computer System (Computational Fluid Dynamics Lab)
   - 48 Processors, 256 GB RAM, large number of TB Storage
   - 24-hour availability for large scale simulations
   - Simulation time of weeks or days reduced to hours or minutes

3. Low Subsonic Wind Tunnel (Fluid Mechanics Lab)
   - Flow velocity up to 30 m/s generation capability
   - Test section of 30 cm by 30 cm
   - External flow investigation capability at low Reynolds numbers
   - 2 component force balance
   - Pitot static tube
   - Data acquisition system for digital output

MS Mechanical Engineering

"Education is not preparation for life; education is life itself"

John Dewey

Today, more than ever before, the knowledge and skills of talented persons with advanced degrees in Mechanical Engineering are vitally needed to face technical challenges of 21st century. To achieve this goal, the Department offers MS in Mechanical Engineering.

The MS degree is awarded on completion of 30 credits of graduate courses including 6 credit hours of research thesis which is considered to be the centerpiece of a student's graduate experience.

Typically, the MS students take courses of their choice from the list of courses offered in any semester. Although research project is assigned to a student on successful completion of coursework, yet the students are encouraged to take courses in the fields which they anticipate or are interested in for their MS research project.

Research topics for MS students typically, but not essentially, pertain to Composite Materials, Advanced Mechanics of Materials, Thermo-Fluids, Computational Fluid Dynamics, Manufacturing Systems, Robotics and Renewable Energy.

Students with BS degrees in Mechanical Engineering, Mechatronics Engineering or Aerospace Engineering can be admitted into the MS program.

Ph.D. Mechanical Engineering

"Develop a passion for learning. If you do, you will never cease to grow"

Anthony J. D' Angelo

The Doctor of Philosophy (PhD) in Mechanical Engineering is the highest degree awarded by the Mechanical Engineering Department and is recommended for students who are interested in leadership careers in academia or research and development pursuits in public or private sector organizations.

The doctoral candidate is expected to attain a level of expertise in some area of Mechanical Engineering, and must therefore choose a field and study the most advanced courses offered in that field.

PhD program is designed to give students the depth in mathematics and engineering sciences, developing analytical skills, together with intensive study and

research experience in a specialized area of Mechanical Engineering.

The degree is awarded in recognition of high level of scholarship, the ability to carry out independent research, and the publication of such research in national and international journals of repute. The program comprises minimum 18 credit hours of graduate level coursework and 30 credit hours of research thesis.

The program necessitates two years of residency in HITEC University. The students eligible for admittance in PhD program should possess MS/ M.Phil. Degree with a minimum CGPA 3 out of 4 and should have passed GAT subject examination as per requirement of HEC, in vogue.

The specific course requirements for a doctoral student are set in consultation with his/her (GEC) Graduate Evaluation Committee to support the student's area of research. The completion of coursework is followed by a comprehensive examination for granting candidacy as a PhD researcher. A positive evaluation of the research by one local and two foreign experts, as per requirements of the HEC, leads to an open defense of the thesis. Publication of at least one research paper in an impact-factor carrying journal of repute is also an essential requirement for the award of the PhD.

MS/Ph.D. Courses

Code	Course Title	Cr. Hr.
ME-811	Finite Element Analysis	3 + 0
ME-812	Advanced Material Science and Engineering	3 + 0
ME-813	Advanced Solid Mechanics	3 + 0
ME 815	Advanced Theory of Elasticity	3 + 0
ME-816	Advanced Thermodynamics	3 + 0
ME-818	Advanced Fluid Mechanics	3 + 0
ME 819	Computational Fluid Dynamics	3 + 0
ME 820	Experimental Stress Analysis	3 + 0
ME-823	Manufacturing System	3 + 0
ME 824	Advanced Robotics	3 + 0
ME-829	Engineering Design and Optimization	3 + 0
ME-830	Mechanics of Composite Materials	3 + 0
ME-831	Fracture Mechanics	3 + 0
ME 832	Advanced Dynamics	3 + 0
ME-835	Theory of Plates and Shell	3 + 0
ME-837	Radiation Heat Transfer	3 + 0
ME-838	Advanced Heat Transfer	3 + 0
ME-839	Theory of Turbo Machinery	3 + 0
ME-840	Gas Dynamics	3 + 0
ME-841	Advanced Mechanical Behavior of Materials	3 + 0
ME-842	Finite Element Analysis of Composite Materials	3 + 0
ME-843	Advanced Refrigeration	3 + 0
ME 860	Solar Thermal Systems	3 + 0
ME 861	Boundary layer Flows	3 + 0
ME 862	Introduction to Turbulent Flows	3 + 0

Code	Course Title	Cr. Hr.
ME 863	Mechanics of Manufacturing Processes	3 + 0
ME 865	Advanced Control Systems	3 + 0
ME 900	Special Topics	9 + 0
MT 839	Advanced Numerical Techniques	3 + 0

Course Contents

ME-811-Finite Element Analysis: Introduction to FEA, Fundamental Concept (Strong, Weak Forms, Matrix Forms), Stiffness Matrix: Linear Spring System with examples in structural, fluid and thermal systems. 1D linear and quadratic Shape functions, bar elements: trusses. Beam Element: Beams and Frames with different type of loading and constraints. 2D Element: Linear Triangular Element with application on plates.

ME-812 Advanced Materials Sciences and Engineering: Elasticity, nonlinearity in crystalline materials, pseudo-elasticity, rubber elasticity, visco-elasticity: elasticity and fluidity, plasticity, limit of elastic response, mechanism in crystalline materials and non-crystalline materials, creep, deformation mechanism maps for elasto-plasticity, fracture due to fatigue.

ME-813 Advanced Solid Mechanics: Fundamental concept of structural mechanics with application to mechanical engineering, residual stresses, thermal effects, analysis of beams and columns, tensioned beams, trusses, frames, cables and shafts of general material and shape, elastic buckling of columns, energy methods, principle of virtual work, introduction to computational structural mechanics.

ME-815 Advanced Theory of Elasticity: Analysis of stress and strain in two- and three-dimensions, Equilibrium and compatibility equations, Plane stress and plane strain analysis and applications, Stress strain and strain displacement relations in 3D, Two-dimensional problems in polar coordinates, General equations in polar coordinates, Strain-displacement relations, compatibility equation, and stress-strain relations, Axisymmetric problems, thick-walled cylinders, rotating disks of uniform thickness, Governing equations for symmetric bending of circular plates, Thermal stresses in cylinders and disks.

ME-816 Advanced Thermodynamics: This course provides a more advanced study of engineering thermodynamics. Includes an examination of the fundamental concepts of classical, macroscopic thermodynamics at a level beyond what is covered in a first course. Coverage includes additional advanced topics such as availability (exergy), equations of state, property relationships, and mixture properties. An introduction to the microscopic aspects of thermodynamics will provide a foundation for understanding the principles of statistical thermodynamics.

ME-818 Advanced Fluid Mechanics: Introduction, kinematics, Rayleigh problems, boundary layer separation and drag, one dimensional compressible flow, steady supersonic two dimensional flow, linearized flow, viscous flow, introduction to turbulence, turbulence modeling.

ME-819 Computational Fluid Dynamics: Introduction, partial differential equations, basics of finite difference methods, concept of error, consistency and stability, momentum and energy equations, diffusion equations, turbulence modeling, boundary layer computational methods, hyperbolic equations, grid systems.

ME-820 Experimental Stress Analysis: Review of elementary elasticity, that includes laws of stress transformation, principal stresses and principal strains, equations of equilibrium, Mohr's stress circle, construction of Mohr Circle for two and three dimensional stress-strain systems, stress concentration points, Strain-measurement method and related instrumentation using electrical resistance strain gauges, Optical methods of stress analysis, using photo elasticity, Laboratory sessions on electrical resistance strain gages and polariscope.

ME-823 Manufacturing Systems: This course focuses on important issues in the design and operation of manufacturing systems and gives some intuition about behavior of these systems. Topics include material handling, material transport system, storage systems, components and classification of manufacturing systems, group technology, cellular manufacturing, flexible manufacturing systems, assembly lines and manufacturing support systems.

ME-824 Advanced Robotics: Robot programming languages, Introduction to mobile robots, Motion planning, Grasp kinematics, Manipulation and grasp planning, Robot intelligence, Special robot mechanisms.

ME-829 Engineering Design & Optimization: This course focuses on the application of optimization techniques for engineering design. Topics include design problem formulation, graphical optimization, optimum design concepts, unconstrained optimization, constrained optimization using KKT conditions, linear programming using SIMPLEX method, numerical methods for optimization and nontraditional/modern optimization algorithms like Genetic Algorithms and Particle Swarm Optimization etc. and introduction to multivariable optimization along with use of MATLAB for optimization.

ME-830 Mechanics of Composite Materials: Introduction, Mechanics of Unidirectional Ply, Mechanics of Composite Lamina, Mechanics of Laminate (Laminate Theory), Failure Criteria of Composite Materials, Design Problems, FEA of Composite Materials.

ME-831 Fracture Mechanics: Theory of elasticity, introduction to fracture mechanics, linear elastic fracture

mechanics, elastic field equations, crack tip plasticity, the energy principle, plastic fracture mechanics, mixed-mode fracture mechanics, fatigue crack growth, fracture toughness correlations

ME-832 Advanced Dynamics: Kinematics and kinetics of plane and three-dimensional motion, General methods of linear and angular momentum, Relative motion, Central force motion, Coriolis acceleration, Gyro-dynamics, Generalized coordinates and constraints, Principle of virtual work and D'Alembert's principle, Hamilton's principle, Lagrange equations, Raliegh-Ritz method, Stability of dynamic systems.

ME-835 Theory of Plates and Shells: Vector, Tensor and Equation of Elasticity, Energy Principles and Variational Methods, Classical Theory of Plates, Circular plates, Buckling of Plates, Theory and Analysis of Shells.

ME-837 Radiation Heat Transfer: Fundamental of Thermal Radiation, View Factors and relation, Black Surfaces, Gray Surfaces, Radiations Shields and its Effects, Radiation Exchange with Emitting and Absorbing Gases.

ME-838 Advanced Heat Transfer: Introduction, general heat transfer equation in rectangular, cylindrical and spherical coordinate system, steady (2-D) and transient (1-D) analysis, analytical, numerical and graphical methods to solve heat transfer equation. Convection equation (mass, momentum and energy), laminar and turbulent heat transfer, free and forced convection (internal and external flows).

ME-839 Theory of Turbo-machinery: The course aims at giving an overview of different types of turbo-machinery used for energy transformation, such as pumps, fans, compressors, as well as hydraulic, steam and gas –turbines, working principles of turbo-machines and apply it to various types of machines, velocity triangles in turbo-machinery stages operating at design and off-design conditions, Perform the preliminary design of turbo-machines (pumps, compressors, turbines) on a 1-D basis, characterization turbo-machinery stages, off-design behavior of turbines and compressors and relate it to changes in the velocity triangles.

ME-840 Gas Dynamics: Fluid flow and thermodynamics of gases, Control volumes, vector calculus, equations of motion, Gas dynamics of nozzles, Steady and unsteady waves, oblique shocks, Prandtl-Meyer expansion, Linearized potential flow, thin airfoil theory.

ME-841 Advanced Mechanical Behavior of Materials: Stress and Strain, Isotropic and anisotropic Elasticity, Tensile Testing, Strain-Hardening of Metals, Plasticity

Theory, Slip, Dislocation Geometry and Energy, Dislocation Mechanics, Fracture Mechanics, creep and stress rupture, fatigue.

ME-842 Finite Element Analysis of Composite Materials: Mechanics of orthotropic materials, Introduction to finite element methods, Choice of Abstraction Level for modelling composites, Elasticity and Strength of Laminates, Buckling, Free Edge Stresses, Computational Micromechanics, Analytical Homogenization, Numerical Homogenization, Local-Global Analysis (Sub-modelling), Laminated RVE, Viscoelasticity, Damage Mechanics.

ME-843 Advanced Refrigeration: Review of Thermodynamics and Heat Transfer, Methods of producing cold, Thermodynamic modeling and parametric analysis of simple and multi-pressure vapor compression refrigeration, Cascade Systems, Cryogenics, Thermodynamic analysis of sorption refrigeration systems: Water-LiBr absorption refrigeration (Single and double effect), Water-NH_3 absorption refrigeration (Single and double effect), Adsorption refrigeration, Solar based absorption/adsorption refrigeration, Compressors, Expansion devices, Condensers and evaporators, Cooling towers and Evaporative Coolers, Vortex tube refrigeration, Thermoelectric refrigeration.

ME-860 Solar Thermal Systems: Introduction to solar energy, physics of the sun and its energy transport, thermal radiation fundamentals, sun earth
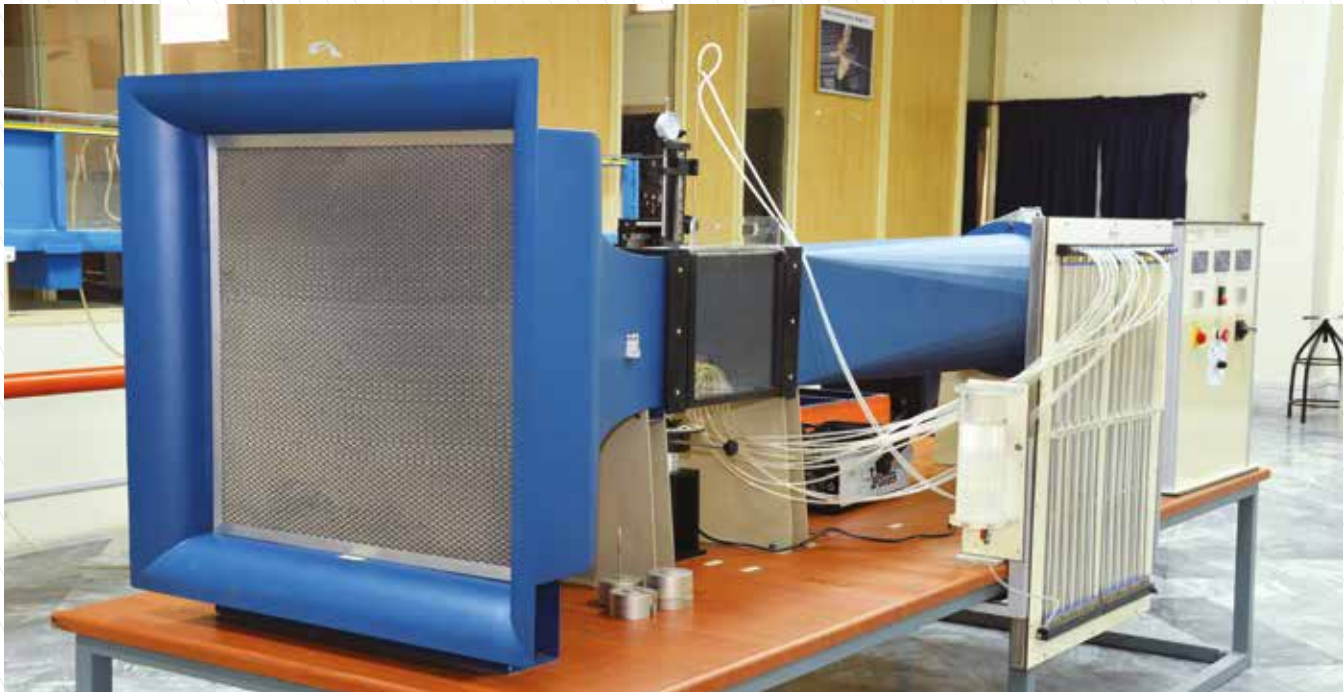
geometric relationship, solar radiation, angles for tracking surfaces, beam and diffuse components of solar radiation, surface tilt, shadow determination, Extraterrestrial and terrestrial Irradiation, radiation on sloped surfaces, optical properties of cover systems, Reflection of radiation, absorption by glazing, transmittance-absorption product, absorbed solar radiation, measuring solar radiation, Components of Solar Thermal Systems, Description of flat-plate collectors, basic flat-plate energy balance equation, collector overall heat loss coefficient, collector heat removal factor and flow factor, liquid heater plate geometries, air heaters, measurements of collector

performance, collector characterizations, sizing of a collector for an application, description of concentrating collectors and configurations, thermal and optical performance of concentrating collectors, Solar Water Heating and Air-conditioning Systems, other potential solar thermal applications.

ME-861 Boundary Layer Flows: The transport equations of mass, momentum and energy for flows with viscosity and heat conduction, molecular transport properties, Navier-Stokes equations, boundary layer simplifications, Incompressible laminar flows, exact solutions, self-similar and non-similar boundary layers, numerical calculation methods, Approximate (integral) methods for boundary layer computations. Internal flows, flow over surfaces, jets, rotating elements, and the effects of compressibility.

ME-862 Introduction to Turbulent Flows: Introduction, Experimental techniques for turbulent flows, Equations governing turbulent flows, Benchmark data and features of basic turbulent flows, Turbulence modeling, Numerical scheme for prediction of thin shear flows, Numerical scheme for prediction of separated flows, Introduction to Large Eddy Simulation (LES), Elements of Direct Numerical Simulation (DNS).

ME-863 Mechanics of Manufacturing Processes: Basics of Materials Behavior, Orthogonal cutting model in machining, cutting conditions in operations, forces in metal cutting & surface finish, grinding analysis, cutting tools and technology, non-conventional machining processes, analysis of plastics extrusion, bulk deformation and analysis of open die forging, flat rolling & metallic extrusion, drawing analysis, engineering analysis of sheet metal, engineering analysis of pouring, collector overall heat loss coefficient, collector

heat removal factor and flow factor, liquid heater plate geometries, air heaters, measurements of collector performance, collector characterizations, sizing of a collector for an application, description of concentrating collectors and configurations, thermal and optical performance of concentrating collectors, solar water heating and air-conditioning systems, other potential solar thermal applications.

ME-865 Advanced Control Systems: Frequency response analysis, Design with PID controller, Pole-assignment controller design, State-space modeling, Controllability, Observability, Linearization of nonlinear systems, Introduction to Robustness, Lyapunov stability concepts, Linear Quadratic Regulator (LQR), Overview of Kalman filter theory.

ME-900 Special Topics: Due to breadth of Mechanical Engineering curriculum, there are many other topics which fall under its purview. Keeping this in view, a maximum of three courses other than those mentioned above, can be offered at MS level as Special Topics.

Research Groups

Research in different areas leading to MS and PhD degrees and that pertaining to industrial projects is carried out under the following research groups in the Department;

Thermo Fluids Research Group (TRG, headed by Dr. Fahad Sarfraz Butt).

This research group combines the research potentials of fluid mechanics, thermodynamics, heat transfer and I.C. engines. Here we are interested in experimental and numerical thermo fluids research. The ongoing research is in the domains of boundary layer flows, internal and external transition flows, wind and solar energy and aero-thermodynamics. We possess strong experimental and computational facilities on campus. A research grade subsonic wind tunnel and a rotating disc apparatus coupled with flow measurement devices especially hot wire anemometer are available. We possess powerful workstations for CFD simulations which will run majority of computational experiments. For further details, kindly see office or the website.

MS and PhD research topics of this group are listed in the following;
- Modeling, experimentation and detailed parametric analysis of solar air collectors of various configurations
- CFD based modeling and analysis of solar air collectors of various configurations
- Analytical and/or CFD based analysis of natural convection inside the evacuated tube solar collectors
- Optical modeling and analysis of evacuated tube collectors: study the effects of tilt angles, cylindrical shape of tubes etc.
- Modeling and design optimization of solar thermal absorption refrigeration system (single/double effect) using TRNSYS
- Modeling and design optimization of solar thermal adsorption refrigeration system using TRNSYS
- Modeling and design optimization of solar thermal space and/or water heating system using TRNSYS
- Analytical modeling and experimental analysis of box type double glazed solar ovens with reflectors
- Analytical modeling and analysis of integrated collector storage or batch type solar collectors
- Transient analysis of flat plate/vacuum tube collector using CFD
- Modeling post combustion convective and conductive heat transfer to and across cylinder liner walls in a high-torque low-speed diesel engine
- Aerodynamic analysis of non-planar concept (box-wing)
- Thermo-elastohydrodynamic analysis of turbocharger

Structures and Materials Research Group (SMRG, headed by Dr. S. Kamran Afaq /Dr. Abdul Munem Khan)

This group is mainly involved in research in the areas of solid mechanics composite materials solid mechanics, stress analysis, vibration analysis and manufacturing processes due to their wide spread usage in numerous applications. Some of the research topics for MS and PhD under this group are;
- Finite element method based analysis of piston skirt liner system lubrication by considering the effect of connecting rod inertia
- Effects of elasto-hydrodynamic lubrication on piston skirt liner system by considering the effect of connecting rod inertia
- Thermal stability, fire retardancy and mechanical

properties of natural fiber composites

- Effect of cutting parameters on circularity, circular runout, cylindericity and total runout in turning operation on steel
- Parametric optimization of friction stir welding for different tool geometries and different thickness plates using Taguchi method
- Probabilistic fracture mechanics of A516 under dynamic loading
- Structural design and prototype manufacturing of rotating antenna of radar
- Aerodynamic designing and performance evaluation of Unmanned Combat Aerial Vehicles
- Detailed structural design of Unmanned Combat Aerial Vehicles

- Experimental study of adhesive bonded joints
- Numerical simulation of probabilistic failure study of composite material structures
- Probabilistic analysis of composite structures
- Analytical and numerical simulation of geo-thermal air conditioning
- Analytical and numerical simulation of composite vertical wind turbine blades
- Numerical simulation of composite plates impregnated in shear thickening fluid
- Optimization of process parameters for stir welding joints
- Hygro-thermal behavior of composite structures
- Mechanical behaviors of anti-symmetric composite laminated structures

Student Chapters

ASME Student Chapter

American Society of Mechanical Engineers

American Society of Mechanical Engineers is a professional association that, in its own words, "promotes the art, science, and practice of multidisciplinary engineering and allied sciences around the globe" via "continuing education, training and professional development, codes and standards, research, conferences and publications, government relations, and other forms of outreach." ASME Student Chapter was inaugurated in HITEC University in Sep. 2011, it is regularly conducting various events among the students such as tutorials and seminars, industrial tours, competitions and conferences etc. It is currently managing 180 members and has its own webpage: asmehitec.webs.com and official email: asme@hitecuni.edu.pk. Dr. S. Kamran Afaq is its advisor.

Recently ASME student chapter has arranged water rocket competition (intra and inter university), avion faire competition, egg drop competition, 3D CAD modeling competition (intra and inter university), mega event named MEC Masters comprising of 3D modeling, aero fare, tech sets, mind crunch, beat the gravity competitions.

SMEP Student Chapter

Society of Mechanical Engineers of Pakistan

The Society of Mechanical Engineers of Pakistan aims at providing a platform to the Mechanical Engineers to enhance their professional expertise, introduce standardization, improve quality of education, provide with growth opportunities etc. Student chapter of SMEP was inaugurated on 6th March 2013 with the intention to be one of the most active student societies.

ASHRAE Student Chapter

American Society of Heating Refrigerating Air conditioning

ASHRAE the American Society of Heating, Refrigerating and Air Conditioning Engineers, founded in 1894, is a building technology society with more than 54,000 members worldwide. The Society and its members focus on building systems, energy efficiency, indoor air quality, refrigeration and sustainability within the industry. ASHRAE HITEC University Student Chapter was inaugurated on March, 6th 2014 under the supervision of Dr. Muhammad Ehtisham Siddiqui and currently being supervised by Dr. Abdul Waheed Badar.

Department of Computer Science and Engineering

Dr. Muhammad Younus Javed
Professor & Chairman

The Department of Computer Science and Engineering (DCS&E) was established in spring 2014 with the aim to impart quality education to its students. The Department not only emphasizes on technical and practical skills of the students but also endeavors to enhance their sense of responsibility towards humanity. The DCS&E has employed highly qualified, most experienced, research-focused and professionally sound faculty for its different academic programs. Dedicated, spacious and well-equipped laboratories have been established for providing state-of-the-art research, development, teaching and learning facilities. The curriculum of each program meets requirements of the industry and is in-line with the criteria set by Higher Education Commission of Pakistan, Pakistan Engineering Council and National Computing Education Accreditation Council.

The Bachelor of Science in Computer Science (BSCS) program at HITEC University has been designed to produce professionals having sound computing knowledge, complex problem solving capabilities, critical thinking and analytical skills. The curriculum and the laboratory work has been designed and integrated in such a way that our graduates get edge over their competitors for securing better positions in the industry, academia and research within the country and abroad. After completing the BSCS program, our students will have a thorough understanding of the latest technical, theoretical and practical aspects of the program area. Our BSCS program encompasses all the areas required by the industry.

The Bachelor of Science in Computer Engineering (BSCE) program has been designed to prepare computer engineers who are fully capable of effectively applying emerging computer engineering knowledge to meet future challenges of the world. The students are trained to understand modern technologies, design concepts & methodologies, and develop products or processes by applying their professional knowledge of mathematics, computing, and engineering. Our graduate computer engineers will play pivotal role as a multi-disciplinary team member in the national and international market in connection with automation, design, research and development. Our professionally skilled and well-groomed computer engineers will be capable of contributing to the society by applying skills and abilities acquired during the study of BSCE.

In Fall 2014, the Department also started MS Computer Science with the aim to broaden the knowledge of computing and bridge the gap between graduate level knowledge and the cutting-edge research methodologies and technologies. The MS program is designed to enable students to learn advanced knowledge in the domain of computer science by

taking specialized courses to enhance their expertise in the latest areas. The department is also offering MS in Computer Engineering with effect from Fall 2016 keeping in view ever increasing demands of the industry, availability of the qualified faculty and the required supporting facilities and resources. The curriculum has been designed to cover advanced technologies and the cutting-edge computer engineering areas in order to make it more attractive for the students.

In Fall 2016, the DCS&E is starting PhD in computer science. It is a full time study program to facilitate the students to engage themselves in the advanced study and research. PhD scholars will be capable of integrating their professional education and experience to solve practical complex problems through innovative approaches.

Besides academics, we also focus on personality development and character building of our students by facilitating them to get involved in extracurricular activities within and outside the HITEC University. We strongly hope that our students will become innovators and leaders with regards to their contribution as per aspirations of the nation. We look forward to see you in our department where you can study to build an exciting career in one of the most promising academic programs of this era.

Faculty of Computer Science & Engineering

Faculty

Dr. Muhammad Younus Javed

Designation: Professor
Qualification: Ph.D. University of Dundee, Scotland, UK
Areas of Interest: Distributed and Parallel Systems, Digital Image Processing, Algorithmics and
                      Computer Networks
E-mail: myjaved@hitecuni.edu.pk

Dr. Syed Jawad Hussain

Designation: Assistant Professor
Qualification: Ph.D. Massey University, New Zealand
Area of interest: Multimedia Communication, Machine learning
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BS Computer Science

The BS Computer Science program at HITEC University endeavors to produce computer scientists and highly skilled programmers, who can play a productive role in software industry, research and the academia. The program comprises of eight semesters (four years) and covers essential courses in the field of computer science. Additional elective courses are also offered to develop in-depth knowledge in the specialized areas.

During the last two semesters, every student is required to take a six credit hours final year project with the aim

to undertake practical industrial problems by utilizing the knowledge and skills acquired during the course of study planned in different semesters of the program. The guidelines given by Higher Education Commission of Pakistan have been followed while preparing BSCS curriculum.

Besides the foundation courses, core computer science courses such as distributed computing, machine learning, artificial intelligence, mobile application development, software engineering, digital image processing, software development, data mining, database systems etc., are also offered to provide required depth in the specialized areas. In addition, a number of courses from other disciplines are taught to bridge the gap. Courses related to social sciences, management and humanities are included in the curriculum for character-building and personality grooming of our students.

The BS Computer Science program is accredited by National Computing Education Accreditation Council (NCEAC). The laboratory work is supervised by the concerned faculty member and qualified lab instructor.

The lab sessions are conducted in the well-established and spacious labs which house state-of-the-art equipment. Internet facility is available throughout the campus, twenty four hours a day and seven days a week for the benefit of the students and faculty.

Highly qualified and experienced full time dedicated faculty members are available for quality teaching. These labs enable our students to develop skills which will help them secure jobs both nationally and internationally. The semester-wise breakdown of BS Computer Science curriculum is appended as follows:-

Curriculum

Semester-1

Course Code	Course Title	Credit Hours
CS-101	Introduction to Information and Communication Technologies	2+1
CS-102	Programming Fundamentals	3+1
CS-103	Discrete Structures	3+0
HS-101	English	3+0
IS-211	Islamic Studies	2+0
MT-101	Calculus & Analytic Geometry	3+0
	Total Credit Hours	**18**

Semester-2

Course Code	Course Title	Credit Hours
CS-104	Object Oriented Programming	3+1
MT-203	Linear Algebra	3+0
HS-102	Pakistan Studies	2+0
HS-401	Professional Values & Ethics	3+0
HS-103	Communication Skills	3+0
EE-201	Basic Electronics	2+1
	Total Credit Hours	**18**

Semester-3

Course Code	Course Title	Credit Hours
CS-201	Data Structures and Algorithms	2+1
CS-204	Software Engineering	3+0
EE-203	Digital Logic Design	2+1
MT-103	Differential Equations	3+0
HS-201	Technical Report Writing	3+0
HS-403	Management & Entrepreneurship	2+0
	Total Credit Hours	**17**

Semester-4

Course Code	Course Title	Credit Hours
CS-202	Microprocessor and Assembly Language	2+1
CS-203	Design & Analysis of Algorithms	3+0
CS-205	Computer Architecture and Organization	3+0
MT-204	Multivariable Calculus	3+0
MS-201	International Relations	3+0
ACC-201	Financial Management	3+0
	Total Credit Hours	**18**

Semester-5

Course Code	Course Title	Credit Hours
CS-301	Theory of Automata	3+0
CS-303	Operating Systems	3+1
CS-304	Database Systems	3+1
CS-3XX	Computer Science Elective I	2+1
MT-302	Probability and Statistics	3+0
	Total Credit Hours	**17**

Semester-6

Course Code	Course Title	Credit Hours
CS-302	Artificial Intelligence	2+1
CS-306	Data Communication and Computer Networks	2+1
CS-307	Visual Programming	2+1
CS-308	Software Quality Assurance	3+0
CS-3XX	Computer Science Elective II	2+1
HS-402	Economics	2+0
	Total Credit Hours	**18**

Semester-7

Course Code	Course Title	Credit Hours
CS-401	Compiler Construction	2+1
CS-4XX	Computer Science Elective III	2+1
CS-4XX	Computer Science Elective IV	3+0
CS-408	Human Computer Interaction	2+1
CS-499	Final Year Project	0+3
	Total Credit Hours	**15**

Semester-8

Course Code	Course Title	Credit Hours
CS-402	Information Security	3+0
CS-405	Numerical Computing	2+1
CS-4XX	Computer Science Elective V	2+1
CS-4XX	Computer Science Elective VI	3+0
CS-499	Final Year Project	0+3
	Total Credit Hours	**15**

List of Computer Science Elective Courses

Course Code	Course Title	Credit Hours
CS-305	Computer Graphics	2+1
CS-309	Web Design and Development	2+1
CS-310	Distributed Computing	3+0
CS-311	Data Warehousing	3+0
CS-312	Web Engineering	2+1
CS-313	Formal Methods in Software Engineering	3+0
CS-314	Social Computing	3+0
CS-403	Mobile Application & Development	3+0
CS-404	Data and Network Security	3+0
CS-406	Digital Image Processing	2+1
CS-407	Fundamentals of Data Mining	3+0
CS-410	Artificial Neural Networks	2+1
CS-411	Computer Vision	3+0
CS-412	Expert Systems	3+0
CS-413	Fuzzy Logic Systems	2+1

Course Code	Course Title	Credit Hours
CS-414	Computational Intelligence	3+0
CS-415	Multi Agent Systems	3+0
CS-416	Natural Language Processing	3+0
CS-417	Game Development	3+0
CS-418	Logical Paradigm of Computing	3+0

BS Computer Science

CS-101 Introduction to Information and Communication Technologies

Basic definitions and concepts, hardware: computer systems and components. Storage devices, number systems, software: operating systems, programming and application software, introduction to programming, databases and information systems, networks, data communication, the Internet, browsers and search engines, email, collaborative computing and social networking, e-commerce, IT security and other issues.

CS-102 Programming Fundamentals

This course covers principles of structured and modular programming, overview of structured programming languages, algorithms and problem solving, program development: analyzing problem, designing algorithms, testing designed solutions, translating algorithms into programs, fundamental programming constructs, data types, basics of input and output, selection and decision (if, if-else, nested if-else, switch statement and condition operator), repetition (while and for loop, do-while loops), break statement, continue statement, control structures, functions, arrays, pointers, records, Files (input-output), testing & debugging.

CS-103 Discrete Structures

Mathematical reasoning: introduction to logic, propositional and predicate calculus, negation disjunction and conjunction, implication and equivalence, truth tables, predicates, quantifiers, natural deduction, rules of inference, methods of proofs, use in program proving, resolution principle, set theory, paradoxes in set theory, inductive definition of sets and proof by induction, relations, representation of relations by graphs, properties of relations, equivalence relations and partitions, partial orderings, linear and well-ordered sets, functions: mappings, injection and surjection, composition of functions, inverse functions,

special functions, peano postulates, recursive function theory, elementary combinatorics, counting techniques, recurrence relation, generating functions. Graph theory: elements of graph theory, planar graphs, graph coloring, Euler graph, Hamiltonian path, trees and their applications.

EE-201 Basic Electronics

For contents please refer to page number 26

CS-104 Object Oriented Programming

Evolution of object oriented programming (OOP), object oriented concepts and principles, problem solving in object oriented paradigm, OOP design process, classes, functions/methods, objects and encapsulation, constructors and destructors, operator and function/method overloading, association, aggregation, composition, generalization, inheritance and its types, derived classes, function/method overriding, abstract and concrete classes, virtual functions, polymorphism, exception handling, files and streams.

HS-201 Technical Report Writing

For contents please refer to page number 29

HS-103 Communication Skills

For contents please refer to page number 30

HS-101 English

For contents please refer to page number 30

CS-201 Data Structures and Algorithms

Introduction to data structures and algorithms, complexity analysis, arrays, sorting algorithms, insertion sort, selection sort, bubble sort, shell sort, heap sort, quick sort, merge sort, radix sort, bucket sort, linked lists, singly linked lists, doubly linked lists, circular list, stacks, queues, and priority queue, Recursion:

Function call and recursion implementation, nested recursion, backtracking. Trees: binary trees, binary heap, binary search, tree traversal, insertion, deletion, and balancing a tree, heap, B-Tree, Spanning tree, AVL trees, graphs: representation, traversal, shortest path, and cycle detection, isomorphic graphs, graph traversal algorithms, hashing and memory management.

CS-204 Software Engineering

Overview of SE, practice & myths, the software processes, generic process models: framework activity, task set, process patterns, process improvement, CMM prescriptive, process models: waterfall model, incremental process model, evolutionary process model, specialized process models: component based development, the formal methods models, agile development, business information systems: components, types, and evaluating methods. SDLC: phases, system planning, preliminary investigation, SWOT analysis. The importance of strategic planning, evaluation of systems requests, requirements engineering. Difference between structured analysis and object oriented analysis, difference between FDD diagrams & UML diagrams, data & process modeling, diagrams: data flow, context, conventions, detailed level DFD's, leveling and balancing, logical versus physical models. The design process, architecture design elements, interface design elements, component-level design elements, deployments design elements, system architecture, architectural styles, user interface design, web apps interface design, software quality assurance, validation testing, system testing, internal and external view of testing, project management, risk management, maintenance and reengineering.

EE-203 Digital Logic Design:

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CS-202 Microprocessor and Assembly Language

Microprocessor bus structure: addressing, data and control, introduction to registers and flags, addressing modes, instruction sets including data movement, arithmetic and logic, program control, stack and its operation, peripheral control interrupts, introduction to assembler and debugger, manipulation and translation of machine and assembly code, describing actions inside the processing chip.

CS-203 Design and Analysis of Algorithms

Introduction, asymptotic notations, recursion and recurrence relations, divide-and-conquer approach, sorting, search trees, heaps, hashing, greedy approach, dynamic programming, polynomial and matrix calculations, graph algorithms, shortest paths, network flow, disjoint sets, string matching, NP complete problems, approximation algorithms.

CS-205 Computer Architecture and Organization

Difference between architecture & organization, design of computer systems and components, processor design, CPU architecture, functional blocks and development of instruction set, design of basic functional blocks, instruction set design, and addressing, control structures and microprogramming, memory management, caches, and memory hierarchies, and interrupts and I/O structures, pipelining of processor issues and hurdles, exception handling, parallelism, multiprocessor systems, introduction to superscalar processors (CISC, RISC), cache memory, different designs of cache memory system, virtual memory system, address mapping using pages, pipelining and threading, instruction level parallelism (ILP), introduction to parallel processing, branch prediction, pre-fetching, multithreading.

ACC-201 Financial Management

meaning & scope of financial management, financial manager & financial environment, time value of money, corporate financial statement analysis / ratios, financial forecasting & financial planning, analysis of cash flows, bond, securities & their valuation, budgeting & evaluation, the basis of capital, introduction to working capital management & managing current assets, working capital financing / financing current assets, strategic financial decisions- basics, risk & return, analysis of inventories, cash flow estimation and other topics in capital budgeting.

CS-301 Theory of Automata

Finite state models: language definitions preliminaries, regular expressions/regular languages, Finite automata

(FAs), transition graphs (TGs), NFAs, Kleene's theorem, transducers (automata with output), pumping lemma and non-regular language grammars and PDA: context free grammars, derivations, derivation trees and ambiguity, simplifying CFLs, normal form grammars and parsing, decidability, context sensitive languages, grammars and linear bounded automata (LBA), Chomsky's hierarchy of grammars, turing machines theory: turing machines, Post machine, variations on TM, TM encoding, universal turing machine, defining computers by TMs.

CS-303 Operating Systems

Evolution of operating systems, different types of operating systems, computing environment, computer system operation, I/O and storage structure, hardware protection, system architecture, system components, services, system calls & programs, virtual machines, systems design and implementation, process scheduling, operations on processes, inter-process communication, client-server systems, threads & threading models, thread types & issues, threads on popular operating systems, CPU scheduling, criteria & algorithms, real-time scheduling & solution, critical-section problem, synchronization, critical-section resolution methods, deadlock characterization, handling of deadlocks, deadlock prevention, detection & recovery, address binding for memory management, swapping, memory allocation, paging, segmentation, virtual memory, file system concept, access methods & protection.

CS-304 Database Systems

Basic database concepts, database architecture, DB design life cycle, schema architecture, conceptual, logical and physical database modeling and design,

entity relationship diagram (ERD), enhanced ERD, relational data model, mapping ERD to relational model, functional dependencies and normalization, relational algebra, structured query language (SQL), transaction processing, concurrency control and recovery techniques, query optimization concepts.

CS-302 Artificial Intelligence

Introduction, intelligent agents, solving problems by searching, informed search and exploration, constraint satisfaction problems, adversarial search, logical agents, first-order logic, inference in first-order logic,

knowledge representation, planning and acting in the real world, uncertainty, probabilistic reasoning, probabilistic learning methods, reinforcement learning, probabilistic language processing, perception and robotics, introduction to LISP/PYTHON and expert systems (ES) and applications.

CS-306 Data Communication and Computer Networks

Data communication concepts, analogue and digital transmission, noise, media, encoding, asynchronous and synchronous transmission, network system

architectures (OSI, TCP/IP), error control, flow control, data link protocols, bridging. Local area networks and MAC layer protocols, multiplexing, switched and IP networks, inter-networking, routing, transport layer protocols TCP, UDP and SCTP, application layer protocols, wireless LANs.

CS-307 Visual Programming

Introduction to Windows programming, Use of Windows API, MFC class hierarchy, class wizard, application wizard and application studio, graphics device interface, menus, document view architecture, multiple views, files and achieving mechanisms, converting windows programs to MFC, sub-classing controls, Windows forms programming, advanced topics in C#, collections, generics, socket programming and database connection with visual applications.

CS-308 Software Quality Assurance

What is software quality: quality assurance, quality engineering software testing: testing: concepts, issues, and techniques, test activities, management, and automation, coverage and usage testing based on checklists and partitions, input domain partitioning and boundary testing, coverage and usage testing based on finite-state machines and Markov chains, control flow, data dependency, and interaction testing, testing techniques: adaptation, specialization, and integration. quality assurance beyond testing: defect prevention and process improvement, software inspection, Formal verification, Fault Tolerance and Failure Containment, Comparing Quality assurance techniques and activities, quantifiable quality improvement: feedback loop and activities for quantifiable quality improvement, quality models and measurements, defect classification and analysis, risk identification for quantifiable quality improvement, software reliability engineering.

CS-401 Compiler Construction

Introduction to compilers, recursive descent parsing, demo compiler overview, lexical analysis using tokenizing, parsing including LL(1) grammars, shift-reduce (LR) parsing, Intermediate code generation and type checking, scope and code generation, the java virtual machine, basic blocks, flow graphs and simple code optimization, basic blocks as DAGs, peephole optimization, and graph coloring, Ershov numbers and data-flow analysis, The GNU compiler collection, compilers and security, how to build a compiler?

CS-408 Human Computer Interaction

This course will introduce the theory and practice of developing user interfaces. Practical concerns will be balanced by discussion of relevant theory from the literature of computer science (graphics, software engineering, and multimedia), cognitive psychology, and industrial design. Usability paradigm and principles, introduction to design basics, HCI in software process, design rules, prototyping, evaluation techniques, task analysis, universal design and user support and computer supported cooperative work, introduction to specialized topics such as groupware, pervasive and ubiquitous applications. Students will also participate in group projects to design, implement, and evaluate user interfaces.

CS-402 Information Security

Basic notions of confidentiality, integrity, availability, authentication models, protection models, security kernels, encryption, hashing and digital signatures, audit, intrusion detection and response, database

security, host-based and network-based security issues operational security issues, physical security issues, personnel security, policy formation and enforcement, access controls, information flow, legal and social issues, identification and authentication in local and distributed systems, classification and trust modeling, risk assessment.

CS-405 Numerical Computing

The concepts of efficiency, reliability and accuracy of a method, minimizing computational errors, theory of differences, difference operators, difference tables, forward differences, backward differences and central differences. Mathematical preliminaries, solution of equations in one variable, interpolation and polynomial approximation, numerical differentiation and numerical integration, initial value problems for ordinary differential equations, direct methods for solving linear systems, iterative techniques in matrix algebra, solution of non-linear equations using the methods and rules: Fixed point method, Regula-Falsi method, Newton Raphson's method, Bisection method, Lagrange Polynomial, Do Little method, Crout's method, Jacobi method, Simpson rule, Trapezoidal rule, Secant method.

CS-305 Computer Graphics

Graphics hardware, fundamental algorithms, applications of graphics, interactive graphics programming, graph plotting, windows and clipping, and segmentation. Programming raster display systems, differential line algorithm, panning and zooming. Raster algorithms and software scan- converting lines, characters and circles. Scaling, rotation, translation, region filling and clipping. Two and three dimensional imaging geometry (perspective projection and orthogonal projection) and transformations. Curve and surface design, rendering, shading, color and animation.

CS-309 Web Design and Development

Introduction to the web structure, layers of the Internet, domain name service, uniform resource locator, overview of web applications, history of markup language.HTML, CSS, box Model, clients side scripting, server side scripting, Review of current web related frame works e.g. Bootstrap, jQuery, jQuery mobile, Ajax, Wordpress, Joomla, dynamic website development. Introduction to current technologies e.g. MySQL, PHP, ASP, ASP.Net. Introduction to related methods and tools e.g., website hosting, database connectivity, dreamweaver, cursory view of web analytics and search engine optimization (SEO).

CS-310 Distributed Computing

Introduction to parallel and distributed systems, software architectures: threads and shared memory, processes and message passing, distributed shared memory (DSM), distributed shared data (DSD). system models, networking and internetworking, communication models and abstractions(message passing, stream oriented communications, remote procedure calls, remote method invocation), naming in distributed systems, concurrency and synchronization, process synchronization, distributed transaction and concurrency control, distributed data replication, security and access control, overview of web services, cloud computing.

CS-311 Data Warehousing

Introduction of the business context for data warehousing and decision support systems, TPS vs.

DSS environments. Data extraction, transformation and loading (ETL and ELT), data warehouse architecture, data marts, dataware house design methodology: de-normalization and dimensional modelling, online analytical processing (OLAP) and data aggregations, indexing techniques, hardware and software systems consideration for data warehousing, data warehouse maintenance.

CS-312 Web Engineering

Requirements of engineering for web applications, web applications modeling, web application architectures, technology-away web application design, technologies for web applications, testing web applications, operation and maintenance of web application, web project management, web application development process, usability of web applications, performance of web applications, security for web applications, review of semantic web.

CS-313 Formal Methods in Software Engineering

Introduction to formal methods, developing and acquiring formal methods, using and applying formal methods, a brief introduction to logic and set theory, Introduction to Hoare's Logic, logic and theorem proving, modeling software systems, sequential, concurrent and reactive systems, states, state spaces, transition systems, combining state spaces, fairness, partial order view, modeling formalism, Formal Specifications Linear temporal logic, automata on infinite words, specifications using Buchi-automata, completeness of specification, Automatic verification, state space verification, representing states, the automata framework, combining Buchi-automata, checking emptiness, translating LTL into automata, model checking examples, checking complexity

of model checking, safety properties, state space explosion problem, Z-Specification, structure and schema.

CS-314 Social Computing

The topics covered will reflect the latest research and development activities in social networking e.g., service architectures for social networks, common APIs for popular architectures (Facebook, open social, etc.), open ID and shibboleth, linked data for social networks (FOAF, SKOS, etc), social network properties and analysis methodologies, social network interoperability, social network topologies and ecosystems, social networks in e-learning, enterprise and media, Identity, privacy and ownership in social networks, aspects of recommendation engines and information retrieval in social networks, sentiment classification, opinion extraction, social knowledge acquisition, social group identification and clustering, outlier detection.

CS-403 Mobile Application and Development

Mobile development concepts, activities, resource management and media, services and content providers, data storage, security, managing evolution, tablets graphics speech sensors networking, processes and threads, factors in developing mobile applications, HTML5 for mobiles, frameworks, user-interface, resource management, content providers, text-to-speech techniques, intents and services, storing and retrieving data, communications via network and the web, telephony, notifications and alarms, graphics, multimedia, location, hardware sensors, developers and app store license agreements, processes and threads, security and hacking, platforms issues.

HS-401 Professional Values & Ethics

For contents please refer to page number 31

CS-404 Data and Network Security

Introduction, cryptology and simple cryptosystems, conventional encryption techniques, stream and block ciphers, DES, more on block ciphers, the advanced encryption standard, confidentiality & message authentication: hash functions, number theory and algorithm complexity, public key encryption, RSA and discrete logarithms, elliptic curves, digital signatures, key management schemes, identification schemes, dial-up security, e-mail security, PGP, S-MIME, Kerberos and directory authentication, emerging Internet security standards, SET, SSL and IPsec, VPNs, firewalls, viruses, miscellaneous topics.

CS-406 Digital Image Processing

Digital image fundamentals, elements of digital image processing, image model, binary and gray scale image, sampling and quantization, relationships between pixels and intensity level, image enhancement: enhancement by point processing, spatial filtering, enhancement in the frequency domain, discrete Fourier transform, color image processing, image segmentation, morphological image processing, image restoration, wavelets & multi-resolution processing, image compression.

CS-407 Fundamentals of Data Mining

Concepts of data mining, data pre-processing and pre-mining,(noisy and missing data, data normalization and discretization), outlier detection, data mining learning methods, data mining classes (association rule mining, clustering, classification), fundamental of other algorithms related to data mining(fuzzy logic, genetic algorithm and neural network), decision trees, rules, patterns and trends.

CS-410 Artificial Neural Networks

Introduction, learning processes, single & multi-layer perceptron, radial basis function networks, support

vector and committee machines, principle component analysis (PCA), self- organizing maps (SOMs), recurrent & temporal feed-forward Networks, neural networks for optimizing problems, solving matrix algebra problems using ANNs, solving linear algebraic equations using ANNs, statistical methods using ANNs, neuro-fuzzy computing, neuro-genetic computing, neurodynamics & dynamically driven recurrent nets.

CS-411 Computer Vision

Concepts behind computer based recognition and extraction of features from raster images, applications of vision systems and their limitations, overview of early, intermediate and high level vision, Segmentation: region splitting and merging, quadtree structures for segmentation, mean and variance pyramids, computing the first and second derivatives of images using the Sobel and Laplacian operators, grouping edge points into straight lines by means of the Hough transform, limitations of the Hough transform, parameterization of conic sections. Perceptual grouping: failure of the Hough transform, perceptual criteria, improved Hough transform with perceptual features, grouping line segments into curves, 3D vision, triangulation principle, stereoscopy.

CS-412 Expert Systems

Introduction, history of knowledge-based expert systems, characteristics of current expert systems, expert systems building, architecture of expert systems, constructing an expert system, tools for building expert systems, rule-based expert systems, building a small rule-based expert system, advance expert system programming techniques, evaluating an expert system, reasoning about reasoning, issues and case studies, intelligent distributed problem solving.

CS-413 Fuzzy Logic System

Mathematical introduction of fuzzy sets and fuzzy logic, study of the fundamentals of fuzzy sets, operations on these sets, and their geometrical interpretations, methodologies to design fuzzy models and feedback controllers for dynamical systems, fundamental concepts of dynamical systems, multi-input multi-output dynamical systems, stability, feedback-control design, and MATLAB control system toolbox, fuzzy systems and properties, fuzzifier and de-fuzzifier design, design of fuzzy systems, fuzzy controllers, hardware and software based design of fuzzy logic control system.

CS-414 Computational Intelligence

Introduction to computational intelligence, neural networks, biological model, information flow in neural cell, artificial neural functions, single and multi-layer perceptrons, recurrent neural networks, Kohonen SOM, learning vector quantization, RBF and hopfield neural networks, Boltzmann machine, artificial immune system, genetic algorithms, genetic programming, particle swarm optimization, ant colony optimization, differential and cultural evolution, co-evolution, evolutionary strategies, evolutionary algorithms, differential evolution, key operators for differential evolution.

CS-415 Multi Agent Systems

Intelligent agents introduction, agents and expert systems, abstract architectures for intelligent agents reactive agents, deliberate agents concrete architectures for intelligent agents, multi-agent systems and societies of agents, agent communications, distributed problem solving and planning, task sharing, distributed planning, search algorithms for agents, distributed rational decision making, task allocation negotiation, learning in multi-agent systems.

CS-416 Natural Language Processing

Introduction and Overview, ambiguity and uncertainty in language, regular expressions, Chomsky hierarchy, regular languages, finite-state automata, practical regular expressions, morphology, Regex tools, string edit distance and alignment, key algorithmic tool like dynamic programming, string edit operations, edit distance, machine translation, context free grammars, constituency, CFG definition, parsing, information theory, the "Shannon game"--motivated by language, entropy, cross-entropy, information gain, language modeling and naive bayes, probabilistic language modeling and applications, Markov models, generative models of language, part of speech tagging and hidden Markov models, the Penn treebank and Brown corpus, probabilistic finite state automata, probabilistic context free grammars, weighted context free grammars, Maximum Entropy Classifiers, the maximum entropy principle, and its relation to maximum likelihood, maximum entropy classifiers and their application to document classification, sentence segmentation.

CS-417 Game Development

history of computer and video games, goals and genres, game design principles, python programming, pygame, storytelling, sprites and animation, game development methodologies, physics, loose ends, audio, sound, and music, 2D game group project check-in, game testing, ethics, MMORPGS, and securing online games, game engines, marketing and maintenance and future of game development.

CS-418 Logical Paradigm of Computing

Introduction to logic, modal logic, propositional and predicate logic and their proof theories, relational and temporal logic, linear time temporal logic (LTL), computation tree logic (CTL), CTL*, mu-calculus, Introduction to model checking and model checking algorithms, formal program verifications, partial order correctness, proof calculus for partial proof rules, introduction to statistical and stochastic processes (random walk, Markov chains, hidden Markov chains), introduction to process algebra, and evolutionary computing.

MS Computer Science Program

The exponential growth in computing and technology has undoubtedly created a great demand for the professionals in the area of computer science. In order to fulfill qualified human resource for meeting demands of the IT industry, academia and software market, the Department of Computer Science and Engineering (DCS&E) started its MS Computer Science (MSCS) program in Fall 2014. The vision of this program is to bridge the gap by producing qualified manpower for expansion and growth of software industry in Pakistan which will play a key role for the socio-economic uplift of the country. MSCS Program offers an opportunity for the computer professionals to grab jobs in the software industry, academia and research-oriented organizations in order to contribute in the areas of advanced analysis of algorithms, theory of computation, simulation & modeling, multimedia communication, cryptography and security, computer vision, machine learning, decision support systems, data mining, web engineering, software project management, software quality assurance, requirement engineering, operating systems, next generation networks, parallel & distributed computing, mobile and pervasive computing, computer networks, artificial Intelligence, Image processing, database systems, software engineering, and human computer interface etc.

To fulfill the MS degree requirements, a student needs to complete 30 credit hours by taking 8 courses of 24 credit hours and 6 credit hours of thesis. The objective of thesis is to enable our students to select a problem, identify research questions, develop hypothesis, conduct experiments and furnish their findings. However, a student may opt for non-thesis option and in this case he/she has to take10 courses and a mandatory technical report. Curriculum has been designed in accordance with guidelines of the HEC/PEC. The semester-wise breakdown of courses along with their contents is given as follows:-

List of Courses

Core Courses

Course Code	Course Title	Credit Hours
CS-801	Advanced Theory of Computation	3+0
CS-802	Advanced Algorithm Analysis	3+0

List of Elective Courses

Course Code	Course Title	Credit Hours
CS-811	Advanced Computer Networks	3+0
CS-812	Wireless Networks	3+0
CS-813	Network Simulation & Modeling	3+0
CS-814	Multimedia Communication	3+0
CS-815	Cryptography & Network Security	3+0
CS-821	Computer Vision	3+0
CS-822	Advanced Digital Image Processing	3+0
CS-823	Machine Learning	3+0
CS-824	Advanced Neural Networks	3+0
CS-825	Decision Support Systems	3+0
CS-831	Advanced Database Management Systems	3+0
CS-832	Data Mining	3+0
CS-833	Data Warehousing	3+0
CS-834	Web Engineering	3+0
CS-835	Advanced Web Analytics	3+0
CS-836	Semantic Web	3+0
CS-841	Advanced Software Engineering	3+0
CS-842	Advanced Software Project Management	3+0

List of Elective Courses

Course Code	Course Title	Credit Hours
CS-843	Software Quality Assurance	3+0
CS-844	Information Security	3+0
CS-940	Special Topics in Requirement Engineering	3+0
EC-861	Advanced Operating Systems	3+0
EE-820	Advanced Computer Architecture	3+0
CS-853	Next Generation Networks	3+0
CS-854	Advanced Information Management Systems	3+0
CS-855	Object Oriented Databases	3+0
CS-856	Software Architecture	3+0
CS-857	Parallel & Distributed Systems	3+0
CS-858	Research Methods	3+0
CS-859	Mobile & Pervasive Computing	3+0
EC-892	Real-time Systems	3+0
CS-861	Operation Research	3+0
CS-950	Selected Topics in Human Computer Interface	3+0
MTH-805	Mathematical Modeling	3+0
MTH-828	Advanced Cryptography	3+0

MS-Thesis

Course Code	Course Title	Credit Hours
CS-899	Thesis	6

Course Contents

CS-801 Advanced Theory of Computation

Models for sequential and parallel computations, turing machines, Boolean circuits, the equivalence of various models and the Church-Turing thesis, formal models of computation, class-based resource usage models, unsolvable problems and model dependent measures of computational complexity, abstract of complexity theory, exponentially and super-exponentially difficult problems, complete problems, implications of modern complexity theoretic approaches to advanced topics such as randomization, proof complexity, and quantum computing.

CS-802 Advanced Algorithm Analysis

Analyzing algorithms, heuristic and randomized algorithms, heap operations, design of faster searching and sorting approaches, hashing and collision resolution, optimal search tree structures, generation of codes and their utilization, amortized analysis, graph algorithms, MST and computation analysis, single and all-pairs paths and algorithms, NPC problems, pattern matching, approximation algorithms, standard complexity classes, time and space tradeoffs in algorithms, sets and their relations, non-computable functions, algorithmic animation and number-theoretic approaches are also included for their application and computational analysis.

CS-811 Advanced Computer Networks

Conceptual knowledge of the architecture, interfaces, protocols and technologies of high-speed networks, implementation in different networks using modern research technologies. routers with IP switching, MPLS, use of ATM and frame relay, ethernet switching, gigabit ethernet, and FDDI, broadband access through DSL and cable modems, network performance, congestion control and traffic management, provision of different

levels of quality of service, resource reservation, unicast and multicast routing, and an overview of security in networks.

CS-812 Wireless Networks

Wireless communication technologies, cellular and mobile communication networks and their components, traffic engineering, mobility management, intersystem operation, second generation digital cellular standards, short message service, 2.5 G data services and third generation cellular standards. Location technology and advanced services, personal area and mobile adhoc networks, self-organization, topology control & routing, protocols to support different networks, network architectures, hot research issues in the area of wireless networks, and network simulation.

CS-813 Network Simulation and Modeling

Simulation and modeling concepts, discrete-event simulation, single-server queuing system, alternative approaches, review of probability and statistics, simulations environments, estimation of means, variances, and correlations, confidence intervals and hypothesis tests, random number generators, simulation of distributions and tests, rejection method, correlations, and stochastic processes, models of arrival processes, Poisson processes, Markov- chain Monte-Carlo simulations, and variance-reduction techniques.

CS-814 Multimedia Communication

Multimedia services and applications, video coding techniques, algorithms for lossless and lossy compression, transform coding, motion compensated predictive coding, JPEG/JPEG-2000, H.26x, MPEG-1/4/7, AVC, scalable video coding, QoS for video delivery, error control in video streaming, cross-layer video adaptation, audio compression algorithms, algorithm implementation for audio application, entropy coding techniques for text, audio and video applications.

CS-815 Cryptography and Network Security

Cryptographic methods, hash function implementation, key exchange methodologies, secure communication, communication verification techniques, digital certificates, network security, protocols and standards, analysis of PKI and TTP, message and network authentication, web security protocols, email security protocols, VPN technology, security in IPV6 networks, firewalls and bypassing techniques, security in web services and DNS, intruder detection and prevention.

CS-822 Advanced Digital Image Processing

Image processing fundamentals, gray level transformation, histogram and area processing, spatial domain smoothing and sharpening filters, orthogonal and ortho-normal basis functions, transform domain smoothing and sharpening filters, discrete cosine transform, information theory, compression methodologies, advanced compression algorithms, morphological image processing, advanced morphological algorithms, and image segmentation.

CS-823 Machine learning

Machine learning applications, evaluating and debugging learning algorithms, supervised learning, decision tree learning, learning set of rules, logistic regression, perceptron, generative learning algorithms, Gaussian discriminant analysis, SVMs, model and feature selection, PCA, ICA, learning theory, bias/variance tradeoff, unsupervised learning, K-means clustering, K-nearest neighbor, rock and cobweb algorithms, string matching algorithms, reinforcement, control, and analytical learning.

CS-824 Artificial Neural Networks

Brain and neural system as cybernetics, neural networks, neuron models, network architecture and topology, training and validation procedure, hamming network and perceptron learning rule, proof of convergence, signals and weight vector space, performance surface and optimization, learning methods, competitive networks using SOM, biological, adaptive resonance theory, Hopfield, cellular neural, evolutionary neural and spike neural networks and their applications.

CS-825 Decision Support Systems

Data warehouse architectures, data transformation, data warehouse design and development, decision making systems, models and support, modeling, analysis and data management, DSS development methodologies, time series forecasting, knowledge-based DSS for enterprise mergers and acquisitions.

CS-831 Advanced Database Management Systems

Overview of databases management systems, design and structure of databases (object-oriented, object-relational, mobile, temporal, spatial, geographic, distributed), distributed multimedia database systems, data warehouse, OLAP systems, XML (data models, documents and query languages), database designing techniques and trends, modeling tools, implementation and applications of advance database systems, and research trends in database systems.

CS-832 Data Mining

Data mining applications and motivation, data pre-processing techniques review, data mining tools, mining frequent patterns and emerging patterns, association and correlations, classification and prediction, decision tree induction, rule-based classification, classification by back-propagation, SVM, cluster analysis: hierarchical, grid-based and density-based methods, clustering high dimensional data, outlier analysis, mining stream, time series and sequence data, and latest trends in data

mining.

CS-833 Data Warehousing

Data warehousing and decision support systems. data cleaning and data integration, data extraction, transformation and loading, data warehouse architecture, data marts, issues in de-normalization and dimensional modeling, OLAP, MOLAP, HOLAP & DOLAP approaches, Indexing special data types, metadata management, data warehouse maintenance and issues, business intelligence, design and development of business intelligence applications, expansion and support of a data warehouse.

CS-834 Web Engineering

The need for web engineering, web effort estimation, web productivity measurement and benchmarking, web quality & usability, web system reliability and performance, web application testing, conceptual modeling and application development, internationalization. review of W3C specifications, web real-time communication, mobile web applications, mobile web for social development, geospatial, accessible rich internet applications, Java script APIs, web components & web performance, and web technologies.

CS-835 Advanced Web Analytics

Historical perspective on the development of web analytics, classification techniques, application settings and corresponding problem formulations, WEKA and MOA for user profiling, web based user tracking, beyond traditional WA, A/B testing, predictive analytics for computational advertisement, user click prediction as classification and problem formulation, traffic volume prediction, classification techniques, utility of web analytics, methodological issues of knowledge discovery, pattern mining and clustering techniques, and social network analytics.

CS-836 Semantic Web

The semantic web activity of W3C: review of techniques and standards, XML with document type definitions and schemas, transformation/Inference rules in XSLT, Rule ML and RIF, metadata with resource description framework, metadata taxonomies with RDF schema, JSON, the W3C Ontology language OWL-2, integrating these techniques for Ontology/Rule-based Multi-Agent systems, current applications of the Semantic Web.

CS-841 Advanced Software Engineering

Systems engineering, project planning & scheduling, advanced concepts of risk management, standards, advanced software engineering process, unified software development process, extreme programming, software development team structures, software quality and process improvement, testing & inspections, component-based software engineering, UML extension mechanisms, model checking, distributed software architectures, objects & components, and enterprise application integration techniques.

CS-842 Advanced Software Project Management

Software project managers roles and responsibilities, nature of software production, key objectives of effective management, planning the project, business planning, technical planning, managing product support and maintenance, evaluating the project, financial planning, resource allocation, organizational considerations, human factors and usability, tools and environments, transition of the product to the user, managing the project, project control, risk management, testing phases, and formalized support activities.

CS-843 Software Quality Assurance

Software quality assurance and test parameters, system/software processes, active static testing, testing to reduce effort & time, measuring and managing testing, software testing throughout the software process, automation of software testing, difficulties and limitations of software testing, the business of software testing, effective strategies of testing, methods and technologies of software testing, software testing and quality assurance.

CS-844 Information Security

Review of information security, understanding threats, malicious software, memory exploits, access control theory and matrix, security policies, ciphers, cryptographic hash functions, authentication codes, public/private key systems, secure design principles, TCP/IP and DNS security issues, TLS/SSL, network intrusion detection and prevention systems, software security, vulnerability auditing, penetration testing, web security, authentication-via-secret and session management, SQL injection, legal and ethical issues.

CS-940 Special Topics in Requirement Engineering

Advance features of software requirements engineering (RE), kinds of software requirements (SR), SRs from the user/customer's perspective, process models and RE process, actors and stakeholders in the RE process, social and cultural issues, requirements elicitation, requirements analysis, requirements errors, requirements management, requirements identification techniques, change management, requirements traceability, requirements prioritization, and the latest research topics and their impact.

CS-853 Next Generation Networks

NGN signaling systems, security threats and mechanisms, software defined networks (SDN), SDN service virtualization and chaining, quality of services (QoS) and network management, next generation internet, multiprotocol label switching, QoS in packet networks, switching & routing paradigms, mobility and internet, traffic/network monitoring, measurements & traffic analysis, QoS assessment, resilient networks, and optimization of energy-aware networks.

CS-854 Advanced Information Management Systems

Managing information assets, IT technology, issues being faced in modern organizations, changing organizational environment and the use of IT, business impacts and social networking, leveraging of the human connectivity on the internet, leadership responsibilities and opportunities, CRM best practices, technological foundations and organizational context of information systems, identification of most effective practices in the internet's newest and revolutionary technologies.

CS-855 Object Oriented Databases

Analysis of extension and formalization concepts in object oriented programming and relational databases, object management systems, persistent programming, object oriented database management systems, prototypes and user interfaces, problems related to temporal and spatial aspects, and review of commercial as well as academic systems.

CS-856 Software Architecture

Advanced architectural techniques, analyzing architectures, varying modeling detail by project needs/type, bridging architecture and code, model-code consistency, architecturally evident coding style, managing model-code drift, model driven engineering and the OMG's MDA, frameworks, API design, architectural refactoring, modeling existing code and systems, risks and their Integration with processes, migration planning, architecture anti-patterns, and survey of architecture resources.

CS-857 Parallel & Distributed Systems

Use of distributed & parallel systems, resource sharing, architectural & fundamental models, networking and internetworking, distributed objects & remote invocation, operating system support, security, distributed file systems, name services, peer-to-peer systems, time & global states, transactions & concurrency control, distributed transactions, replications, mobile & ubiquitous computing, distributed multimedia systems, shared memory, web services, and case study of CORBA.

CS-858 Research Methods

Introduction to research, concepts, ethics & integrity, quantitative research methods, design of quantitative surveys, qualitative research approaches, data collection & analysis, qualitative research articles, mixed-methods design & research, research review and analysis, evaluation methods, and comparison of research techniques.

CS-859 Mobile & Pervasive Computing

Pervasive and wearable computing, pervasive application development, heterogeneity of device platforms, dynamics of application environments, developing context-aware applications and pervasive software, application framework, core application services, layer interaction, overall architecture, operating systems for smartphones, hardware platforms, naming and service discovery, mobile data access, consistency management, mobile networking, application structure & deployment, MDS applications, distributed file systems, security in networks, and latest trends.

CS-861 Operation Research

Overview of operations research, linear programming (LP) and allocation of resources, linearity requirement, maximization and minimization problems, graphical LP minimization solution, LP simplex method, sensitivity analysis, transportation model & methods, assignment

model & methodologies, shortest route schemes, and applications/algorithms of operation research.

CS-950 Selected Topics in Human Computer Interface

Theory and research issues related to user-centric design, interaction design, human-computer-interaction (HCI), internal and external validity, ethics approval and participants consent, gathering and reporting demographic data, assigning participants to test conditions, choosing levels of variables, analyses for main effects and interaction effects, requirements to establish cause and effect relationships, outliers, models of interaction qualitative research methods, use of surveys, interviews, ethnographic research, measuring subjective response, new research topics and their impact in HCI.

Ph.D. Computer Science

DCS & E has recently launched PhD computer science program. It is a full time study program for the scholars to enhance their expertise and professional skills by studying advanced courses and through the application of latest research methodologies. Department is committed to train and produce graduates that have comprehensive knowledge and are capable of integrating their professional education and experience to solve real-life problems through innovative ideas. Program emphasizes on quality research as a gateway to new horizons of scientific knowledge and discovery.

The PhD curriculum is flexible and has been designed considering HEC guidelines. Within the scope of general requirements, students may opt to suit their individual research interests based on their educational backgrounds. Experienced researchers and highly qualified faculty members working in multiple research domains are available to guide the students. Research groups are working in different fields of computer science including major areas such as advanced analysis of algorithms, theory of computation, simulation & modeling, multimedia communication, cryptography and security, computer vision, machine learning, decision support systems, data mining, web engineering, software project management, software quality assurance, requirement engineering, operating systems, next generation networks, parallel & distributed computing, mobile and pervasive computing, artificial Intelligence, image processing, database systems, software engineering, and human computer interaction.

The program comprises of 18 credit hours of course work and 30 credit hours of research. The courses can be selected in consultation with the respective PhD supervisors from the list of graduate courses. The PhD program requires candidates to undertake six graduate level courses and must pass the qualifying examination before undertaking the research work in a chosen area for the doctoral thesis. The courses and their contents in the specialized areas are given as follows:

List of Elective Courses

Computer Networks

Course Code	Course Title	Credit Hours
CS-910	Selected Topics in Computer Networks	3+0
CS-816	Advanced Wireless Networks	3+0
CS-817	Research Trends in Pervasive Computing	3+0
CS-818	Network Performance Evaluation	3+0
CS-819	Information Theory & Coding	3+0

Artificial Intelligence and Image Processing

Course Code	Course Title	Credit Hours
CS-920	Selected Topics in Digital Image Processing	3+0
EC-831	Advanced Digital Signal Processing	3+0
CS-827	Advanced Pattern Recognition	3+0
EC-852	Pattern Recognition & Analysis	3+0
CS-829	Advanced Computer Vision	3+0

Database Management System

Course Code	Course Title	Credit Hours
CS-930	Special Topics in Database Management Systems	3+0
CS-837	Distributed Database Systems	3+0
CS-838	Data Visualization	3+0
CS-839	Multimedia and Web Databases	3+0

Software Engineering

Course Code	Course Title	Credit Hours
CS-941	Selected Topics in Software Engineering	3+0
CS-845	Research Trends in Requirement Engineering	3+0
CS-846	Intelligent User Interfaces	3+0
CS-847	Global System Development	3+0

Elective Courses for MS/PhD

Course Code	Course Title	Credit Hours
EC-805	Microcontroller system design & applications	3+0
EC-803	VLSI Architecture & Design	3+0
EC-809	High performance programming with multicore & GPUs	3+0
CS-873	DSP Processor Architecture and Programming	3+0
EC-825	Embedded Control Systems	3+0
CS-892	Real-Time Systems	3+0
CS-876	Neural and Fuzzy Systems	3+0
CS-877	Soft Computing	3+0
CS-878	Intelligent Systems	3+0
CS-879	Multimedia Systems and Applications	3+0
CS-880	Mobile Communication Systems	3+0
CS-881	Advanced Big Data Analysis	3+0
CS-882	Contemporary Issues in Distributed Database Systems	3+0
CS-883	Advanced Cloud Computing	3+0
CS-884	Advanced Evolutionary Computing	3+0
CS-885	High Performance Computing	3+0

Course Contents

CS-910 Selected Topics in Computer Networks

Network measurements, volunteer computing, IoT, architecture, privacy and security in networks, social networks, software define networking, communication & topology management, self-organizing behavior in peer-to-peer networks, dynamic response to critical environmental threats, altruism and sacrifice in collective behaviors, cooperative navigation among mobile sensors, mobility-aided communication mechanisms, self-healing distributed systems and adaptive energy management in sensor networks.

CS-816 Advanced Wireless Networks

Overview of techniques in design and operation of first, second, and third generation wireless networks, cellular systems, medium access techniques, radio propagation models, error control techniques, handoff, power control, common air protocols, radio resource and network management. As an example for the third generation air interfaces, WCDMA shall be discussed as a case study for analyzing its large impact on future wireless networks.

CS-817 Research Trends in Pervasive Computing

Review of pervasive computing and its security, challenges to the security and privacy, Effects of changes in computing paradigm on traditional security models, new security solutions to address the challenges in pervasive computing systems, security issues in ubiquitous computing, privacy violations using online services, security policies, security for mobile devices, trusted security, reputation systems, context-aware security, multi-factor, and persistent/continuous authentication.

CS-818 Network Performance Evaluation

Advances in networks and protocols, evaluation of networks using analytical, simulation and experimental methods, design of networks & protocols, investigation and management of networking tools and techniques, computer network performance metrics, performance evaluation techniques, workload characterization, simulation/analytic models, empirical measurement studies, choice of measurement tools, and design of measurement experiments.

CS-819 Information Theory & Coding

Information as measurable quantity, information contents of a message, source coding for discrete memory-less channel, information transmission, discrete channel capacity, analysis and evaluation of Shannon Harley theorem, Huffman coding, error correcting methods, entropy, advanced techniques and their impact, theory and coding algorithms and their effect on data processing, compression, transmission costs and storage.

CS-920 Selected Topics in Digital Image Processing

Feature descriptors, scale invariant feature transform (SIFT), SIFT-PCA, speeded up robust features, advanced methods of image segmentation, image super-resolution, image registration, color image processing techniques, shape analysis, applications including face detection and recognition, latest research problems and their solutions using modern tools and methodologies.

CS-827 Advanced Pattern Recognition

Advance level transformations techniques, camera model and imaging geometry, multi-view, geometry,

stereopsis, linear filters, edges, texture, segmentation by clustering pixels, split and merge, mean shift algorithm, graph-theoretic clustering, fitting a model-Hough transform, motion analysis and tracking, model-based vision, and finding templates using classifiers.

CS-829 Advanced Computer Vision

Color Vision, multiple view geometry, camera calibration, 3D reconstruction, object recognition, optical flow and motion analysis, perceptual grouping, background modeling, detection and tracking, robotic vision, gesture and facial expression recognition, and activity recognition.

CS-837 Distributed Database Systems

Distributed database systems, background of relational data model and computer networks, database architectures, design approaches, horizontal & vertical fragmentation, replication, transaction management, distributed concurrency control, query processing and query optimization in distributed environment, parallel processing, parallel DBMSS issues, distributed

object database management systems, and database interoperability.

CS-838 Data Visualization

Cognitive load theory, communication design, identification of chart junk, graphical integrity, optimization of data-ink in multivariate data sets, info-graphics, vector graphics and interactive data visualization using JavaScript.

CS-839 Multimedia and Web Databases

Multimedia data, human sensory system and multimedia, database approach for the management of multimedia information, multimedia databases, object-oriented multimedia DBMS, SQL & multimedia, multimedia query specification language, querying multimedia data, modeling multimedia databases, multimedia and the internet, quality-of-service issues, synchronization and user interaction, model for interactive retrieval of videos and still images, latest developments and research trends in multimedia database systems, and contemporary issues.

CS-845 Research Trends in Requirement Engineering

Systematically establishing, defining and managing the requirements for a large, complex, changing and software-intensive systems from technical, organizational and management perspectives, past, present and future paradigms and methodologies in requirements engineering, informal, semi-formal and formal approaches, requirements engineering process and requirements engineering product concerning both functional and non-functional requirements by using a systematic decision-making process.

CS-846 Intelligent User Interfaces

design aspects of state-of-the-art intelligent user interfaces (IUIs) / interactive intelligent systems, intelligent systems based on semantic technologies, user modeling, cognitive architectures, metacognition and introspection, learning and automatic adaptation and planning in IUIs, input and output modalities and perception towards multimodal interaction, conversational agents, question answering emotions and affective/accessible computing, human computation, and collaborative multimodality.

CS-847 Global System Development

Application development and application maintenance sing on-shore, near-shore and offshore resources, complexity and challenges between theories and operational business, costs and flexibility of services to clients, flexibility in addressing rapidly changing business conditions, use of proven methodologies and processes to improve the overall quality of application development and application maintenance. Increase of productivity and efficiency of existing application development and application maintenance infrastructure.

CS-878 Intelligent Systems

Intelligent schemes for advanced pattern recognition, modeling of dynamical systems, neural networks, expert systems and fuzzy systems, evolutionary computing, learning theory, constraint processing, logic programming, probabilistic reasoning, computer vision, speech processing, natural language processing, application of model-based optimization scheme to practical problems, rule-based and model-based fuzzy control, stability analysis, and multivariate systems and applications.

CS- 879 Multimedia Systems and Applications

Multimedia modalities, interaction, objects & agents, communication, artificial languages, interactive multimedia systems, knowledge and user understanding, knowledge elicitation, user profiling &modeling, interaction & interface, modalities and the interface, functionality and usability, visual appearance and graphic design, multimedia content, semiotics and media, text and sound, visual perception of text, images on page, combining sound channels, technology of sound, representational images, juxtaposition of images, perception of motion, modern languages of film and television.

CS-880 Mobile Communication Systems

Review of the techniques for antennas, radio propagation, communication diversity, channel coding and modulation, multiple access and cellular methods, medium access control protocols, IEEE 802.11, network architecture and mobility protocols, LTE networks, security in mobile networks, ad-hoc networks, economic, health, social aspects, and 4G and 5G networks.

CS-881 Advanced Big Data Analysis

Importance of big data analysis, dimensions of big data, storage, delivering business benefit from big data, selecting data sources for analysis, eliminating redundant data, big data stores, choosing the correct data stores based on data characteristics, moving code to data, Integrating disparate data stores, mapping data to the programming framework, tools and techniques to analyze big data, big data strategies, and implementation big data solutions.

BS Computer Engineering

The Bachelor of Science Computer Engineering (BSCE) program has been designed to produce quality computer engineers for taking competitive jobs in the national and international market relating to the field of computer engineering. This program focuses on the integration of concepts of software and hardware knowledge for design, development and operation of real-time computer systems. In the present era, the sophisticated computer-based systems permeate all spheres of life and are being actively used in a wide variety of engineering disciplines and technologies.

The BSCE discipline covers modern applications covering electronics, logic design, computer architecture, algorithmics, programming, signals & systems, communication networks, microprocessors & interfacing, communication systems, digital system design, embedded systems, parallel and distributed computing, communications systems, digital signal processing, digital image processing, etc. The BSCE curriculum meets requirements of Pakistan Engineering Council (PEC) and Higher Education Commission (HEC) of Pakistan.

The duration of the program is 4 years (8 semesters) and consists of courses from a wide range of topics which are taught at foundation, breadth and depth level of computer engineering.

The foundation courses provide basic concepts to the students to understand fundamentals of computer engineering. The breadth level courses give exposure to a number of important areas closely related to the field of computer engineering and the depth level courses offer advanced topics and contain a substantial design component. In the last two semesters, every student is required to take a six credit hours' final year project that involves design, testing, analysis and implementation of a prototype system, which covers both hardware and software. To thoroughly understand design concepts pertaining to the field of computer engineering, a number of mathematics courses have also been included in the curriculum.

We strongly believe that the in-depth knowledge of computer engineering and allied disciplines is extremely useful for our students in order to find right solutions for the complex engineering problems. In this context, our program consists of realistic proportion of computer and electrical engineering courses that make a solid foundation for the design and implementation of efficient and effective automated computer systems for their optimized performance. The semester-wise breakdown of BS Computer Engineering curriculum is appended as follows:

Curriculum

Semester-1

Course Code	Course Title	Credit Hours
BS-101	Engineering Physics	3+0
HS-101	English	3+0
MT-101	Calculus & Analytical Geometry	3+0
EE-101	Engineering Workshop	0+1
HS-102	Pakistan Studies	2+0
EC-110	Computing Fundamentals	2+1
	Total Credit Hours	**15**

Semester-2

Course Code	Course Title	Credit Hours
HS-103	Communication Skills	3+0
MT-102	Linear Algebra and Differential Equations	3+0
EE-103	Network Analysis	3+1
EC-111	Programming Fundamentals	3+1
EC-121	Digital Logic Design	3+1
	Total Credit Hours	**18**

Semester-3

Course Code	Course Title	Credit Hours
MT-201	Complex Variables & Transforms	3+0
IS-211	Islamic Studies	2+0
ME-211	Computer Aided Engineering Drawing	0+1
EC-225	Discrete Structures	3+0
EE-205	Electronic Devices and Circuits	3+1
EC-230	Object Oriented Programming	3+1
	Total Credit Hours	**17**

Semester-4

Course Code	Course Title	Credit Hours
EC-201	Engineering Project Management	3+0
MT-202	Numerical Methods	3+0
EC-222	Data Structures & Algorithms	3+1
EC-223	Signals and Systems	3+1
EC-228	Computer Architecture and Organization	3+1
	Total Credit Hours	**18**

Semester-5

Course Code	Course Title	Credit Hours
HS-201	Technical Report Writing	3+0
MT-302	Probability and Statistics	3+0
EC-332	Computer Communication Networks	3+1
EC-333	Microprocessor and Interfacing Techniques	3+1
EC-334	Database Systems	3+1
	Total Credit Hours	**18**

Semester-6

Course Code	Course Title	Credit Hours
CS-204	Software Engineering	3+0
EC-231	Operating Systems	3+1
EC-341	Digital System Design	3+1
EC-390	Digital Signal Processing	3+1
xx-xxx	EC Depth Elective – I	2+1
	Total Credit Hours	**18**

Semester-7

Course Code	Course Title	Credit Hours
HS-401	Professional Values & Ethics	2+0
EE-304	Communication Systems	3+0
xx-xxx	IDEE – I	2+1
xx-xxx	IDEE – II	2+1
xx-xxx	EC Depth Elective – II	2+1
EC-499	Final Year Project – I	0+3
	Total Credit Hours	**17**

Semester-8

Course Code	Course Title	Credit Hours
HS-402	Economics	3+0
HS-403	Management & Entrepreneurship	3+0
xx-xxx	EC Depth Elective – III	2+1
xx-xxx	EC Depth Elective – IV	2+1
EC-499	Final Year Project – II	0+3
	Total Credit Hours	**15**

Total Courses: 43
Total Credit Hours: 136

Elective Courses

Course Code	Course Title	Credit Hours
EC-442	Embedded Systems	2+1
EC-444	Parallel & Distributed Computing	2+1
EC-445	System Programming	2+1
EC-448	Robotics	2+1
EC-482	Network Security & Cryptography	3+0
EC-465	Software Project Management	2+1
EC-467	Mobile Application Development	2+1
CS-305	Computer Graphics	2+1
EC-481	Wireless and Mobile Networks	3+0
EC-483	Fault Tolerant Computing	3+0

Inter–Disciplinary Engineering Elective Courses

Course Code	Course Title	Credit Hours
CS-302	Artificial Intelligence	2+1
CS-308	Software Quality Assurance	3+0
CS-309	Web Application Engineering	2+1
CS-406	Digital Image Processing	2+1
CS-407	Fundamentals of data mining	2+1

Course Contents

BS-101 Engineering Physics

Wave motion, mathematical concepts of simple and damped harmonic motion, analytical treatments of superposition of waves, basics of electricity (Ohm's law KCL KVL), electric charge, Coulomb's Law, electric field and intensity, electric potential, capacitors and charge storage concepts, magnetism, magnetic fields, Faraday's and Lenz's laws, Ampere's law and its applications, Eddy currents, inductance, induced current and their applications, basics of optics, introduction to semiconductor physics, atomic structure of elements, energy band diagram for solids, intrinsic semi-conductor and extrinsic semi-conductors, electron hole pairs, distribution of electrons and holes in a conduction and valence band, recombination and life time.

HS-201 Technical Report Writing

For contents please refer to page number 29

HS-103 Communication Skills

For contents please refer to page number 30

HS-101 English

For contents please refer to page number 30

EE-101 Engineering Workshop

For contents please refer to page number 26

EC-110 Computing Fundamentals

Introduction to numbers systems, CPU, memory, input/output devices, data organization, file storage, programs and software, system and application software, operating systems, communication technology, compiler, DBMS, computer networks and internet, WWW, web mail applications, computer graphics, AI, viruses and anti-viruses, programming languages, compilation and interpretation, problem specification, algorithms, flow chart, pseudo code, basic programming techniques, data types and declaration, header file and linkage, variables and constants, arrays, input/output, termination, remark, control structures, branching, conditional structures, repetition and loops, basic library functions.

EE-103 Network Analysis:

For contents please refer to page number 26

EC-111 Programming Fundamentals

Fundamental programming concepts, Translation of algorithms to programs, data types, variables, expressions, control structures, problem solving using sequence, selection and iteration, functions, arrays, strings, structures, pointers, records, file handling, design, development and testing of complex engineering problems.

EC-121 Digital Logic Design

Number systems, logic gates, boolean algebra, combination logic circuits and designs, simplification methods K-maps, Quinne Mc-Cluskey, flip flops and latches, asynchronous and synchronous circuits, counters, shift registers, shift registers counters, triggered devices & its types, binary arithmetic and arithmetic circuits, memory elements, state machines, introduction programmable logic devices (CPLD, FPGA), lab assignments using tools such as Verilog HDL/VHDL, Logisim, etc.

EC-201 Engineering Project Management

To develop ability to plan and manage computer engineering projects successfully, maximizing the return from each stage of the hardware and software development life cycle.

HS-401 Professional Values & Ethics
For contents please refer to page number 31

HS-402 Economics

For contents please refer to page number 31

EC-222 Data Structures & Algorithms

Fundamentals of data structures, data types, abstract data types, user defined data types, algorithms and their complexity, time-space trade off, arrays, records and pointers, matrices, linked lists, circular lists, two way lists, sequential (array) and linked implementation of stacks and queues, polish notation, recursion, towers of Hanoi, recursive implementation of stacks and queues, priority queues, tree, binary tree, binary search tree, traversals, heap, general trees, graphs, depth-first/breadth first traversal, adjacency matrix, shortest distance algorithms, sorting (insertion sort, selection sort, merge sort, radix sort), hashing, searching: (linear search, binary search, depth first /breadth first search).

ME-211 Computer Aided Engineering Drawing:

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EC-223 Signal and Systems

Linear time-invariant systems, convolution integral for continuous-time systems, convolution sum for discrete-time systems, properties of linear time-invariant systems, systems described by differential and difference equations, Fourier Series, properties of continuous-time Fourier series, continuous-time Fourier transform and its inverse, properties of the transform, common transform pairs, discrete-time Fourier transform and its properties, frequency response corresponding to difference equations. sampling, uniform sampling, sampling theorem, aliasing, decimation, interpolation. Laplace Transform, region of convergence, properties, analysis of LTI systems, solution of differential equations, continuous and discrete-time filtering.**EC-225 Discrete Structures**

The Foundation: logic and proofs, basic structures,

sets, functions, sequence, and sums, the fundamentals: algorithm, the integers, and matrices, induction and recursion, counting, advanced counting techniques, relations, graphs, trees, Boolean algebra, modeling computation.

EE-205 Electronic Devices and Circuits

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EC-228 Computer Architecture and Organization

Difference between architecture & organization, introduction to Flynn's classification of computer architecture (SISD, SIMD, MISD, MIMD systems), design of computer systems and components, processor design, CPU architecture, functional blocks and development of instruction set, design of basic functional blocks PC,IR,CU,ALU etc.), instruction set design, and addressing, control structures and microprogramming, memory management, caches, and memory hierarchies, and interrupts and I/O structures, pipelining of processor Issues and hurdles, exception handling, parallelism, multiprocessor systems, Introduction to superscalar processors (CISC, RISC), cache memory, different designs of cache memory system, virtual memory system, address mapping using pages, pipelining and threading, instruction level parallelism (ILP), introduction to parallel processing, branch prediction, pre-fetching, multithreading.

EC-230 Object Oriented Programming

Concepts of object oriented paradigm, encapsulation, inheritance, polymorphism, abstract classes and interfaces, overloading and overriding, object-oriented design, event-driven programming, Event propagation, exception handling, threading, multi- threading, packages, recursion, use of stacks, queues and lists from API, building GUI applications.

EC-231 Operating Systems

Evolution of operating systems, different types of operating systems, computing environment, computer system operation, I/O and storage structure, hardware protection, system architecture, system components, services, system calls & programs, virtual machines, systems design and implementation, process scheduling, operations on processes, inter-process communication, client-server systems, threads & threading models, thread types & issues, threads on popular operating systems, CPU scheduling, criteria & algorithms, real-time scheduling & solution, critical-section problem, synchronization, critical-section resolution methods, deadlock characterization, handling of deadlocks, deadlock prevention, detection & recovery, address binding for memory management, swapping, memory allocation, paging, segmentation, virtual memory, file system concept, access methods & protection.

CS-305 Computer Graphics

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EC-332 Computer Communication Networks

Introduction of computer networks and services, network design principles, OSI and TCP/IP reference models, network topologies, the physical layer and data communication fundamentals, transmission medias, data encoding, data communication interfaces, data link layer and its protocols, multiplexing, FDM and TDM, medium access control and various multiple access methods, ethernet and token ring systems, wide area networks, network layer and routing, hub, bridges and switches, internetworking, IP protocol, IP addressing, transport layer, services provided by transport layer, TCP & UDP, congestion control & quality of service, application layer, domain name system, worldwide web, overview of network security.

EC-333 Microprocessor and Interfacing Techniques

Introduction to microprocessors and microcontrollers, microprocessor organization, internal/external architecture of example microprocessors, addressing techniques, addressing modes, machine language coding and the debug software development program, instruction set, assembly language program development through hardware and the MASM assembler, memory devices, cycles and sequencing, interfacing, microcontrollers, microprocessor applications, interrupts and ISRs, timings, I/O interfacing.

EC-334 Database Systems

User interface, data independence, user view, three data models (relational, hierarchical, network, object oriented), conceptual, logical and physical database design and evaluation, normalization, query languages, query optimization, security, integrity and concurrency protocols, introduction to SQL and its application to RDBMS, database design, model building, data table, forms & reports, database administration.

EC-341 Digital System Design

High-level digital design methodology using VHDL/Verilog, design, implementation, and verification, application requiring HW implementation, floating-point to fixed-point conversion, architectures for basic building blocks, adder, compression trees, and multipliers, transformation for high speed using pipelining, retiming, and parallel processing, dedicated fully parallel architecture, time shared architecture, hardwired state machine based design, micro program state machine based design, FPGA-based design and logic synthesis.

EC-390 Digital Signal Processing

Applications of DSP, digital signals, systems and convolution, flip and slide convolution & frequency response, Fourier transform and frequency response, discrete time Fourier transform, symmetry properties, sampling theorem & D/A reconstruction, DFT and FFT algorithms, DFT properties & circular convolution (spectrum analysis & windowing), FFT algorithms and high speed (block) convolution, Z-transform and its properties with inverse, FIR and IIR filters and their implementations, FIR filter design methods, IIR filter design methods, resolution & side lobes, spectrum analysis, power spectrum for random signals, porting of DSP algorithms on embedded systems especially on DSP chips including fixed point programming.

HS-403 Management and Entrepreneurship

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EC-442 Embedded Systems

Trends and challenges in embedded system design, the microcontroller architecture, assembly language programming, addressing modes and instruction set, I/O ports programming, TIMER and SERIAL and PARALLEL port programming, interrupts, interfacing, A/D and D/A conversion, interfacing and application using PWM.

EC-444 Parallel and Distributed Computing

This course introduces the concepts and design of distributed computing systems, difference between processes and processors, parallel computer architecture, introduction to parallel programming, performance measurement, process management and migration, message passing, remote procedure calls (RPC), Java RMI, CORBA, service oriented architecture (SOA), mobile agents, distributed

coordination, distributed shared memory, distributed file systems and fault tolerance.

EC-445 System Programming

Introduction to system program, Linux architecture: overview & basics, programs, processes & threads, file and directory structure, i/o processes, i/o efficiency, error handling, user identification, file sharing, atomic operations, file types, file access permissions, UNIX special files, pipes, terminal control & queues, login accounting, system identification, time and date routines, signals & timers, signal concepts, signal function, interrupted system calls, POSIX threads, thread limits, thread attributes, synchronization attributes, reentrancy, thread synchronization.

EC-448 Robotics

Introduction, components and subsystems, object localization, spatial description and transformations, kinematics (manipulator position / motion), statics, dynamics, mobile robots, task planning, sensors measurement and perception, control, programming.

EC-467 Mobile Application Development

Introduction to mobile computing, development environment, factors in developing mobile applications, HTML5 for mobiles, frameworks, user-interface, text-to-speech techniques, intents and services, storing and retrieving data, communications via network and the web, telephony, notifications and alarms, graphics, multimedia, location, hardware sensors, developers and app store license agreements, security and

hacking, platforms issue.

EC-482 Network Security and Cryptography

Introduction, computer security concepts, OSI security architecture, classical encryption techniques, block ciphers and stream cypher, passive attacks, active attacks, symmetric encryption, RC4, public key cryptography DES, triple DES, AES, key distribution and user authentication, cryptographic hash functions MD5, digital signatures, key management and distribution, user authentication protocols, TLS, malicious software, firewall, HTTPS, S/MIME, security attacks, DoS attacks, spoofing, spams, session hijacking, wireless security, internet security, antiviruses, digital immune system.

EC-465 Software Project Management

Introduction to project management, principals of project management, integrated software engineering project planning (project infrastructure, characteristics, activities (work breakdown structure), iterative planning, size, resource, cost and schedule estimation), project activity planning (network), resource requirements, scheduling, and allocation, monitoring and controlling progress, project organization and staffing, risk analysis and management, client management, project direction and control, project progress visibility: matrices and measurement, configuration management.

EC-481 Wireless and Mobile Networks

introduction to wireless communication, wired vs. wireless communication, electromagnetic spectrum, design challenges, wireless transmission, evolution of wireless networks, channel planning for wireless system, issues, QoS, security, multimedia services and applications, WLANS, WiMax, wireless pan, CDMA One/IS-95, wireless CDMA design considerations, walsh codes, IS-95 reverse link, EDGE, WCDMA/ UMTS, transport and physical channels, signaling, physical layer procedures, compressed mode measurements, handover measurements, CDMA-2000, mobile ad hoc, security, WEP protocol, mobile IP, introduction to wireless mesh networks, characteristics, WSN, high rate WPAN , ZigBee, OFDM, OFDMA, fundamentals of cellular concepts, 1G/2G/2.5G/3G cellular networks, trunking and grade of service, measuring traffic intensity, trunked systems, Erlang charts, improving coverage and capacity, GSM specifications, call routing in GSM, GPRS, EDGE, limitation of 3G, 4G objectives, 4G overview, mobility management, handoff types, QoS considerations.

EC-483 Fault Tolerant Computing

Introduction to digital system testing, economics of testing, fault models, test generation at gate level and switch level, random test generation, BIST for memories, fault diagnosis and reconfiguration, simulation based test generation, design for testability.
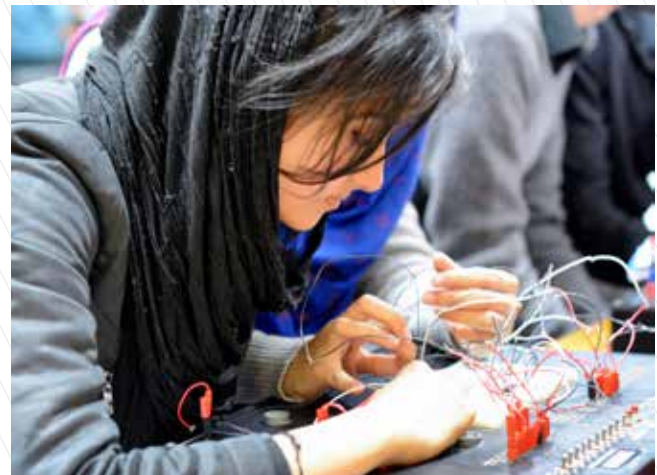
Computer Science and Engineering Laboratories

Practical experience is part and parcel of every professional institution. The Department of CS&E maintains a wide variety of state-of-the-art laboratories. There are seven dedicated, spacious and well-equipped laboratories, providing software and hardware resources. The manuals of all lab experiments have been prepared and are in-line with curriculum of the program. All the laboratories are equipped with latest machines with licensed and updated software. Lab experiments are conducted by the experienced and qualified lab engineers under the guidance of faculty members. The latest, state-of-the-art PC workstations are set up with wired and wireless internet access to facilitate students in completing their assignments, lab reports, etc. The detail of laboratories is given below:

Computing Lab

This general purpose Computing Lab provides open access support for computer science and computer engineering students. All general purpose software packages are installed on the latest machines. This lab is dedicated for core computing courses such as programming fundamentals, object-oriented programming, data structures and algorithms etc.

Digital Signal Processing

Each machine of this lab provides specialized software in addition to general purpose software design and application. This laboratory is dedicated for core computing and signal processing courses. Students can get maximum benefit by having hands-on experience by utilizing the latest workstations and simulation tools and training kits required for the completion of experimental work.

Embedded Systems Lab

It provides embedded and other hardware resources that are required to design, analyze and implement embedded systems. In addition, the lab also has a number of analog and digital equipment required for experimentation and project completion at both junior and senior level of undergraduate studies.

Data Communication and Networks Lab

It is utilized to conduct experiments for communication courses in the field of wired and wireless communication. It helps the students in grasping theoretical concepts and visualization of data transmission in terms of bits and bytes. Peer-to-peer and client-server models along with various network topologies are demonstrated. Different simulation packages are installed in the lab to get an in-depth understanding and practical exposure to network communication technologies.

Artificial Intelligence Lab

The Artificial Intelligence (AI) lab focuses on advancing computer vision and decision-making systems necessary for computers to make critical decisions when interacting with the world. It grately helps students to do where in different areas such as rational decision making, distributed systems of multiple agents, machine learning, reinforcement learning, cognitive learning, game theory, natural language processing and robotics.

Database Systems Lab

A wide variety of graphics, CAD, database management software, and other software packages are available on these machines. Students use this lab heavily for designing database solutions, generating queries,

implementing interactive processing and developing most suitable GUIs.

Electronics Lab

Electronics lab is equipped with components such as diodes, transistors, operational amplifiers, oscilloscope, power supplies and function generators which are essentially required to practically implement the theoretical concepts of electronic systems.

Digital Systems Lab

Digital systems lab is designed for the understanding of digital logic concepts and consists of oscilloscopes, digital trainers, digital multi-meters, function generators, 8086 microprocessor kits and supporting accessories. Implementation of adders, subtractors, logic circuits, decoders, encoders, multiplexers, combinational circuits, sequential logic circuits, flip-flops, counters and registers is also carried out in this lab. It also covers practical implementation of microprocessor and interfacing techniques.

Electronic Workshop Lab

Electronic workshop lab provides hands-on experience to students about different electronic measuring equipment such as oscilloscopes, Meggers, analog/digital multi-meters and single/three-phase watt-meters.

Computer Aided Engineering Drawing (CAED) Lab

CAED Lab has been established to address the basic designing needs of all areas of engineering including building design, floor plans in civil engineering, component design in mechanical engineering and preparation of schematic diagram for machines

and various component in electrical and electronics engineering.

MS Computer Engineering Program

The Department of Computer Science and Engineering offers also Master of Science in Computer Engineering (MSCE). The MSCE program is designed to prepare students for technically demanding career in industry as well as for higher studies in computer engineering. It involves knowledge of hardware and software development. The students learn how to design new generations of computers and embedded computing systems such as those found in smartphones, cars, appliances, computer networks, smart factories and the internet-of-things.

The program covers the entire digital integrated circuit design process targeting Field Programmable Gate Arrays (FPGAs) and Application Specific Integrated Circuits (ASICs) using various optimization criteria such as speed, cost, power, energy, reliability and security. It also encompasses the complete software development process targeting microcontrollers, microprocessors, multi-cores and Graphics Processing Units (GPUs). It teaches students how to efficiently partition the system into software and hardware components, and develop high-performance interfaces between these two parts. It exposes students to modern computer-aided design tools for hardware and software design.

To fulfill the MS degree requirements, a student needs to complete 30 credit hours. Thesis and Non-thesis options are available to the students. The thesis option requires 8 courses of 24 credit hours and 6 credit hours of thesis whereas for the non-thesis option, a student is required to take 10 courses of 30 credit hours besides writing a technical report on the given topic.

The curriculum is given as follows: -

Curriculum

Semester-1

Course Code	Course Title	Credit Hours
EC-xxx	Core – I	3
EC-xxx	Core – II	3
xx-xxx	Elective – I	3
	Total Credit Hours	**9**

Semester-2

Course Code	Course Title	Credit Hours
EC-852	Core – III	3
EC-xxx	Specialization Elective – I	3
xx-xxx	Elective – II	3
	Total Credit Hours	**9**

Semester-3

Course Code	Course Title	Credit Hours
EC-xxx	Specialization Elective – II	3
xx-xxx	Elective – III	3
EC-899	Thesis	3
	Total Credit Hours	**9**

Semester-4

Course Code	Course Title	Credit Hours
EC-899	Thesis	3
	Total Credit Hours	**3**

Core Courses

The candidate has to complete a minimum of three core courses from the following list. The department may offer core/elective courses from the given list, but not limited to this list, as per the availability of resources.

Course Code	Course Title	Credit Hours
EC-801	Advanced Computer Architecture	3+0
EC-802	Advanced Digital Systems Design	3+0
EC-803	VLSI Architecture and Design Methodologies	3+0
EC-821	Advanced Embedded Systems	3+0
EC-831	Advanced Digital Signal Processing	3+0
EC-861	Advanced Operating Systems	3+0
CS-802	Advanced Algorithms Analysis	3+0

Specialization Electives

Candidate has to select a minimum of two (2) from one of the specialization streams and three (3) elective courses from any stream.

Hardware Design

Course Code	Course Title	Credit Hours
EC-804	Advanced Microprocessor and Microcontroller Design	3+0
EC-805	Microcontroller System Design and Applications	3+0
EC-806	System on Chip Design	3+0
EC-807	HW/SW Co-Design	3+0
EC-808	FPGA Based Systems	3+0
EC-809	DSP Integrated Circuits	3+0
EC-810	Advanced FPGA Design	3+0
EC-811	Parallel Processing Architecture	3+0
EC-812	RISC Processor Architecture and Programming	3+0
EC-813	High Performance Programming with Multicore and GPUs	3+0

Embedded Systems

Course Code	Course Title	Credit Hours
EC-822	Embedded Communication Software Design	3+0
EC-823	Architecture and Design of Distributed Embedded Systems	3+0
EC-824	Software Modeling for Embedded Systems	3+0
EC-825	Embedded Control Systems	3+0
EC-826	Application of MEMS Technology	3+0
EC-829	Real Time Operating Systems	3+0

Artificial Intelligence and Scientific Computing

Course Code	Course Title	Credit Hours
EC-851	Soft Computing	3+0
CS-878	Intelligent Systems	3+0
EC-853	Pattern Recognition & Analysis	3+0
EC-854	Neural and Fuzzy Systems	3+0
CS-823	Machine Learning	3+0
CS-824	Artificial Neural Networks	3+0

Computer Networks and Distributed Computing

Course Code	Course Title	Credit Hours
EC-872	Data Communication & Networks	3+0
EC-876	Embedded Wireless Sensor Networks	3+0
EC-877	Embedded Networking	3+0
EC-878	Adhoc Networks	3+0
EC-879	Distributed Embedded Computing	3+0
CS-811	Advanced Computer Networks	3+0
CS-815	Cryptography & Network Security	3+0
CS-859	Mobile and Pervasive Computing	3+0

General Electives

Course Code	Course Title	Credit Hours
EC-832	Advanced Digital Image Processing and Applications	3+0
CS-829	Advanced Computer Vision	3+0
EC-842	Wireless and Mobile Communication	3+0
CS-879	Multimedia Systems and Applications	3+0
EC-890	Robotics and Control	3+0
EC-891	Pervasive Devices and Technology	3+0
EC-892	Real Time Systems	3+0
EC-893	Applied Mathematics for Engineers	3+0
EE-713	Real Time DSP Design and Application	3+0
EE-717	Statistical Signal Processing	3+0

Course Code	Course Title	Credit Hours
EE-719	Array Signal Processing	3+0
EE-723	Advanced Digital Communication	3+0
EE-728	Smart Antennas	3+0
CS-831	Advanced Database Management Systems	3+0
CS-832	Data Mining	3+0
CS-833	Data Warehousing	3+0
CS-834	Web Engineering	3+0
CS-835	Advanced Web Analytics	3+0
CS-836	Semantic Web	3+0
CS-841	Advanced Software Engineering	3+0
CS-843	Advanced Software Quality Assurance	3+0
CS-858	Research Methodology	3+0

Course Description of MS Computer Engineering

EC- 801 Advanced Computer Architecture

processors and memory hierarchy, fundamentals of computer design, parallel and scalable architectures, multiprocessor system interconnects, scalable and multithreaded architectures, pipelining and superscalar techniques, performance issues, extending the MIPS pipeline to handle multi-cycle operations, parallel programming models, code optimization and scheduling, trace scheduling compilation, parallelization and wave fronting, software pipelining, parallel programming environments, synchronization and multiprocessing modes, and locks for protected access.

EC- 802 Advanced Digital Systems Design

Sequential circuits design, design of CSSN and iterative circuits, ASM realization, analysis of asynchronous sequential circuit (ASC), design of ASC, designing vending machine controller, fault diagnosis and testability algorithms, DFT schemes, built-in self-test, synchronous design using programmable devices, sequential circuit with programmable array logic; architecture and application of field programmable logic sequence, architecture with EPLD, PEEL, realization state machine using PLD, Xilinx FPGA, Xilinx 2000/4000 family. VHDL based designing with PLD-ROM, PAL, PLA, sequential PLDs, and case study – Keypad Scanner.

EC-803 VLSI Architecture and Design Methodologies

Overview of digital VLSI design methodologies, logic design with CMOS, IC fabrications, trends in IC technology, programming techniques and technologies, re-programmable devices' architecture, function and I/O blocks, system/FPGA partitioning, partitioning methods, floor planning, placement- physical design flow, routing, design of CMOS 2 stage and 3 stage Op-Amp, high speed and high frequency Op-Amps, digital design with Verilog HDL, modeling, Verilog and logic synthesis-simulation, design examples, ripple carry adders, carry look ahead adders, multiplier, ALU, shift registers, multiplexer, comparator and test bench.

EC-804 Advanced Microprocessor and Microcontroller Design

Microprocessor architecture, virtual memory and paging, segmentation, pipelining, Instruction level parallelism, RISC versus CISC, On-chip register files versus cache evaluation, high performance CISC architecture – Pentium, paging, protection, multitasking, exception and interrupts, programming of the Pentium processor, high performance RISC architecture – ARM, Motorola 68HC11 microcontrollers, serial communication interface, A/D converter, hardware expansion, basic assembly language programming, PIC microcontroller, CPU architecture, instruction set, interrupts, timers, memory, I/O port expansion, i2c bus for peripheral chip access, A/D converter, UART.

EC-805 Microcontroller System Design and Applications

8051 architecture, memory organization, addressing modes, instruction set-timers, interrupts, I/O ports, interfacing I/O devices, serial communication, assembly language programming, RTOS for 8051, LCD digital clock using full RTOS, PIC microcontroller design, PIC programming, timer programming, peripherals of PIC microcontroller, sensor interfacing, flash and EEPROM memories, system design – case study, interfacing LCD display, keypad interfacing, generation of gate signals for converters and inverters, motor control, controlling DC/AC appliances, measurement of frequency, and stand-alone data acquisition system.

EC- 806 System on Chip Design

System-level and SoC design methodologies & tools,

HW/SW co-design, analysis, partitioning, real-time scheduling, hardware acceleration, virtual platform models, co-simulation and FPGAs for prototyping of HW/SW systems, transaction-level modeling, electronic system-level languages: system, high-level synthesis, allocation, scheduling, binding, resource sharing, pipelining, SoC and IP integration, verification and testing.

EC-807 HW/SW Co-Design

Models for describing hardware and software components (specifications), system design, hardware-software partitioning, design space exploration, performance analysis and estimation techniques, current and hot topics related to HW/SW co-design, thermal-aware design and control.

EC- 808 FPGA Based Systems

Introduction to ASICS, CMOS logic and ASIC library design, programmable logic cells and I/O cells, interconnects and ASIC design software - Actel ACT, Xilinx LCA, Xilinx EPLD, Altera MAX 5000 and 7000, Altera MAX 9000 Altera FLEX, design systems, logic synthesis, logic synthesis, simulation and testing - Verilog and logic synthesis, VHDL and logic synthesis, types of simulation, boundary scan test, fault simulation, automatic test pattern generation built-in self-test, floor planning, placement and routing - System partition, FPGA partitioning, partitioning methods, floor planning, placement, physical design flow, global routing, detailed routing, special routing, circuit extraction, DRC.

EC- 809 DSP Integrated Circuits

DSP IC's and VLSI circuit technologies - standard digital signal processors, application specific IC's for DSP, DSP systems & system design, IC design, VLSI process technologies, digital signal processing, sampling, transfer functions, adaptive DSP algorithms, image coding, digital filters and finite word length effects - FIR filters & structures, FIR chips, IIR filters, mapping of transfer functions, multi-rate systems, interpolation, scaling of signal levels, sensitivity and noise, DSP system architectures, multiprocessors and multi-computers, mapping of DSP algorithms onto hardware, arithmetic units and integrated circuit design - number systems, bit-parallel and bit-serial arithmetic, basic shift accumulator, complex multipliers, improved shift-accumulator, layout of VLSI circuits, FFT processor, DCT processor and interpolator as case studies.

EC- 810 Advanced FPGA Design

introduction to ASICs, CMOS logic and ASIC library

design, programmable logic cells and I/O cells - digital clock managers, block & distributed RAM, LUT based structures, phase locked loops, select I/O resources, device architecture, Spartan 6, Vertex 4 architecture, Altera cyclone and Quartus architectures, Verilog and VHDL, logic synthesis, fault simulation, boundary scan test, built-in self-test, scan test, system partition, FPGA partitioning, floor planning, placement, physical design flow, global, detailed and special routing, circuit extraction, and DRC.

EC- 811 Parallel Processing Architecture

Parallel computer models, multiprocessor and multicomputer, multi-vector and SIMD computers, PRAM and VLSI models, architectural development tracks, parallelism, program partitioning & scheduling, program flow mechanisms, system interconnect architectures, performance matrices and measures, parallel processing applications, scalability analysis and approaches, advanced processor technology, superscalar and vector processors, memory hierarchy and virtual memory technology, bus cache and shared memory, sequential and weak consistency models, pipelining and superscalar technologies, parallel models, languages and compilers, parallel program development and environments, UNIX, MACH and OSF/1 for parallel computers.

EC-812 RISC Processor Architecture and Programming

Microcontroller architecture, memory organization, addressing modes, I/O memory, interrupt structure, ADC/DAC Interfacing, ARM architecture and programming, core & architectures, ARM programmer's model, registers, pipeline, interrupts, co-processors, instruction set, instruction cycle timings, ARM application development, DSP on ARM, FIR/IIR Filters,

interrupt handling, embedded operating systems, memory protection and management, design with ARM microcontrollers.

EC- 813 High Performance Programming with Multicore and GPUs

Computer architecture including memory hierarchy and basic pipelining, Various contemporary high-end processors, in particular the i7 core, multicore cache, and GPUs, Methods of performance evaluation, Methods of hardware aware code development, How to program complex hardware to obtain high utilization, Gain experience with developing efficient programs: using extended instruction sets, synchronization, methods of parallel programming, cache aware optimizations, CUDA for GPU programming.

EC- 821 Advanced Embedded Systems

Embedded design with microcontrollers - product specification, hardware/software partitioning, detailed hardware and software design, integration & testing, system startup, functionalities for system design, in system and application programming, host based and remote debugging, ROM emulators, logic analyzer, in-circuit emulators, embedded design life cycle & testing, different phases & modelling of the EDLC, choice of target architectures for embedded application development and for control dominated-data dominated systems, PCB design, manufacturing & PCB assembly, bug tracking, reduction of risks & costs, performanc testing, and maintenance.

EC-822 Embedded Communication Software Design

OSI reference model communication devices, communication echo system design considerations, host based communication, embedded communication

system, limitation of strict layering, tasks & modules, modules and task decomposition, Layers and switches/routers, protocol Implementation, debugging Protocols, partitioning of structures and tables, buffer and timer management, third party protocol libraries, management software, multi board communication software design, Multi board architecture and single/multiple line card architecture, interfacing, failures and fault, tolerance in multi board systems, hardware independent development, using a COTS board, development environment, and test tools.

EC-823 Architecture and Design of Distributed Embedded Systems

Broad band transmission facilities, open interconnection standards, ethernet, wireless, LAN and ATM, internet protocol, hardware & software of internet, internet security, IP addressing, interfacing internet server applications to corporate database HTML and XML, I/O streaming-object serialization, networking, threading, RMI, multicasting. distributed database and embedded java concepts, communication between distributed objects, analog/digital co-design, design method based on multiprocessors-architecture for reliable distributed computer controlled systems, optimization of functional distribution in complex system design.

EC- 824 Software Modeling for Embedded Systems

Data representation, number formats, low level programming, recursive functions, dynamic memory allocation, file handling, assembly programming, register usage conventions, typical use of addressing options, Instruction sequencing, threads, preemptive kernels, system timer, scheduling, object oriented analysis and design, connecting the object model with the use case model, key strategies for object identification, types and strategies of operations, architectural design in

UML concurrency design, threads in UML, software/hardware partitioning, co-design overview, co-simulation, synthesis and verification, re-configurable computing, system on chip and IP cores, low-power RT embedded systems, and on-chip networking.

EC- 825 Embedded Control Systems

embedded system organization, embedded computing, embedded system design challenges, selection of processor, memory and I/O devices, bus communication system, RTOS, inter process communication, interrupt driven input and output, multitasking semaphores, interface with communication protocol, design methodologies and tools, system integration, high speed data acquisition and interface-SPI read/write protocol, design of software for embedded control, layered software development, interfacing & porting, survey on basics of contemporary RTOS, case studies with embedded controller.

EC- 826 Application of MEMS Technology

MEMS: micro-fabrication, materials and electro-mechanical concepts, electrostatic sensors and actuation, thermal sensing and actuation, design and fabrication of thermal couples, thermal bimorph sensors, thermal resistor sensors, applications, cantilever Piezoelectric actuator model-properties, Piezo-resistive sensors, magnetic actuation, micro fluidics applications, medical applications, optical MEMS, and NEMS devices.

CS-829 Advanced Computer Vision
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EC- 829 Real Time Operating Systems

Operating system structures, design and implementation of processes, communication between processes,

distributed operating systems & issues, distributed scheduling, fault & recovery, RTOS tasks and states, multithreaded preemptive scheduler, synchronization, classical synchronization problems, RT models and languages, RT scheduling, interrupt processing, control blocks, memory requirements, RT kernel, polled loop systems, RTOS porting to a target, comparison and basic study of various RTOS, application domains, case studies - RTOS for image processing, fault-tolerant applications & control systems, embedded RTOS for network communication.

EC- 831 Advanced Digital Signal Processing

Linear time-invariant (LTI) systems, convolution sum, correlation, de-convolution, blind de-convolution, DTFT/ZT and properties, sampling of continuous-time signal and sampling rate conversion, application to the discrete-time processing of continuous-time signals, sampling rate conversion in multi-rate systems, transform analysis of LTI systems, filter design techniques, transformation techniques for the design of IIR filters, FIR filter design by windowing, application to linear convolution, computation of the DFT and FFT, decimation, possible generalizations and specializations. discrete-time random processes, finite data record and stochastic models, and lattice filters.

EC- 832 Advanced Digital Image Processing and Applications

Fundamentals of image processing, image acquisition, sampling and quantization, color fundamentals and models, image operations, image enhancement, spatial domain and filtering, smoothing and sharpening filters, image segmentation and feature analysis, multi resolution analysis and compressions, image pyramids, multi resolution expansion, wavelet transforms, image compression, image classification, image recognition, image understanding, video motion analysis, image fusion, steganography, digital compositing mosaics, and color image processing.

EC- 842 Wireless and Mobile Communication

Wireless transmission, signal propagation, spread spectrum, satellite networks, capacity allocation, FAMA, DAMA, MAC, cellular wireless networks, GSM, architecture, protocols, connection establishment, frequency allocation, routing, handover, security, GPRA, Wireless LAN, IEEE 802.11 standard architecture, services, mobile IP, DHCP, Adhoc networks, proactive and reactive routing protocols, multicast routing, TCP over Adhoc networks, WAP, architecture, WWW programming model, WDP, WTLS, WTP, WSP, WAE, WTA architecture, WML and WML scripts.

EC- 851 Soft Computing

Soft computing concept, importance of tolerance of imprecision and uncertainty, biological and artificial

neuron, neural networks, adaptive feed forward multilayer networks, competitive learning, neural networks as associative memories, solving optimization problems, stochastic neural networks, Boltzmann machine, fuzzy sets, fuzzy logic and fuzzy inference, genetic algorithms, probabilistic reasoning, rough sets and chaos.

EC- 853 Pattern Recognition and Analysis

Pattern recognition, matrix manipulation, Matlab, Eigen values and Eigen vectors, partial derivatives, optimization, gradient descent, Lagrange multipliers, handling data, cross validation, PCA, pattern recognition algorithms, linear regressions, logistic regression, neural networks, support vector machines, learning theory, generalization, regularization, and Bayes learning.

EC- 854 Neural and Fuzzy Systems

Neural networks and fuzzy systems, BAM stability.

uncertainty types, multilayer perceptron, uncertain inference, rational asset pricing, two-stage RAP, multivalued set theory, subset-hood and partial equality, deep learning, EM-back-propagation, Pareto optimality, capital asset pricing, standard additive model, knowledge combination, supervised learning, rule structure and approximation, pricing derivatives, equilibrium model, unsupervised and competitive learning, adaptive clustering, neural vector quantization, gradient systems, classical supervised learning, feedback SAMs, and project presentations.

EC- 861 Advanced Operating Systems

Parallel & distributed systems, clustered systems and load balancing, interrupt processing, layered methodologies, system design and implementation, mechanisms for optimization of schedulers, implementation methods for IPC, multithreading systems and handling of threads, queue scheduling and evaluation methods, synchronization algorithms to resolve CS problems, RAG and deadlock handling algorithms, TLBs & protection, page replacement and buffering schemes, system structure & implementation, free space management, file sharing & protection, disk structure and space allocation methods, disk scheduling, I/O systems hardware, operations and performance.

EC- 872 Data Communication and Networks

Components of network, ISO layered architecture, modulation and demodulation, data link layer - design issues, CRC and sliding window, performance analysis, framing formats, HDLC protocols, wireless LAN, performance analysis of MAC protocols, network layer - switching, design issues, IP addressing and diagram, routers and gateways, routing, CIDR, ICMP, ARP, RARP, IPv6, QoS, transport layer: TCP and UDP, error handling, flow and congestion control, application

services - SMTP, FTP, telnet, WWW, HTTP, DNS, security, and multimedia applications.

EC- 876 Embedded Wireless Sensor Networks

Embedded network systems, representation of signals, signal propagation, sensor principles, source detection and identification, digital communications, multiple source estimation and multiple access communications, networking, network position and synchronization services, network, energy & data management, articulation mobility and infrastructure, nodes architecture, network data integrity, and experimental system design.

EC- 877 Embedded Networking

Serial/parallel communication, communication protocols, SPI, ISA/PCI bus protocols, USB bus communication, PIC microcontroller, USB interface, CAN bus and interface, inside ethernet, building a network, design choices, selecting components, ethernet controllers, using the internet in local and internet communications, inside the internet protocol, exchanging messages using UDP and TCP, serving web pages, email for embedded systems, wireless sensor networks, applications, time synchronization, MAC protocols, SMAC, and routing.

EC- 878 Adhoc Networks

Wireless LAN, PAN, WAN and MAN, first, second and third generation systems, wireless ATM, Adhoc wireless internet, MAC, routing and multicast routing protocols, transport layer and security protocols, TCP over Adhoc wireless, security requirements, Issues and challenges in QoS, frameworks, energy management, wireless sensor networks, location discovery, quality of a sensor network, performance analysis, TCP/IP based applications.

EC- 879 Distributed Embedded Computing

Broad band transmission, network infrastructure and management, network security, capabilities and limitations of the internet, interfacing internet server applications to corporate databases HTML and XML Web page design and the use of active components, distributed computing using java, embedded agents & design criteria, behavior and functionality, agent co-ordination mechanisms and benchmarks, embedded computing architecture, analog/digital co-design, optimizing functional distribution, validation and fast prototyping of multiprocessor system-on-chip, dynamic scheduling for real-time multiprocessor systems.

EC- 890 Robotics and Control

Components of robots, degrees of freedom, joints & coordinates, robot languages, actuators, sensors, vision system, social issues, kinematics, homogenous transformation, DH representation, inverse kinematics-solution, programming-degeneracy and dexterity, differential motion and robot path planning, dynamic modeling, robot control system, linear control schemes, decentralized PID control, computed torque control, force control, hybrid position force control, impedance/torque control.

EC- 891 Pervasive Devices and Technology

WSN, challenges, WSN versus Adhoc networks, physical layer and transceiver design considerations in WSNs, MAC protocols, choice of modulation scheme, dynamic modulation scaling, antenna considerations applications of sensor networks, issues in pervasive sensor network, operating systems, design principles for WSNs gateway concepts, pervasive networking & computing, mobility management, pervasive web application architecture access from PCs and PDAs,

access via WAP, pervasive device, emerging wireless technologies, 1G, 2G, 2.5G, 3G, 4G, wireless LAN, PAN & MAN, broadband satellite and microware systems, emerging wireless technologies, IEEE 802.20 mobile broadband wireless access.

EC- 892 Real Time Systems

Issues in real time computing, structure of a real time systems RTS), performance measures, task assignment and scheduling, fault tolerant scheduling, programming languages and tools, low level programming, programming environments, run-time support, real time databases, transaction priorities & aborts, concurrency control issues, disk scheduling algorithms, serialization, consistency, fault tolerant routing, integrated failure handling, reliability

evaluation techniques, reliability & software-error models, fault tolerant synchronization in hardware and software.

EC- 893 Applied Mathematics for Engineers

Matrix theory, decomposition, calculus of variations, functional dependent on first and higher order derivatives and several independent variables, problems with constraints, Binomial, Poisson, geometric, uniform, exponential, gamma and normal distributions, linear programming, two phase method - transportation and assignment models, Fourier trigonometric series, convergence of series, power signals, exponential Fourier series, Parseval's theorem and power spectrum, Eigen value problems and orthogonal functions, Liouville systems.

Faculty of Sciences

Dr. Syed Tauseef Mohyud-Din
Professor & Dean

Faculty of Sciences comprises Departments of Mathematics and Islamic Studies. Both the Departments offer post graduate programs only.

The faculty of these Departments is recognized for its excellence in research. Over the years, the Faculty of Sciences has been very revolutionary in its approach to curriculum and course offerings. In designing the MS and PhD courses, the faculty has endeavored to stay current. Similarly the courses offered at bachelor level, are also designed to bridge the gap between theory and application.

We are passionate about delivering inspirational, innovative and cutting edge teaching; this is our ethos and these goals are embedded in our strategy.

Our staff is as dedicated to teaching as they are to their research, bringing their knowledge into the learning environment and encouraging our students to develop and flourish in an academic community. We pride ourselves on imparting students with the skills, knowledge, and the ability to discover and understand for themselves through research led-teaching.

Inquiry-based learning (IBL) is an important element of the `research-led´ learning experience. `IBL´ describes a cluster of strongly student-centered approaches to learning and teaching that are driven by inquiry or research.

Students conduct small or large-scale inquiries that enable them to engage actively with the concepts and questions of their discipline(s), often in collaboration with each other. Learning takes place through an emergent process of exploration and discovery. Guided by subject experts and those with specialist roles in learning support, students use the scholarly and research practices of their disciplines to move towards autonomy in creating and sharing knowledge.

Apart from classroom teaching, the faculty remains involved in the supervision of the students while guiding them in various extra and co-curricular activities, literary pursuits and competitions within and outside University. The conducive learning environment provided by the Faculty of Sciences helps to attain its objectives.

The Faculty is led by Dr. Syed Tauseef Mohyud Din, who has unique distinction of producing first PhD in Mathematics. He has published his research work extensively in journals of international repute. His expertise in the realm of research has won him several awards of excellence namely; Best Research Paper Award 2010, President's Pride of Performance Award on 23rd March, 2012 and the Research Productivity Awards (in category A) 2011 and 2012. He has also published 40 research papers in ISI index impact factor journals in the current year.

Department of Mathematics

Dr. Muhammad Tahir
Professor & Chairman

The Department of Mathematics aims at providing a comprehensive knowledge of Mathematics at undergraduate as well as graduate and doctoral levels. At undergraduate level the students of Electrical Engineering, Mechanical Engineering, Computer Engineering, and Computer Science are provided with high quality knowledge of Engineering Mathematics. Furthermore, at MS (Mathematics) and PhD (Mathematics) levels the students are imparted state of the art education. These programmes have earned a great repute over the years and students all over the country show great enthusiasm for admission in the Department of Mathematics HITEC University.

Apart from going through the course work, the students are encouraged to carry out quality research work, leading to publications in renowned international journals.

The syllabi have been designed to enrich the students' understanding towards the subject of Mathematics with a view to helping them encounter practical problems successfully in their careers. Utmost emphasis is laid on conceptual learning and application of Mathematics to the real world problems with the help of good examples and exercises. In this regard a balance is maintained between applications and the basic principles behind them.

The curriculum of Mathematics focuses primarily on the development of fundamental tools that are essential for all engineering majors and provides a strong foundation, which allows the students to cope up with the basic Mathematical and physical concepts of engineering. At the same time the curriculum for MS and PhD programmes has been synthesized with the objective to produce high quality Mathematicians of international standard.

Being mindful of the importance of the subject of Mathematics, the University has inducted highly qualified permanent faculty members, mostly PhD, to meet all the challenges at undergraduate as well as graduate and doctoral levels.

Apart from directing the students in the discipline of Mathematics, plentiful emphasis is laid on their character building. This aspect is taken care of consciously so that after graduating from this institution they should not only portray themselves as good Mathematicians but also as good citizens and good Muslims.

Faculty of Mathematics

Faculty

Dr. Muhammad Tahir

Designation: Professor and Chairman
Qualification: PhD (Mathematics), University of Wales, United Kingdom
Area of Interest: Numerical Solution of Partial Differential Equations
Contact: mtahir@hitecuni.edu.pk

Dr. Syed Tauseef Mohyud Din

Designation: Professor
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Ms. Rafay Mustafa

Designation: Lecturer
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Farman Ullah Khan

Designation: Lecturer
Qualification: MS (Mathematics), COMSATS Institute of Information Technology, Islamabad
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Tahir Abbas

Designation: Academic Coordinator (Dean)
Qualification: MSc (Statistics), University of Wah, WahCantt
Contact: tahir.abbas@hitecuni.edu.pk

Faisal Shakoor

Designation: Academic Coordinator (Chairperson)
Qualification: MS (Management Sciences), CIIT, Wah
Contact: coordinatormaths@hitecuni.edu.pk

MS Mathematics

This program requires a course work of 24 credit hours. 6 additional credit hours are also required to be completed either through research and submission of a thesis and its successful defense or by taking two additional courses in lieu of the thesis. This program imparts specialized knowledge in various areas of mathematics and exposes the students to latest development. Special efforts are made to nurture and enhance the research capabilities of the students through seminars, workshops and critique sessions. Typical research topics for MS students are Numerical Analysis, Analytical and Numerical techniques for Ordinary & Partial Differential Equations and Finite Element Analysis. Research opportunities are also available in Numerical Linear algebra, Mechanics of Fluids (Newtonian and Non-Newtonian), Computational Fluid Dynamics and Computational Rheology.

List of Courses

Course Code	Course Title	Credit Hours
MTH-801	Perturbation Methods-I	3+0
MTH-805	Mathematical Modeling	3+0
MTH-806	Mathematical Essentials for Cryptography	3+0
MTH-807	Relativistic Astrophysics	3+0
MTH-808	Advanced Ordinary Differential Equations with Applications	3+0
MTH-809	Advanced Numerical Analysis	3+0
MTH-810	Numerical Linear Algebra	3+0
MTH-812	Computational Fluid Dynamics	3+0
MTH-815	Boundary Value Problems-I	3+0
MTH-817	Integral Equations and Applications	3+0
MTH-818	Advanced Partial Differential Equations and Applications	3+0
MTH-820	Variational Inequalities and Applications	3+0
MTH-821	Numerical Solution of Partial Differential Equations	3+0
MTH-823	Finite Element Analysis-I	3+0
MTH-824	Advanced Numerical Linear Algebra	3+0

Course Code	Course Title	Credit Hours
MTH-826	Advanced Mathematical Physics	3+0
MTH-828	Advanced Cryptography	3+0
MTH-829	Fractional Calculus & Applications	3+0
MTH-831	Numerical Solution of Boundary Value Problems for ODEs	3+0
MTH-832	Advanced Fluid Mechanics	3+0
MTH-833	Non-Newtonian Fluid Mechanics	3+0
MTH-834	Numerical Optimization and Applications	3+0
MTH-835	Integral Transforms and their Applications	3+0
MTH-836	Turbulence Modeling	3+0
MTH-837	Thermal and Concentration Boundary Layer	3+0
MTH-838	Mathematical Theory of Elastodynamics	3+0
MTH-839	Advanced Numerical Techniques*	3+0
MTH-869	Thesis (MS level)	6+0
MTH-886	PhD Thesis	30+0

*Only for Engineering Disciplines

Ph.D. Mathematics

The Doctor of Philosophy (PhD) in Mathematics is the highest degree awarded by the Department. The program comprises 18 credit hours of course work and 30 credit hours of research thesis. The courses are selected in consultation with the thesis supervisor. The progress of student is continuously monitored through the Guidance and Evaluation Committee (GEC).

The students eligible for admission in PhD program should possess an MS/M.Phil Degree with a minimum CGPA 3 out of 4 and should have passed GAT (Subject) examination as per requirement of HEC, in vogue. The completion of course work is followed by Comprehensive Examination for granting candidacy as a PhD scholar.

The program necessitates two years of residency in HITEC University. The PhD thesis is evaluated by one local and two foreign experts from technologically more advanced countries, as per requirement of the HEC after positive evaluation from these experts. The PhD Scholar is required to undertake an open defense to fulfill the degree requirements.

The degree is awarded in recognition of high level of scholarship, the ability to carry out independent research, and the publication of research in national and international journals of repute. The Department sponsors research activities involving analytic and numerical solutions of Ordinary & Partial Differential Equations, Finite Element Analysis, Numerical Linear Algebra, Newtonian and Non-Newtonian Fluid Mechanics and Computational Fluid Dynamics etc. Our PhD program is the most vibrant and extensive as compared to other universities of Pakistan.

Courses Contents

MTH-801: Perturbation Methods-I

Introduction, order symbols and Gauga functions, asymptotic series and expansions, asymptotic expansion of integrals, integration by parts, Laplace's method and Watson's lemma, method of stationary phase and method of steepest descent, straight forward expansions and sources of non-uniformity, the Doffing equation, small reynolds number flow past a sphere, small parameter multiplying the highest derivative, the method of strained coordinates, Lindstedt Poincare method, renormalization method, variation of parameters and method of averaging, method of multiple scale with examples.

MTH-805: Mathematical Modeling

Classification of mathematical models, deductive, inductive, floating models. Modeling methodology, modeling skills, use of difference equations for mathematical modeling, matrix models, consistency of models, discrete models, population growth model; linear models; logistic models. Continuous models: One variable models; equilibrium and stability; multivariable models. Mathematical modeling using random numbers: stochastic models: Discrete probabilistic models and continuous probabilistic models.

MTH-806: Mathematical Essentials for Cryptography

Congruences, Fermat's little theorem and Euler's theorem, primitive roots, algebraic preliminaries, groups, fields, field extensions, finite fields, elliptic curves, time estimate for doing arithmetic, computational complexity and number-theoretical algorithms, mathematics for stream ciphers, Minimal polynomial and families of recurring sequences, characterizations and properties of linear recurring sequences, Boolean functions.

MTH-807: Relativistic Astrophysics

Static stellar structure and the equilibrium conditions, introduction to stellar modeling, The Hertzprung-Russel diagram and stellar evolution, gravitational collapse and degenerate stars, white dwarfs, neutron stars and black holes, systems of stars, irregular and globular clusters, galaxies super clusters and filaments, astrophysical dark matter and galactic haloes.

MTH-808: Advanced Ordinary Differential Equations with Applications

Applications of first and second order ODEs; systems of first order ODEs, Eigenvalue method for first order systems, variation of parameters for first order systems, nonlinear ODEs, Lotka-Voltera predator-prey model; Series Solution of ODEs, Legendre's differential equation, Bessel's differential equation, hypergeometric differential equation, Chebyshev differential equation, Laguerre differential equation, Hermite Differential Equation.

MTH-809: Advanced Numerical Analysis

Aitken's and Neville's iterated interpolation, Hermite interpolation. Cubic spline interpolation, parametric curves, Bivariate interpolation. Errors in polynomial interpolation: Dirichlet Function, Runge Function, orthogonal systems and Chebyshev Polynomials, SVD least-squares theorem, numerical integration: adaptive Simpson's scheme, adaptive Newton-Cotes integration, adaptive scheme of O'Hara and Smith, Romberg integration, Euler-Maclaurin's formula. Gaussian quadrature: Weighted Gaussian quadrature theorem, Gauss-Legendre quadrature, Gauss-Hermite quadrature, Gauss-Laguerre quadrature, Gauss-Chebyshev quadrature. Multiple integrals: Simpson's double integral, Gaussian double integral, gaussian triple integral, improper integrals.

MT-810: Numerical Linear Algebra

Direct methods for solving linear systems (Algorithmic approach), sparse matrices, solution of tridiagonal system, solution of pentadiagonal system, Stone's strongly implicit procedure (SIP), stability and conditioning of linear systems, perturbation of linear systems, iterative methods for solving sparse systems (Algorithmic approach), convergence of iterative methods, pre-conditioning, conjugate gradient method, Eigenvalues and Eigenvectors (algorithmic approach), diagonalization of matrices, Schur's theorem, Sourian-Frame theorem, Bocher's Formula, Gerschgorin's theorems, ovals of Cassini, Eigenvalues by iterations (Power method), Wielandt deflation, Householder's method, QR method.

MT-812: Computational Fluid Dynamics

Thermodynamic properties of a fluid, basic flow analysis techniques, review of governing equations, integral conservation laws, differential conservation laws, Bernoulli equation, boundary conditions for basic equations, stream functions, vorticity and Irrota-Tionality, mathematical classification of flows, discretization approaches, finite difference methods, finite volume methods, solution of the Navier Stokes equations, grid generation.

MTH-815: Boundary Value Problems-I

Introduction to boundary value problems, linear and nonlinear models, Adomian's decomposition method, modification in decomposition methods, applications of ADM and MADMs for IV and BVPs, variational iteration method, Adomian's polynomials and Padé approximation, comparison of VIM, ADM and other techniques, Homotopy perturbation method (HPM), modifications in HPM, applications in HPM and its modified versions, modification of variation

of parameters method (VPM), differential transform method and its applications, introduction of Homotopy analysis method.

MTH-817: Integral Equations and Applications

Linear integral equations: preliminaries, introductory concepts of integral equations, Volterra integral Equations, Fredholm integral equations, Volterra integro-differential equations, Fredholm integro-differential equations, Abel's integral equation and singular integral equations, systems of Volterra equations and Fredholm equations, systems of singular integral equations, nonlinear integral Equations, nonlinear singular integral equations, applications of integral equations.

MTH-818: Advanced Partial Differential Equations and Applications

Introduction, linear and nonlinear PDEs, homogeneous and inhomogeneous PDEs, solutions of PDEs, boundary and initial conditions, well-posed PDEs, method of characteristics, method of separation of variables, Laplace's equations, D'Alembert's solution, solution of physical models, solitons and compactons, solitary wave theory, types of travelling wave equations, Pade approximation, various techniques to find travelling wave solutions.

MTH-820: Variational Inequalities and Applications

Basic concepts, minimization problems, existence and uniqueness of solutions of different classes of variational inequalities, fixed point formulations, Wiener-Hopf equations, iterative methods, auxiliary principle technique, convergence analysis, variational inclusions, resolvent Equations.

MTH-821: Numerical Solution of Partial Differential Equations

Parabolic equations, finite-difference representation for parabolic equation, classical explicit method, Laasonen fully implicit method, Crank-Nicolson method, weighted average approximation method, DuFort-Frankel method, Keller Box method, convergence, consistency and stability of finite difference scheme, stability criterion (matrix method, Fourier method), von Neumann polynomial, hyperbolic equations: finite difference schemes for the first-order wave equation,

finite-difference representation for second order hyperbolic equation, Explicit methods and Courant-Friedrichs-Lewy (C.F.L), implicit difference methods, elliptic equations: five-point and nine-point difference approximation, Laplacian operator in skewed and polar coordinates, Poissonian operator in triangular coordinates, Applications.

MTH-823: Finite Element Analysis-I

Calculus of variations, Hamilton's Principle. One dimensional shape functions, integral formulations and variational methods: Integral formulations, weighted-integral and weak formulations, linear and bilinear forms and quadratic functionals, variational methods, the Ritz Method, approximation functions, method of weighted residuals. Galerkin and weighted residual methods, finite elements in one dimension, weak form with linear trial functions, second order equations, linear elements of second order equation, local and global matrices, quadratic element of second order linear Problems, mixing two different elements.

MTH-824: Advanced Numerical Linear Algebra

Iterative matrices and preconditioning, Chebyshev acceleration and Symmetric SOR (SSOR), projection methods, Krylov subspace methods, Arnoldi's iteration, incomplete orthogonalization method (IOM), generalized minimal residual (GMRES) method, The Lanczos Iteration, incomplete LU (ILU) factorization preconditioners, conjugate gradient (CG) method, incomplete modified Gram-Schmidt, multigrid methods, weighted Jacobi iteration, Gauss-Seidel iteration, nested iteration, algebraic multigrid (AMG), smoothness in AMG, interpolation in AMG.

MTH-826: Advanced Mathematical Physics

Nonlinear ordinary differential equations, Bernoulli's equation, Riccati equation, LaneEmden equation, Nonlinear Pendulum, Duffing's equation, Pinney's equation, Perturbation theory, Bogoliubov-Krilov method. Linear partial differential equations: Heat equation, wave equation, Laplace equation, integral equations, Wiencr-Hopf equations, Fredholm theory, variational methods, Sturm-Liouville problem and variational principles, Rayleigh-Ritz methods for partial differential equations, matrix algebra, method of Faddeev.

MTH-828: Advanced Cryptography

Introduction and classical cipher systems, block ciphers, DES, AES cipher, correlations and Walsh transforms, cryptographic criteria, generalization to S-Boxes, pseudo-random-sequence generators and stream ciphers, linear feedback shift registers, public key cryptography, Elliptic curve cryptography, digital signature and authentications threats, challenge-response algorithms, zero knowledge protocols and oblivious transfer, lattice based cryptography.

MTH-829: Fractional Calculus and Applications

Special functions of the fractional calculus, gamma function, Mittag-Leffler function, Wright function, functional derivatives and integrals, Grundwald Letnikov fractional derivatives and applications, Reimann Liouville fractional derivatives, properties of fractional derivatives, Caputo's fractional derivatives, Laplace and Fourier transforms of fractional derivatives, existence and uniqueness theorems, Leibniz rule, techniques in fractional calculus, fractional Green's function, one-term, two-term, three-term, four-term and n-term equations, Numerical evaluation of fractional derivatives, approximation of fractional derivatives, finite part integrals and fractional derivatives, Abel's integral equations, solution of Bessel's equation, applications to diffusion problems.

MTH-831: Numerical Solution of Boundary Value Problems for ODEs

The Taylor-Series method, The Euler method and its modifications, Runge-Kutta methods and Butcher's theory, Runge-Kutta-Fehlberg method, multistep methods, higher order equations and systems, stiff differential Equations. Boundary-value problems, shooting methods, The Riccati method. Finite difference methods, finite element/spectral methods: Fundamental Lemma of calculus of variations, Euler-Lagrange equations, equivalence of variational and weak formulations of BVPs, Rayleigh-Ritz method, collocation method, Galerkin method, pseudospectral Galerkin method, pseudospectral Galerkin collocation method.

MTH-832: Advanced Fluid Mechanics

Physical and thermodynamical properties of fluids, kinematics of the flow field, dynamics of the flow field, flow of a uniform incompressible fluid, steady unidirectional flow, unsteady unidirectional Flow, Ekman layer, flow with circular streamlines, dynamical similarity, flow at small Reynolds number, flow at large Reynolds numbers: Effects of viscosity, vorticity dynamics: Kelvin's circulation Theorem, source of vorticity, boundary layers, separation of boundary layers, jets, free shear layers, wakes, oscillatory boundary layers, flows with a free surface potential flow: Theory and applications, Theory of an inviscid fluid flow, properties of irrotational flows, steady flow, applications

MTH-833: Non-Newtonian Fluid Mechanics

Classification of non Newtonian fluids, Rheological formulae (Time independent fluids, Thixotropic fluids and viscoelastic fluids), variable viscosity fluids, the deformation rate, viscoelastic equation, materials with short memories, The Rivlin-Ericksen fluid, basic equations of motion in rheological models. The linear viscoelastic liquid, axial oscillatory tube flow, angular oscillatory motion, periodic transients, basic equations in boundary layer theory, truncated solutions for viscoelastic flow, Similarity solutions.

MTH-834: Numerical Optimization and Applications

Classical optimization, single-variable optimization, multivariable optimization, linear programming, duality and post-optimal analysis, Karmarkar's interior method, parametric linear programming, nonlinear programming (one-dimensional minimization methods): elimination methods, interpolation methods, nonlinear programming (unconstrained optimization methods): direct search methods, indirect search methods.

MTH-835: Integral Transforms and their Applications

Fourier transforms, application of Fourier transform, Fourier sine transform, Fourier cosine transform, double Fourier transform, double Fourier sine transform, double Fourier cosine transform, application of Fourier sine and cosine transform, Hartley transform, Laplace transform, applications of Laplace transform, Mellin transform, applications of Mellin transform, Weiestrass transform, Hankel transform, applications of Hankel transform, Abel transform, Hilbert transform, applications of Hilbert transform, Hermite transform, Legendre transform, applications of Legendre transform, Jacobi and Gegenbauer transform, application of Jacobi transform, applications of Gegenbauer transform, Laguerre transform, applications of Laguerre transform.

MTH-836: Turbulence Modelling

Turbulent scales, vorticity gradient interaction, energy spectrum, Boussinesq assumption, algebraic models, exact k equation, k-ε, k-ω and k-τ models, low-Re- k-ε model, Launder-Sharma low-Re k-ε model, The two

layer k-ε model, Reynold stress models, Reynolds stress models vs Eddy viscosity model, curvature effects, acceleration and retardation effects, modeled k equations, modeled ε equation, one and two equation model, some physical examples of turbulence flows. non-linear eddy viscosity models and algebraic stress models, Reynolds stress transport models, large eddy simulations, detached eddy simulations and other hybrid models, direct numerical simulations.

MTH-837: Thermal and Concentration Boundary Layer

Thermal conduction mechanism, modes of heat transfer, derivation of steady state heat equation, derivation of unsteady heat equation, derivation of steady and unsteady heat equation, boundary layer equation, thermal boundary layer, convective transfer constants from boundary layer analysis. application of heat transfer in engineering problems, mass diffusivity mechanism, derivation of mass diffusion equation, derivation of mass diffusion equation, application of mass diffusion in engineering problems, mass diffusion between parallel surfaces, flow in circular passages, mass diffusion in an inclined channel, mass diffusion over s stretching surface, heat conduction and mass diffusion analogies.

MTH-838: Mathematical Theory of Elastodynamics

Analysis of strain and stress, body and surface forces, stress tensor, maximum normal and shear stress, homogenous isotropic bodies, elastic moduli of isotropic bodies, equilibrium equations for an isotropic elastic solid, dynamical equations for an isotropic elastic solid, Saint-Venant's principle, waves in infinite media, longitudinal waves, surface waves, Rayleigh waves, transverse waves, plane wave solutions, propagation in waveguides, waves propagation in elastic solids, Helmholtz theorem, generalized Hooke's law, reflection, reflection and transmission at plane interface, reflection at free surface, refraction, dispersive media, diffraction, scattering due to irregular structures.

MTH-839: Advanced Numerical Techniques

Direct and iterative methods for linear systems, numerical solution of ODEs: initial-value problems, boundary-value problems, shooting method, finite difference method, Galerkin method, numerical solution of PDEs: parabolic equation Crank-Nicolson scheme, DuFort-Frankel scheme, stability of finite difference scheme (matrix method, Fourier method), hyperbolic equation, Euler, upstream, Lax, leap frog and Lax-Wendroff schemes, elliptic equation, five-point scheme for Poisson equation, curved boundary.

Courses offered to other Departments

Course Code	Course Title	Credit Hours
MT-101	Calculus and Analytic Geometry	3+0
MT-102	Linear Algebra and Differential Equations	3+0
MT-103	Differential Equations	3+0
MT-201	Complex Variables and Transforms	3+0
MT-202	Numerical Methods	3+0
MT-203	Linear Algebra	3+0
MT-204	Multivariable Calculus	3+0
MT-302	Probability and Statistics	3+0
MT-303	Applied Linear Algebra	2+0

MT-101: Calculus and Analytic Geometry

Functions and graphs, limits &continuity, differentiation and applications, extreme values of a function, differentials and approximation, indeterminate forms, Leibnitz theorem, integration, rules of integration, applications of definite integrals, length of a plane curve, volumes of solids of revolution, conic sections, infinite sequences and series, vectors in 3- dimensional space, vector valued functions and motion in space, analytical geometry in 3- dimensional space, functions of several variables, partial derivatives, tangent planes and normal lines, extrema of functions of two variables.

MT-102: Linear Algebra and Differential Equations

Introduction to linear algebra, matrix algebra, system of linear equations, applications of linear equations in real life problems, introduction to differential equations, first-order differential equations, applications of first-order differential equations, higher-order differential equations, techniques to solve higher order ODEs, variation of parameters method and applications, method of undetermined coefficients and applications, Cauchy Euler equation, Partial differential equations: one dimensional heat equation, higher dimensional heat equation, one dimensional wave equation, higher dimensional wave equation, Laplace equation, Laplace transform and applications.

MT-103: Differential Equations

Introduction to differential equations, exact and non-exact differential equations: Initial value problem, separable equations, homogeneous equations, exact equations, integrating factors, orthogonal trajectories. applications of first-order differential equations: nonlinear equations, Bernoulli's equation, Riccati equation, Clairaut equation, linear differential equation of higher order: Cauchy-Euler's equation, reduction of order, Wronskian, applications of 2nd order differential equations. Partial differential equations: one dimensional heat equation, higher dimensional heat equation, one dimensional wave equation, higher dimensional wave equation, Laplace and Poisson equation, Laplace transform and applications.

MT-201: Complex Variables and Transforms

Complex analysis, polar form of complex numbers, complex functions, their derivatives, analytic functions, Cauchy-Riemann equations, Laplace equation, line integral in the complex plane, Cauchy's integral theorem, Functions given by power series, Taylor and Maclaurin series. Vector calculus, Vectors in 2-space and 3-space, vector product, arc length, gradient of a scalar field, directional derivative, divergence of a vector field, curl of a vector field, line integrals, Green's theorem in the plane, divergence theorem of Gauss, Stokes theorem.

Fourier Series, periodic functions, even and odd functions, half-range expansions, Fourier transforms, solution of differential equations.

MT-202: Numerical Methods

Solving nonlinear equations (bisection method, Newton-Raphson method, Horner's method, method of false position, secant method), Solving non-linear system of equations, Interpolation with equal interval of arguments (Newton formulas), unequal interval of arguments (Divided difference interpolation formula) lagrange interpolation, numerical differentiation, numerical Integration (Newton-Cotes), solving first order ODEs (Euler and Heun's methods, predictor-corrector methods, Runge-Kutta methods, solving system of first order ODE's, Solution of second order ODEs.

MT-203: Linear Algebra

Basic matrix operations, linear system of equations, Gauss elimination, linear models in science and engineering, linear dependence and independence of vectors, rank of a matrix, homogeneous and non homogeneous systems, determinants and their properties, Cramer's Rule, inverse of a matrix, Gauss-Jordan elimination method, Decomposition of matrices (LU, Doolittle, Crout), vector spaces, inner product spaces, linear transformations, Eigen values and Eigen vectors, orthogonal matrices, orthogonal transformations, diagonalization of matrices, quadratic forms.

MT-204: Multivariable Calculus

Functions of several variables, partial derivatives of first and higher order, tangent planes and differentials, extreme values and saddle points. Multiple integrals: 3 dimensions, vector functions: arc length and unit tangent vector, curvature and unit normal vector N, torsion and unit binormal vector B. Vector Calculus: line integrals, vector fields, work, circulation and flux, conservative fields, Green's theorem, curl and divergence, parametric surfaces and their areas, surface integrals, the divergence theorem of Gauss, Stokes' theorem.

MT-302: Probability and Statistics

Descriptive statistics, measures of central tendency, probability, conditional probability, multiplicative rules, random variables, discrete random variables and probability distributions, continuous probability distributions, joint probability distributions, mathematical expectation, mean, variance and covariance of random variables, Chebyshev's theorem, discrete uniform distributions, binomial distribution, Poisson distribution, normal distribution, estimation(point estimates and confidence intervals), test of hypothesis (what is hypothesis testing, errors in hypothesis testing, one-tailed and two-tailed tests of significance, sample tests of hypothesis about population mean, two-sample tests of hypothesis), regression and correlation.

MT-303: Applied Linear Algebra

Algebraic properties of matrices, elementary row operations, echelon form of a matrix, rank of a matrix, inverse of a matrix, solving linear system with gauss elimination method, application of linear systems, determinants, Cramer's rule and applications, vectors in Euclidean space, norm of a vector, distance between two vectors, orthogonal vectors, orthogonal projections, inner product, Eigenvalues and Eigenvectors, characteristics polynomials, quadratic forms, quadratic forms and Eigenvalues.

Department of Islamic Studies

الكلمة الحكمة ضالة المومن فحيث
وجدها فهو احق بها

"The word of wisdom is the lost asset of the believer, so wherever he finds it, he has a better right to it"
(Al-Tirmadhi)

Dr. Taj Uddin al-Azhari
Chairman
Department of Islamic Studies

The Department of Islamic Studies was established in 2008 as emerging seat of higher learning and research. The Department is envisioned to evolve into a center of excellence for producing Islamic scholars to revitalize the spirit of Islamic thought and scientific query. The department grants admissions in Master and PhD programs and offers diversity of courses. Special emphasis is laid to produce research dealing with the current problems and futuristic issues in the light of Islamic scholarship.

The Department has updated the curriculum keeping in view the modern challenges to the Muslim Ummah and requirements of tolerance and interfaith harmony. A number of courses are introduced to achieve these objectives. The studies also help the students to acquaint themselves with the concept of convergence of Islam and science, since current research has opened vast chapter of compatibility of modern science with Quran.

In addition, the curricula and syllabi of Islamic studies is designed to revive the Islamic system of objective based diligence in order to enable the students to deal with present challenges and develop thorough understanding of fundamental classical sources of Islam.

The Department prepare the students to work for cause of Islam and develop the understanding of different cultures and civilizations. Our mission is to provide quality education in Islamic thoughts and culture and aims at launching Dawah, teaching and training programs at international level.

Faculty of Islamic Studies

Faculty Members

Dr.Taj Uddin al-Azhari
Designation: Chairman, Department of Islamic Studies
Qualification: PhD in Islamic Studies, University of Punjab
                    MA in Hadith, Al-Azhari University Egypt,
Contact: drtajuddinazhari@Gmail.com

Dr. Muhammad Tufail Hashimi
Designation: Professor
Qualification: PhD Islamic Studies, University of the Punjab
Contact: tufail.hashmi@hitecuni.edu.pk

Dr.Manzoor Ahmad Alazhari
Designation: Associate Professor
Qualification: PhD Legal Policy Al-Azhar University, Egypt,
Post Doc.   University of Oxford, UK.
Contact: mallazhari1@gmail.com

Dr.Rab Nawaz
Designation: Asst. Professor
Qualification: PhD (Tafsir and Quranic Sciences) International Islamic University Islamabad
Contact: qarirabnawaz@gmail.com

Mrs. Zahida Jabeen
Designation: Lecturer
Qualification: M.Phil (Peace and Conflict Studies), NDU Islamabad
                    MA (English, International Relations, Political Science)
Contact: Zahida5883@gmail.com

Mrs. Ruqya Safdar
Designation: Jr.Lecturer
Qualification: M.S in Progress (Islamic Studies). MA Islamiyat

Babar Shehzad
Designation: Program Coordinator
Qualification: MS (Management Sciences) (Finance), COMSATS Institute of Information Technology
Contact: Babarms50@Gmail.com

MS Islamic Studies

The Department offers MS (Islamic Studies) program. It is a broad based scheme, focusing on contemporary socio-political and economic issues, ijtihad, objectives of Islamic shariah, Islamic philosophy, international relations, Islamic world view and contemporary study of major world religions. Researchers are encouraged to work on practical issues to fulfil the needs of our society in particular and humanity at large.

The MS degree is awarded after completion of 30 credit hours, 24 of which are course work. The remaining 6 credit hours can be completed either by writing a research thesis or by taking 2 additional courses from the list of offered subjects in respective semester.

Ph.D. Islamic Studies

The Doctor of Philosophy (Ph.D.) in Islamic Studies is the highest degree awarded by the Department. The program comprises 18 credit hours of course work and 30 credit hours of research thesis. The courses are selected in consultation with the thesis supervisor. The progress of student is continuously monitored through the Guidance and Evaluation Committee (GEC).

The students eligible for admittance in Ph.D. program should possess an MS/M.Phil. degree with a minimum CGPA 3 out of 4 and should have passed GAT subject examination as per requirement of HEC, in vogue.

The completion of course work is followed by comprehensive examination for granting candidacy as a Ph.D. Scholar. The program necessitates two years of residency in HITEC University.

The Ph.D. thesis is evaluated by one local and two foreign experts from technologically more advanced countries, as per requirement of the HEC. After positive evaluation from these experts, the Ph.D. Scholar is requiredto undertaken open defenseto fulfillthe degree requirements.

The degree is awarded in recognition of high level of scholarship, the ability to carry out independent research, and the publication of such research in national and international journals of repute.

The Department encourages the researchers to work on current problems and futuristic issues related to the renaissance of Islamic thought, philosophy and scientific knowledge, leading to the ultimate truth.

MS/Ph.D. Islamic Studies Courses

Course Code	Course Title	Credit Hours
IS-801	Development of Quranic Commentary Literature & its Trends	3+0
IS-802	Diligence in Islam (Ijtihad)	3+0
IS-803	Objectives of Islamic Shariah (Maqasid al-Shariah)	3+0
IS-804	Islamic Thoughts and Sciences: Source Literature	3+0
IS-805	Islamic Philosophy	3+0
IS-806	Contemporary Issues: Islamic View Point	3+0
IS-807	Hadith Studies	3+0
IS-808	Principles of Tafsir	3+0
IS-809	Principles of Hadith	3+0
IS-810	Comparative Study of Tafsir Literature	3+0
IS-811	Principles of Fiqh	3+0
IS-812	Comparative Study of Different Juristic Schools of Thought	3+0
IS-813	Islamic Banking and Finance	3+0
IS-814	Management & Administration in Islam	3+0
IS-815	Islamic World View	3+0
IS-816	International Relations and Islam	3+0
IS-817	Comparative Study of Major World Religions	3+0
IS-818	Islam and Science	3+0
IS-819	Research Methodology	3+0
IS-820	Analytic Study of Seerah	3+0

Course Code	Course Title	Credit Hours
IS-821	Ethics of Disagreement in Islam (Adab al-Ikhtalaf)	3+0
IS-822	Dawah Principles & Techniques	3+0
IS-823	Islamic Economics	3+0
IS-824	Islamic Political System	3+0
IS-886	MS Thesis/Two Courses	0+6

Course Contents

IS-801 Development of Quranic Commentary Literature and its Trends:
Early development of Quranic commentary literature, difference between Tafsir and Ta'wil, prerequisite qualification for writing Quranic commentary, basic sources of understanding Quran, different trends in Quranic commentaries and introduction to their representative literature, transmitted commentary, opinion based commentary, commentary based on: scholastic theology, grammar and literary rhetoric, spiritual approach, earlier Divine scriptures, sectarianism, manners of recitation, scientific approach, comprehensive approach.

IS-802 Diligence in Islam (Ijtihad):
Ijtihad: definition, need and importance, Ijtihad in the time of Holy Prophet (PBUH) and his companions, principles of Ijtihad: objectives and cause based, development of the principles of Ijtihad: principles of Imam Abu Hanifah, Imam Malik, Imam Ja'far al-Sadique, Imam al-Shaf'i, Imam Ahmad bin Hanbal and Al-Zahiriyah, qualification of a Mujtahid, classes of Mujtahidin, scope of Ijtihad in present time, change of Ijtihad with the change of time and space, need for a global fiqh based on international infrastructure of Ijtihad, taqlid and fatwa and their impact on society, importance of talfiq in the process of Ijtihad, practical training of Ijtihad in contemporary issues.

IS-803 Objectives of Islamic Shariah (Maqasid al-Shariah):
Introduction: Islam revolves around objectives, determination of objectives from Quranic injunctions and Prophetic traditions, kinds of objectives: general and specific, types of objectives: indispensible, required and refining objectives, five traditional objectives of Islamic law, new objectives mentioned by contemporary scholars, order of priority among the objectives, implementation of objectives in various aspects of life, scope of Ijtihad on the basis of objectives of Islamic shariah.

IS-804 Islamic Thoughts and Sciences:
Introduction to source books and fundamental literature about Quranic sciences, Tafsir, Hadith sciences and its literature, Islamic law and jurisprudence, history, biographies, geographical histories, chronological histories, historical geography, literature on Islamic thoughts, political system, economics, and social studies, scholastic theology and encyclopaedic works of Islam, famous libraries of the world having rich collection of Islamic literature.

IS-805 Islamic Philosophy:
Human nature and its demands, basic questions and their answers by the secular philosophies and the religions, God (Allah), His being, Oneness and attributes, creation of universe, human beings and their destination, human spirit: difference between life and spirit, freewill and predestination, good and evil, sources of human knowledge: nature, five senses, intelligence, revelation (possibility and its modes), prophet hood and its proof, cause and effect, miracles and causes, effects of faith and deeds on human personality, life after death: possibility, reward and punishment, intercession, personification of faith and deeds into heaven and hell.

IS-806 Contemporary Issues:
Islamic View Point:Political issues, democracy in the light of Islam, international relations in contemporary world in the light of juristic concept of Dar al-Islam and Dar al-harb, concept of Ummah and nationality, preaching of an un-Islamic religion in Islamic world and

vice versa, medical issues: transplantation, cloning, test tube baby, family planning, alcoholic medicines, abortion, economic issues: indexation on deferred payment, premium on rental contracts, sale of rights, murabahah, paper currency, electronic currency, money changing, insurance, stock exchange: sale and purchase of shares, mudharabah and financing, social issues: interfaith marriages, divorce and its ways of application, Islamic concept of hijab, filtration of polluted water, moon sighting and difference of dawn.

IS-807 Hadith Studies:

Introduction to Hadith, need and importance, Hadith/Sunnah as a source of Islamic shariah, ways of judgment of authenticity of Hadith, different kinds of Hadith, compilation of Hadith literature, famous books of Ahadith, Hadith sciences in sub-continent.

IS-808 Principles of Tafsir:

Definition, Quran and its revelation, Makki and Madani verses, arrangement of Quranic text, causes of revelation, gradual revelation, compilation, dialects of Quranic recitation, abrogation of Quranic injunction, miraculous nature of the Quran, interpretation (Tafsir and Ta'wil), Al-muhkamwalmutashaabih, introduction to verse, chapter, part and manzil, cause of repetition in the Quran, literary form of Quran, interlink among verses and chapters, basic qualification of a Mufassir, Uloom-e-Khamsa

IS-809 Principles of Hadith:

Definition, difference between Hadith and Sunnah, two methods of testing the authenticity of the Hadith: riwayah/sanad and dirayah/logic, two parts of Hadith: chain of narrators and text, studies of validity of reporters and the reported, investigation about the reporters, kinds of ahadith: Hadith-e-mutawatar, khabr-e-wahid,

Hadith-e-dhaif, Hadith-e-modhu', Hadith-e-mursal, Hadith-e-ma'ruf, moquf and maqtu', nasikh-o-mansukh, al-munqate', al-mudhal, al-moalal, al-mullaq, ghareeb al-Hadith, asbab at-ta'nfilrawi, methodology of Hadith criticism, different kinds of Hadith literature: conditions for acceptance of Hadith adopted by famous authors of authentic Hadith literature like Bukhari, Muslim, Abu Dawud, Nasai, IbnMajah, Tirmidhi, Imam Malik and others. Testing of Hadith text through dirayah, case studies of testing ahadith through riwayah and dirayah.

IS-810 Comparative Study of Tafsir Literature:

Early development of tafsir literature, sources of tafsir: Quran, Hadith, Arabic language and literature, history, two kinds of tafsir: tafsirbilma'thur and tafsirbil ray, centres for teaching of tafsir: Makkah, Madina, Kufa, Syria, comparative study of mathurtafasir: tafsir-e-TabritafsirIbnKathir, comparative study of tafsirbil ray: tafsir-e-Razi, tafsir-e-Zemakhshari and tafsir-e-Ruh al-ma'ani, Shia' Tafsir: tafsir-e-Tabrasi and tafsir-e-Kashi, FiqhiTafasir: tafsir-e-Jassas, Ibn al-Arabi and Qurtabi, Tafasir of modern time: tafsir al-Manar, Tafheem-ul-Quran, Tadabbur-e-Quran, Zia-ul-Quran, English tafasir: tafsir-e-MajidiandThe Holy Qur'an: Text, Translation and Commentary(Abdullah Yusuf Ali).

IS-811 Principles of Fiqh:

Introduction,history, sources of Islamic Jurisprudence: basic and secondary,Istihsan (Juristic Preference): definition, kinds and authenticity, Istishab (presumption of Continuity): definition and authenticity, maslahahmursalah (extended analogy): definition, requirements, sadd-al-dharay (blocking the lawful means to an unlawful end), qawl-al-sahabi (opinion of a companion), Shar-o-man Qablana (earlier scriptures), Urf (custom):definition, types and legal status, Maqasadshariah (juristic ideologies), Ijtihad and taqlid.

IS-812 Comparative study of Islamic schools of thought:

Introduction, background and formation,compilation of fiqh, scholars of Islamic schools, great Imams, minor scholars, rules and principles of each Imam and school of thought, contradictory and alternative differences, main reasons for conflicting rulings, stagnations and decline, emergence of taqleed, proximity amongst schools of law, modern institutions of collective opinions.

IS-813 Islamic Banking and Finance:

Islamic finance: introduction, foundation,characteristics, principles, status of present economic systems in Islamic shariah, the concept of usury, financial tricks, gambling and other prohibited activities, banking: introduction, types, characteristics, functions, Islamic banking: introduction, history, background, global scenario, different modes of financing, shariah standards, shariah audit and compliance, Islamic insurance (Takaful), current issues, critical study of modern Islamic banking.

IS-814 Management and Administration in Islam:

Islamic management and administration: background, fundamental theories: freedom, justice, equality, consultation and dignity of mankind, Islamic view of human nature: introduction, types of people, the functions of man, the responsibilities, accountabilities, social behaviour, evolutionary development of administration and management, sources of Islamic administration and management: the time of Holy Prophet (PBUH) and the Pious Caliphs (R.A), institutions: the diwan (secretariat), hisbah, a comparison of Islamic and other models, emphasis on Islamic values and ethical standards, non-usurious financial institutions,

punishment on administrative corruption, balance between material and spiritual wellbeing, Divine origin, prevention of injustice, concept of shura (consultation), emphasis on cooperation, concept of leadership, qualities of leadership, expectation of the group, concept of administrative law.

IS-815 Islamic World View:

Unity of God, unity of human race, dignity of mankind, equality, freedom of faith, thought, expression, occupation, earning of livelihood, movement, choice and action, legal and social justice, security of life, faith, honour, property and family, right of privacy, education and healthcare, ethical values: truth, honesty, commitments, peace and tolerance, patience and gratitude, use of natural capital, environmentalism, responsibility, accountability, no punishment without trial, international obligations, judgment of good and evil, respect for the chastity of woman, status of Dawah and Jihad.

IS-816 International Relations and Islam:

Islam as an international religion, a complete code of life, characteristics of Islamic state and its relation with other states and communities, studies of principles of international relations mentioned by famous scholars of early Islamic period, emergence and trajectory of Islam as a force in international relations since the late 19th century, revival of Islam in world politics, concept of Jihad and Dawah, relationship with non-Muslims, global issues: population, reasons for becoming human rights an international interest and concern, various international concerns/issues of environment: global warming, ozone depletion, acid rain, desertification & deforestation, efforts towards the protection of environment, proliferation of weapons, obstacles to arms control, major steps/efforts towards arms control, role of international Islamic organizations in world politics, major issues of Muslim world, Muslim minorities.

IS-817 Comparative study of Major World Religions:

Religion: definition, need, two categories of religion – Divine and worldly, Divine religion: Judaism, Christianity and Islam, common teachings and differences, worldly religions: Hinduism, Buddhism, Confucius, Zoroastrianism, points of convergence and divergence, comparative study of: creation of universe, the creator, the message, salvation and life hereafter, dignity of mankind and racism, human rights, status of women, social customs, divine status of kingdom, status of religious leaders, political and socio-economic laws, movements of renaissance in these religions, religion in the twenty first century, world religion and peace, Islam: last the universal religion, characteristics.

IS-818 Islam and Science:

Scientific method: introduction, study of scientific method in the light of Holy Quran, a brief history of conflict between science and religion, study of important aspects of creation in the light of Islam and science: heavens and the earth, basic process of the formation of the universe and resulting composition of the worlds, modern scientific data concerning the formation of the universe, testing the data in the Quran concerning the creation, astronomy in the Quran: general reflections concerning the sky, nature of heavenly bodies, celestial organization, the conquest of space, the earth in the Quran: water cycle and the sea, the earth's relief (creation of mountains), the earth's atmosphere, the origin of life, the vegetable kingdom, the animal kingdom, human reproduction, sex education, preservation of data: Quranic concept of preservation of doing, saying and thinking of human beings,

scientific research about recording and preservation of human activities by waves and human thoughts in subconscious, brief history of Muslim contribution to science: medicine, mathematics, astronomy, physics, chemistry, geography, future of sciences in the Muslim world.

IS-819 Research Methodology:
Identification of research problem, formulation of hypothesis and problem statement, review of relevant concepts, principles of Islamic research: transmitted narration, cognizance, their application in Tafsir, Hadith, Islamic law, Islamic jurisprudence, history and other branches of Islamic sciences, techniques of research: library research, surveys, lab research, preparation of synopsis, data collection techniques, data testing, academic writing, analyzing and presentation of results, discussion and conclusion of research, recommendations and suggestions, defence of thesis, Case study: sample research article, stepwise training from observation, problem, hypothesis, literature review, data collection, analysis, results, discussion, recommendations, indexation, bibliography.

IS.820. Analytic Study of Seerah:
An overview of socio-political and religion-ethical background of the world in general and Arabic peninsula in particular at the eve of emergence of Islam, study of Makkan period: formation period of establishment of faith and belief, spirituality, training of the followers, firm standing and patience, utilization of each opportunity to achieve the sacred goal, sacrifices, formation of a new community and search for peaceful environment, study of Madni period: foundation of society and state,

brotherhood, peace treaties with surrounding tribes, security and administration, spread of knowledge and education, enforcement of law of war and peace, law making and judiciary, rights of citizens and state, rights of non-Muslims, status of women, political and economic system of prophetic state, social institutions, dissemination of Islam and international relations.

IS.821. Ethics of Disagreement in Islam (Adab al-Ikhtalaf):

Difference between divergence and variation, kinds of differences: (a) political: causes of differences during the early period of Islam, political differences amongst the companions of the Holy Prophet (PBUH) and their respect to each other, difference between the concept of Khilafah and Imamah, brief history of this difference and coexistence of Sunni and Shia' people down the history. (b) scholastic: emergence of Mutazalities, Ashariah, Maturadiah, Murjiah, Khawarij and Shia' as scholastic Islaimic groups and their thoughts, effects of these groups on the society and their inter-group relations, differences of today and ways to establish the harmony and tolerance among the difference schools of thought, (c) judicial: origin of the variation in the Holy Quran and Sunnah, history of differences of scholars in academic affairs with respect to each other

during the early period of Islam. Causes of difference of opinion among the scholars of juristic schools of thought, difference of opinion as a source of legislation, way-out in necessity and scope to change of law with the change of time and space, Study of Al-sha'arani's ideology of Al-Mizan and its application in our society, provision of Talfique (applying the opinions of different schools of thought to solve the problem) and the status of Taqlid (to follow the opinion of single jurist in every issue of life).

IS-822 Dawah Principles & Techniques:

Finality of prophethood, need and importance of Dawah, two kinds of Dawah: (a) call for Islam, (b) enjoining good and forbidding evil, the caller: pre-requisite qualification: credibility, truthfulness, honesty, patience, tolerance, organization and accommodation, knowledge of fundamentals of Islam, Islamic concept of Dawah, subjects of Islamic Dawah, awareness about the faith, customs and culture of the called, ability to use the different branches of knowledge for Dawah purpose, role of Islamic schools of thought to make the Dawah more acceptable, methodology of Dawah: emotional, intellectual and experimental, wisdom based, positive dialogue, argumentation, dialogue: basic principles, Quranic base for interfaith dialogue and its application on different religions and various issues.

IS-823 Islamic Economics:

Analytic study of capitalism, socialism and Islamic economic system, principles of Islamic economics: Divine guidance, concept of real ownership and trust, demarcation of Halal and Haram in earning and spending, circulation of money and distribution of wealth, balance in personal and social motives, Usury: Islamic view point regarding interest on savings, investments, personal and commercial loans, present banking system, interest free banking and alternatives through Mudharabah and Musharakah, a critical study of current Islamic banking system, indexation (another alternative): effects of devaluation and its adjustment through indexation in the light of Islam, how to implement the Islamic economic system.

IS-824 Islamic Political System:

Principles of Islamic political system: unity and sovereignty of Allah, dignity of mankind, equality of human being, basic sources of Islamic law: the Book and the Sunnah, human beings as representative of Allah, legislative system: election / selection of ruler, basic qualification of ruler, consultative council (Shura), qualification of members and their prerogative, judicial system: importance of justice, independence of judiciary, justice for all, social justice, administrative justice, rights and obligations of state and citizens. Status of women, rights of non-Muslims and just foreign policy

Courses Offered to Other Departments

Course Code	Course Title	Credit Hours
IS-211	Islamic Studies	2
HS-401	Professional Values and Ethics	2
HS-102	Pakistan Studies	2

IS-211 Islamic Studies:

کورس:

ہم اسلامیات کیوں پڑھتے ہیں۔؟انسان اور دوسری مخلوقات میں بنیادی فرق،زندگی کے بنیادی سوالات،زندگی ایک آزمائش،آزمائش میں کامیابی کا حصول،کامیابی کے حصول کا

ذریعہ: ہدایت، ہدایت کے ذرائع: علم اور ذرائع علم، وجدان، ہدایت، فطرت، حواس، عقل، الہامی ہدایت، الہامی ہدایت: قرآن، خصوصیات: قرآن، آخری، مکمل، اور محفوظ کتاب، فہم قرآن کی اہمیت، قرآنی معاشرے کا قیام، الہامی ہدایت: سنت، قرآن کی عملی تفسیر، اطاعت رسول کی ضرورت و اہمیت، اطاعت رسول کا دائرہ کار، حقیقت توحید و شرک، توحید ذات و صفات، توحید کے تقاضے، توحید، توحید کے اثرات، شرک اور اس کی اقسام۔ مکالمہ بین المذاہب، مختلف مذاہب کی متفقہ اساسیات، وحدت نسل انسانی، شرف انسانیت، مساوات نسل انسانیت، مختلف مذاہب کے پیروکاروں کے باہمی تعلقات۔ ریاستوں کے باہمی تعلقات، اقوام متحدہ کے چارٹر کی روشنی میں، قرآن حکیم کی تعلیمات، حدیث نبوی اور معاہدات نبوی، فقہ اسلامی کی روشنی میں مسلم اور غیر مسلم تعلقات کا دائرہ کار، بنیادی حقوق، معاشرتی حقوق، تجارتی حقوق، رواداری ۔ حدود و تعلقات، مسلمان ۔ غیر اسلامی ریاستوں کے شہری، بطور شہری حقوق و فرائض، عدالتی اختیارات اور مذہبی امور، سیاسی امور میں شرکت کا دائرہ کار، محرمات اور بطور مسلمان رویہ کی حدود، فرقہ، ہم آہنگی اور اسلامی تعلیمات، فرقہ بندی کی اساس، اسلام میں فرقہ بندی کی ممانعت، اختلافات باعث رحمت اور فکری ارتقا، اختلاف کو خلاف بنانے کے مفاصد، اسلامی فرقوں میں اہم آہنگی کیسے پیدا کی جائے۔ اسلام کا تصور عبادت: ہمہ وقتی عبادت، اہم عبادات، نماز کی اہمیت اور اثرات، دین میں ترجیحات، فرائض، واجبات، سنن اور مستحبات، انفرادی اور اجتماعی حقوق، حقوق و فرائض میں توازن، اہم ذمہ داریوں کی اولین اہمیت۔ صداقت و امانت، دل، دماغ اور زبان کی سچائی، زبان کو آلودگی سے محفوظ رکھنا، امانت کی اہمیت اور امانت کے مفہوم کی وسعت، صدق و امانت کے ثمرات ۔ عدل، اہمیت، عدل کی معاشرتی اور قانونی بنیادیں، عدل اجتماعی یا کفالت عامہ، طبقاتی عدل ۔ کسب حلال اور محنت کی عظمت، ذمہ داری اور عہد کی اہمیت، حلال و حرام کے اسلامی معیار، حلال و حرام کے اثرات ۔ رذائل اخلاق اور ان کے اثرات، تکبر، حسد، غصہ، لالچ، انسانی شخصیت پر ان کے اثرات ۔

عملی کام:

نماز کی تصیح، ترجمہ اور ضروری مسائل ۔ قرآن کے آخری دس سورتوں کا یاد کرنا ۔ قرآن کی منتخب آیات کا ترجمہ و مفہوم (سورۃ المومنون ابتدائی آیات، سورۃ الفرقان 61 تا 77، سورۃ الحجرات 10 تا 18)

HS 401 Professional Values and Ethics

Ethical and moral issues for engineers, health, safety and welfare of people, major theories of moral development, code of ethics prescribed by professional bodies, fundamental human rights and its legal provision in an organization, principles of justice, contract laws, arbitration, partnership, evidence laws, labor laws, drafting and legal documents used in contractual transactions.

HS-102: PAKISTAN STUDIES (02)

COURSE CONTENTS:

Ideology of Pakistan and Two Nation Theory, Nation state and nationalism, Sir Syed Ahmad Khan (Aligarh Movement), Allama Iqbal and Quaid-e-Azam on Two Nation Theory, Role of minorities in Pakistan Movement, Role of Women in Pakistan Movement, Overview of Muslim politics in United India from 1906 to 1947, Pakistan Constitution of 1956 , 1962 and 1973, Political History of Pakistan (1970-2013), Major issues of conflict between Pakistan and India, Pakistan's foreign policy, Pakistan's relation with international community, OIC, ASEAN, SAARC, SCO and ECO, Physiographic Features of Pakistan and Geo-strategic importance of Pakistan. Various political, economic and cultural issues like National integration/ sovereignty violation, menace of corruption, energy crisis, quagmire of front line state.

Admissions

Lt Col Muhammad Hafeez (Retd)

Tamgha-e-Imtiaz (Military)
MA Educational Administration
MA Political Science
Registrar

The Office of the Registrar is the nucleus of the University and coordinates all the activities within and outside of the University. It is the custodian of the common seal and academic records of the University. It provides secretariat support to the Board of Governors and the Vice Chancellor. It maintains the register of students and its graduates. This Office is responsible for the admissions, registration, semester enrolments of the students and preparation of degrees for the graduating students. It also mantain record of students, faculty and staff of the University.

The admissions are strictly based on merit. The University is open to all persons without prejudice to gender, religion, race, creed, color or domicile.

Admission is granted on the basis of eligibility criteria. Applicants, who have appeared in a prerequisite examination prescribed for admission in a program and are awaiting results, will be provisionally admitted against an undertaking that they will pass their examination as per admission criteria.

Students awaiting results are required to submit attested copies of their certificates/degrees within two weeks after the declaration of results, failing which the University will cancel their admissions. Only those students will be registered who would complete all admission formalities including deposit of their fees and other dues on prescribed date.

Every undergraduate student shall be expected to take the full load of the courses prescribed for the semester. A master level student, however, will have the option to enroll for fewer courses. Admission Test is applicable to candidates of undergraduate programs only.

Students applying for graduate programs are required to be qualified as per criteria laid down by HEC.

Eligibility Criteria

BS (Electrical Engineering)

- F Sc/A Level or equivalent with Physics, Chemistry and Mathematics or

- Diploma of Associate Engineers in Electrical/Telecommunication/Electronics/Avionics/Instrumentation/Information Technology/Precision Mechanical and Instrument/Radar Technology/Automation/Radio Technology/Instrumentation and Process Control

- Minimum 60 % marks

BS (Mechanical Engineering)

- F Sc/A Level or equivalent with Physics, Chemistry and Mathematics or

- Diploma of Associate Engineers in Mechanical/Mechanical (Power)/Mechanical (Production)/Precision Mechanical and Instruments/Auto and Diesel Tech/Bio-Medical/Dies and Mould/Automation/Refrigeration and Air Conditioning/Mechanical (Construction Machinery)

- Minimum 60 % marks

BS (Computer Engineering)

- F Sc/A Level or equivalent with Physics, Chemistry/Computer Science and Mathematics

- Diploma of Associate Engineers in Computer Information Tech./Computer/Telecommunication/Electrical/Electronics/Software/Radar Technology/Automation/Radio Technology/Instrumentation/Instrumentation and Process Control

- Minimum 60 % marks

BS (Computer Sciences)

- Intermediate/equivalent with Mathematics, Chemistry/ Computer Sciences and Physics

- Minimum 50 % marks

MS Engineering (Electrical/ Mechanical)

- BE/BS/BSc Engineering in relevant discipline

- Minimum CGPA 2.00/4.00 or 50% marks

- GAT General conducted by NTS/University Admission Test with minimum 50% cumulative score

MS (Computer Science)

- BS (Computer Science/Software Engg), MCS / MSc Comp Sc
- Minimum CGPA 2.00/4.00 or 50% marks

- GAT General conducted by NTS/University Admission Test with minimum 50% cumulative score

MS (Mathematics)

- BS/M.Sc Mathematics

- Minimum CGPA 2.00/4.00 or 50% marks

- GAT General conducted by NTS/University Admission Test with minimum 50% cumulative score

MS (Islamic Studies)

- MA/BS (Islamic Studies/Shariah/Arabic)

- Dars-e-Nizami from HEC recognized institution with 50% marks

- Minimum CGPA 2.00/4.00 or 50% marks

- GAT General conducted by NTS/University Admission Test with minimum 50% cumulative score

Ph D

- MS / M Phil or equivalent (in relevant discipline) with minimum CGPA 3.00/4.00 from an HEC recognized institution
- GAT Subject test conducted by NTS with minimum 60% cumulative score or GRE Subject test with minimum 60% percentile score

Admission Test

A written Admission Test is compulsory for all admissions in undergraduate programs as advertised in the national press. Students with valid NAT IE/ICS results are also eligible to apply.

Admission Test will be held at the prescribed date comprising following pattern:

Engineering

English	22%
Analytical	22%
Quantitative (Arithmetic, Algebra & Geometry)	22%
Subject (Physics, Mathematics, & Chemistry)	34%

Computer Science

English	22%
Analytical	22%
Quantitative (Arithmetic, Algebra & Geometry)	22%
Subject (Physics, Computer, & Mathematics)	34%

Determination of Merit

The final merit will be determined based on:-

University Admission Test	50%
HSSC Part 1/HSSC or equivalent	40%
SSC /O-level	10%

Merit list of candidates who have appeared in A level (Final Exams) will be prepared by assigning 50% weightage to O-Level marks and 50% weightage to the admission test. Final selection will be based on securing minimum 60% marks in A Level as per equivalence provided by Inter Board Committee of Chairmen.

Announcement of Result

The result will be announced as per given schedule.

Complete result will be displayed on the University website. All selected candidates will be informed about their admissions through the Email and SMSs. List of selected candidates will also be displayed at the University Secretariat.

Late Admissions

As a matter of policy, late admissions are not entertained

and no deviation is made from the announced schedule. The University reserves the right to reject the application of a student for admission without assigning any reason.

Registration and Enrollment

- On completion of admission formalities including deposit of dues, the applicants will be registered as bonafide students of the University
- Applicants are required to provide original academic certificates and documents to the Registrar Office at the time of registration
- After registration, Registrar Office will issue University Registration Card/Identity Card to all students
- Students are allowed to enroll for the courses offered by their department after getting their Registration Number
- If a student fails to get himself enrolled for the courses, his/her name will be struck off the strength and vacant position will be offered to the next candidate on the waiting list
- Students must enroll for the courses in each semester within first two weeks of the start of the semester
- All admissions will be provisional until provision of original documents

Transfer within HITEC University

We do not encourage shifting students from one discipline to the other. However in extreme circumstances, students can be transferred from one discipline to the other within the same merit or to the discipline with lower merit on their request.

Dates to Remember

Events	Date	Days
Availability of Prospectus	July 11, 2016	Monday
Last Date of Submission of Admission Form	August 16, 2016	Tuesday
Admission Test	August 20, 2016	Saturday
Admission Test Result/1st Merit List	August 25, 2016	Thursday
Deposit of Dues /Registration of Students	August 26-Sep 2, 2016	Friday - Friday
Second Merit List (if required)	September 3, 2016	Saturday
Deposit of Dues / Registration of Students	September 3-8, 2016	Saturday-Thursday
Third Merit List (if required)	September 9, 2016	Friday
Commencement of Fall Semester 2015	September 19, 2016	Monday
Orientation	September 19, 2016	Monday

Contacts

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Financial Matters

Mrs. Nabila Shuja
MSc, M.B.A, DIABP, MCP, MCSE+I, MCDBA, CCNA.
Treasurer

Treasurer is the Chief Financial Officer of the University. This office is vested with the responsibility to maintain and prepare the accounts of the University in accordance with the generally accepted accounting standards approved in Pakistan. The management of University assets, liabilities, receipts, expenditures, funds and investments are also at the discretion of this office. The Treasurer office also ensures utilization of funds according to the budget approved by the Board and perform such functions as assigned by the Board.

Fee Structure

The fee structure for the student registered in the academic year 2016-17 in different disciplines of undergraduate & postgraduate is as under:-

Programs	Admission/Registration/Development Fee (One Time)	Security Deposit (One Time)	Semester Fee
BS Engineering	Rs. 30,000/-	Rs. 20,000/-	Rs. 95,000/-
BS Computer Sciences	Rs. 30,000/-	Rs. 20,000/-	Rs. 70,000/-
MS Engineering	Rs. 10,000/-	Rs. 10,000/-	Rs. 5,500/- per cr hr
MS Mathematics	Rs. 10,000/-	Rs. 10,000/-	Rs. 5,500/- per cr hr
MS Computer Sciences	Rs. 10,000/-	Ra. 10,000/-	Rs. 5,500/- per cr hr
MS Islamic Studies	Rs. 9,000/-	Rs. 3,000/-	Rs. 3,000/- per cr hr
PhD	Rs. 10,000/-	Rs. 10,000/-	

- Semester fee includes tuition fee, examination fee, lab charges, sports subscription etc.
- All the registered students will pay their fee as per the fee slips issued by the Accounts Office.
- Challan forms will be available from the Accounts Office at the time of admission. Fee is payable at any branch of Bank Alfalah Limited or through bank draft in favor of HITEC University.
- Subsequently, fee challans will be issued before the commencement of each semester.
- Please note that all fees are subject to revision.

Payment of Dues

- For the convenience of students the University has set up a permanent banking booth at the University campus, by the Bank Alfalah Limited for the cash deposit of fee.

- The fee challan will be available from Accounts Office at the time of new admission and registration to regular semester.

- The students can deposit fee online through all domestic branches of Bank Alfalah Limited as per following details:

  ■ Bank Account # 0205-02900013, Title "HITEC UNIVERSITY, TAXILA CANTT".

  ■ The student is responsible for submission of online fee deposit slip/challan to Accounts Office to confirm his/her admission/registration.

- The fee can be deposited through Bank Draft drawn in favour of Bank Account # 0205-02900013, Title "HITEC UNIVERSITY, TAXILA CANTT".

- All registered students of the University should deposit their semester fee within 10 working days of the commencement of classes of that semester, thereafter fine will be charged as per University policy.

Refund Policy

Timeline	% age of Tuition Fee
Undergraduate Program	
Up to 7th day after commencement of Classes	Full Fee (100%) Refund
8th-15th day after commencement of Classes	Half Fee (50%) Refund
From 16th day after commencement of Classes	No Fee Refund
Postgraduate Program	
Up to 14th day after commencement of Classes	Full Fee (100%) Refund
After 14th Day of commencement of Classes	No Fee Refund

- **% age of Fee** shall be applicable on all components of fee, except for security and admission charges
- **Timeline** shall be calculated continuously, covering both weekdays and weekends

Fine for Late Payment of Fee

The following fine will be levied for payment of fee after due date:

- For the first ten days after due date, 5% of the payable amount.

- After ten days up to twenty days, 10% of the payable amount.

- After twenty days Rs. 10,000/- will be charged.

- Two months after due date, Registration shall be

suspended.

- For re-activation of registration, the student will be required to pay the admission charges again, with all outstanding charges and fine.

Financial Assistance/Scholarship

HITEC University allocates substantial amount every year for scholarships and financial assistance to deserving students as described below:-

- **50 Percent fee waiver-** For the top 50 merit list position holders of engineering discipline for 1st semester only.
- **China North Industries Corporation (NORINCO) Scholarship-** Awarded to position holders of all undergraduate disciplines on semester basis (semester GPA should not be less than 3.50)

- **Financial Assistance on need-cum Merit Basis-** given to needy students, subjects to minimum 2.5 semester GPA.
- **Muhammad Nusrat Scholarship -** supports the deserving students subject to minimum GPA of 2.50.
- **Begum Razia Sultana Scholarship -** awarded to bright female students enrolled in regular program of HITEC University.
- **NTS Scholarship** - Awarded on need cum merit basis to new entrants who appeared in the NTS test.
- **TFP Scholarship** - Awarded on performance basis to deserving students.
- **Qarz -e- Hasna Scheme -** Avalable to eligible candidates incollaboration with "Ihsan Trust of Meezan Bank"

Hostel Accommodation (for boys)

Only limited on-campus accommodation is available on "first come first served basis".

Hostel Security (Refundable)	Rs. 10,000/-
Per Month Charges	Rs, 4,000/-

Transport

Transport facility is available for Islamabad & Rawalpindi areas only.

Per Semester Charges	Rs. 20,000/-

Miscellaneous Charges

Course Repeat Fee	:	Rs. 4,000/- per cr hr
Semester Freeze Fee	:	25% of the each semester Fee
Migration Fee	:	Rs. 25,000/- each semester exempted
Transcript Fee/ Semester	:	Rs. 300/ Rs. 600 Normal/Urgent
Degree Fee	:	Rs. 3000/Rs. 5000/- Normal/Urgent
Additional Grade Report including Attestation:		Rs. 300/- per semester
Recalculation Fee	:	Rs. 1,000/- per subject
Attestation	:	Rs. 100 per document
Duplicate Admit Card	:	Rs. 200/-
Convocation Charges	:	Rs. 8,000/- (will be deducted from the security refund)

Contacts

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Academic Regulations

Lt Col (R)
Mahmood Ahmed Siddiqui TI (M)
Controller of Examinations

Introduction

The Office of the Controller of Examinations is responsible for all matters concerning examinations and ensures that the examinations are held in free and fair environment. It is also responsible to notify the date sheet, appoint the supervisory staff and issue admit cards to the students in end semester examination. The Office maintains strict secrecy of all information regarding examination matters, notifies the semester and other results and makes semester grade reports available to students on University website. The Office also maintains over all examination records of the students and issues interim/ final transcript(s) and other certificates.

The HITEC University follows semester system, quite akin to that in vogue in American universities. Singular features of this system are highly focused and well delivered classroom lectures, extensive experimentation and continuous assessment of students' performance. It aims to infuse habits of regularity and competitiveness amongst the students.

The following few pages give definitions of various terms applicable to our system. They also contain a summary of rules and regulations. Please do take a few minutes to peruse through them.

Academic Calendar

It consists of two regular and a Summer Semester. Duration of regular semesters is nineteen weeks each which includes sixteen weeks of teaching and three weeks of examinations. The Summer Semester (conducted for undergraduate programs only) is condensed to eight weeks duration, but the credit hours taught for a course are equal to a regular semester. The schedule of semesters for the year 2016-2017 is:-

Fall Semester 2016	19 Sep 2016 - 27 Jan 2017
Spring Semester 2017	13 Feb 2017 - 23 Jun 2017
Summer Semester 2017	03 Jul 2017 - 08 Sep 2017

Contact Hour

One hour including ten minutes break spent on academic and research related activities including instructional work/tutorials, laboratory work (practical), research work, projects, seminars, workshops, internships, etc during the course of studies at the University.

Credit Course

A course of which enrolment and successful completion is a mandatory requirement for the award of degree.

Credit Hour (Cr Hr)

A lecture of one hour duration (including ten minutes break) delivered per week per semester for a course countable towards a student's Cumulative Grade Point Average. However, in case of seminars, tutorials and laboratory work (practical), one credit hour may require two or three contact hours depending upon the nature of the subject.

Semester Credit Load

In every semester, undergraduate students must enroll in all the courses prescribed for that semester (as specified in the road map of that program). The academic load in each semester ranges from fifteen to nineteen credit hours for undergraduate and three to twelve credit hours (i.e. one to four courses) for graduate students. In Summer Semester, an undergraduate student can enroll in the number of courses not exceeding nine Cr Hrs.

Academic Performance Evaluation

The students are evaluated as per following criteria:-

- Quizzes
- Home Assignments
- Case Studies/Seminars/Workshops
- Practical/Laboratory Tests
- Project
- Internship
- Viva Voce
- Sessional Examinations
- End Semester Examination

Grading System

The performance of each student in a course of study is based on relative grading system except otherwise mentioned. The grades and grade points in case of relative grading are as follows:-

GRADE	GRADE POINT
A	4.00
A-	3.67
B+	3.33
B	3.00
B-	2.67
C+	2.33
*C	2.00*
C-	1.67
D	1.00
F	0.00
I	Incomplete

(* Lowest grade in case of postgraduate courses)

Note: In all cases of project, thesis, dissertation evaluation and where the class strength is 10 or less students, the performance will be based on the marks obtained by a student and the grades and grade points will be as follows:-

MARKS	GRADE	GRADE POINTS
90-100	A	4.00
85-89	A-	3.67
80-84	B+	3.33
75-79	B	3.00
70-74	B-	2.67
65-69	C+	2.33
60-64	*C	2.00*
55-59	C-	1.67
50-54	D	1.00
less than 50	F	0.00
-	I	Incomplete

(*Lowest grade in case of postgraduate courses)

Award of Grade 'F'

In addition to 'F' grade awarded on the basis of academic failure, a student shall not be allowed to appear in end semester examination of a subject in which his/her attendance is less than 75%, and he/she shall be awarded 'F' grade in that subject. The 'F' grade so obtained shall only be cleared by repeating the same course whenever offered.

Award of Grade 'I'

A student, who, because of illness or other acceptable reasons approved by the Departmental Board of Studies/Board of Faculty, fails to appear in end semester examination, provided his overall attendance is not less than 75%, is given 'I' as a grade. The student receiving such a grade makes up the unfinished portion of his course and is given a grade at the discretion of the faculty without prejudice to the previous grade 'I'. In case the student fails to make up the course work, he receives a grade 'F' unless further extension is given by the Board of Faculty. He shall pay the prescribed fee

for re-appearing in the end semester paper. Following procedure should be adopted to remove 'I' grade:-

- ■ **Sessional Examinations.** Whenever a student misses sessional examination, makeup test shall be arranged within the period to be decided by the Departmental Board of Studies but not later than four weeks from original date of missed sessional examination. Makeup test for Mid-term examination of two hours duration (only for lab courses) will also be governed accordingly.

- ■ **End Semester Examination.** Whenever a student misses end semester examination, make up examination shall be arranged within first six weeks after the beginning of the subsequent semester.

Attendance Rule

A student shall not be allowed to appear in end semester examination of a subject in which his/her attendance is less than 75%, and he/she shall be awarded 'F' grade.

Cumulative Grade Point Average (CGPA)

The summation of grade points of all credit courses divided by the total number of credit hour taken by a student, i.e.

$$CGPA = \frac{Sum\ of\ (P \times N)}{Sum\ of\ N}$$

Where 'P' represents grade point assigned to a letter grade scored by the student in a course and N represents the number of credit hours associated with the course. In short it is the ratio of total grade points earned in all the courses to the total number of credit hours of those courses.

Semester Grade Point Average (GPA)

The summation of grade points of the particular semester credit courses divided by the total number of credit hour taken by a student in that semester, i.e.

$$GPA= \frac{\text{Sum of (PxN) of a semester}}{\text{Sum of 'N' of that semester}}$$

where 'P' represents grade point assigned to a letter grade scored by the student in a course and N represents the number of credit hours associated with that course. Here numerator is the summation of grade points earned in a semester and denominator is the summation of credit hours attended in that semester.

Repetition of Course(s)

A student can repeat a course to obtain minimum CGPA laid down for the prescribed program or to improve the CGPA. It is the responsibility of the student to clear the failed course(s) or improve CGPA by applying (subject to course offering) to the respective chairperson and get the approval to repeat the course. While repeating a course, a student will undergo all the formalities applicable to regular semester i.e. pay the fee, attend the classes and appear in the quizzes, assignments, projects, practical examination, sessional examinations and end semester examination as planned for the course. During Summer Semester a maximum of 'B' grade shall be awarded.

Opting to repeat a course(s) a student shall not be eligible for top honors/awards even if he/she improves and obtains equal or better CGPA. The student transcript shall show both old and new earned grades, but the CGPA shall be based on better earned grade. Apart from clearance of 'F' grade an undergraduate student can repeat a maximum of six courses and graduate student can repeat a maximum of two courses.

Semester Freeze

Based on the positive recommendation of the Chairperson of the Department/College/ Institution, semester freeze up to one year from course work is allowed to students facing acute domestic problems or any other valid reason(s). During semester freeze period the student shall be required to pay 25% of the tuition fee (Rs. 6000/- for PhD student) for each semester to continue his/her registration with the University. Prior to resumption of studies after the semester freeze, it shall be mandatory to clear all the previous outstanding dues, if any. Freezing of first semester is not allowed.

Final Grade

The grade earned by a student in home assignments, quizzes, case studies, viva voce, practical/laboratory work, sessional examinations, end semester examination and projects etc, are formalized into final result by the concerned faculty member. All the examination answer books/sheets including end semester examination are marked and shown to the students. The marks obtained by the student in each examination are also displayed on notice boards at least one week prior to commencement of end semester examinations. The faculty members prepare the final results of the students on the standard award list in duplicate and submit it to the Departmental Board of Studies. The award list of each course duly approved by the Departmental Board of Studies are then sent to the Office of the Controller of Examinations.

Recalculation/Change of Grade

There shall be no re-evaluation of answer scripts of the end semester examination. However, a candidate shall be allowed to have his answer scripts rechecked by the Controller of Examinations on payment of prescribed fee within 30 days of the declaration of the result. The Dean of the Faculty concerned, on the recommendation of the concerned Chairperson, may condone the delay up to a maximum period of 15 days on payment of double fee. The Controller of Examinations and a faculty member of the concerned department shall check the answer scripts of the end semester examination of the applicant and satisfy themselves regarding following aspects and certify that:-

- The script belongs to the applicant and that it has not been changed.
- No portion of the script has been left unmarked.
- The marks awarded in the script have been correctly brought out/ reproduced on its cover.
- The grand total on the cover of the script is correct.
- The grand total on the cover of the script is correctly transferred to the award list.
- The result has been correctly posted and notified.

Change in Pre-End Semester Examination Result(s)

After notification/declaration of final results by the Controller of Examinations, pre-end semester examination results will not be changed e.g. quizzes, assignments, sessional examinations or

any other activity which was assigned marks. Only the application(s) raising query in final paper will be accepted. Student(s) seeking change/rectification of pre-end semester examination results due to erroneous entry of marks by the concerned faculty member will be admitted and processed through Chairperson of concerned Departments/Institutes/Colleges.

Medium of Instruction

The medium of instruction will be English except where permitted by the competent authority.

Semester Enrolment

Enrolment in each regular and Summer Semester is mandatory for every student. List of enrolled students will be notified by the Registrar Office within first two weeks of commencement of each semester and Controller of Examinations shall publish results on the basis of that list. Enrolment forms are available with each Department and if a student fails to enroll for the semester, his/her name will be struck off the university rolls and will be included in the list of suspended students. The registration will be restored after paying the laid down fee and the fine imposed as per rules.

Course Add/Drop

Undergraduate Programs. A student, if allowed to enroll in additional course(s) in a regular semester or during Summer Semester, can add or drop a course(s) on the basis of conflict in weekly program or on personal grounds within first two weeks of commencement of semester. In this case fee will not be charged, nor will the result be announced. In all other situations a student is liable to pay the fee and his result will also be announced.

Postgraduate Programs. A student can apply and get approval by the respective Chairperson of department/ school/institution, to add or drop a course(s) due to conflict in weekly program or on personal grounds within first two weeks of commencement of regular semester. In this case fee will not be charged, nor will the result be announced. In case a student applies for dropping a course(s) within two weeks after first sessional examination, fee will be charged, but the result will not be announced. In all other situations a student is liable to pay the fee and his/her result will also be announced.

Award of Bachelors'/Masters'/PhD Degree and Academic Deficiencies

Award of Degree

HITEC University, awards undergraduate/graduate degree to the students who satisfy the following conditions:-

- Have completed the minimum credit hours as per approval of PEC/HEC for each program.
- Have achieved a minimum CGPA of 2.00, 2.50 and 3.00 for Bachelors', Masters' and PhD programs respectively.
- Have no unclear 'F' grade.
- Have cleared all dues.

Conditions for Academic Deficiencies

A student who obtains one or more of the following grades in a regular semester final result is considered academically deficient, namely:-

- 'F' grade in any subject.
- Semester GPA less than 2.00, 2.50 and 3.00 for Bachelors', Masters' and PhD programs

respectively, in first semester only.

- CGPA less than 2.00, 2.50 and 3.00 for Bachelors', Masters' and PhD programs respectively.
- 'I' (Incomplete) grade in any course.

Academic Deficiencies

- **Probation.** Probation means that a student is deficient in academic standards and is either likely to be relegated or withdrawn from the program.
- **Relegation.** Relegation means that the student is asked to join the next junior class when recommended by the Board of Faculty. It can be on academic, medical or disciplinary grounds.
- **Withdrawal.** Withdrawal means that a student is considered unsuitable for further studies and shall be deregistered from University rolls.

Disposal of Academically Deficient Bachelor Students

Probation

A student is placed on academic probation under any of the following conditions, if:-

- First semester GPA is equal to or more than 0.75 but below 2.00.
- CGPA at the end of second semester is equal to or more than 1.50 but below 2.00.
- CGPA in third or subsequent semesters is below 2.00 but does not qualify for relegation.

- Fails in a subject(s).

Relegation

A student is relegated under any of the following conditions:-

- The second semester CGPA is equal to or more than 1.25 but below 1.50.
- From third and in subsequent semesters, obtains CGPA less than 2.00 in two consecutive regular semesters.
- On medical or disciplinary grounds.
- Own request
- Recommended on medical grounds will not be counted towards withdrawal.

Withdrawal

A student is withdrawn from the University subject to any of the conditions listed below:-

- At the end of the first semester, obtains GPA below 0.75.
- At the end of first two semesters secures CGPA below 1.25.
- Earns relegation after being placed on relegation twice except as provided in the rules.
- On disciplinary ground or using unfair means in the examination.

Postgraduate Academic Regulations

Masters' and PhD candidates may visit the University website to acquaint themselves with the academic regulations pertaining to these programs.

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Student Affairs

Huma Fawad
Director Student Affairs
M.Sc. Engg Management, UET Taxila, MBA,
B.Sc. Mechanical Engineering, UET Lahore.

Student Affairs Office is responsible for all co-curricular and extra-curricular activities of the students in the Campus by providing them with various opportunities for their overall grooming and development. This office provides a variety of services and also looks after the overall discipline and welfare of the students, besides organizing, coordinating and supervising the co-curricular and extra-curricular activities, within and outside the University campus. Student Affairs Office aims to enhance and cultivate students potential in sports, literature, music, culture, arts, social entrepreneurship and community development program.

The office maintains a close liaison with various industries and organizations for student projects, industrial visits and internship program. It is also responsible for arranging Inter University Events (Olympiad), Open House, Job Fair, Excursion Trips, etc.

Financial Assistance

There are several Financial Assistance Programs in the University and Student Affairs Office is responsible for the award of these need-cum-merit based scholarships to deserving students. These programs are funded either by the University's internal sources or by outside organizations to HITEC students.

Hostel
A newly built hostel facility is available at the campus to accommodate three hundred students. Fully furnished, well ventilated and airy rooms with allied facilities are provided to the students at very reasonable rates. Boys hostel complex offers indoor games, TV room and the management also aspires to build a fitness centre for the students and faculty of the University. Similarly an exclusive hostel facility is also available for girl students.

Transport
University owns a fleet of transport, consisting of buses and vans, for transporting students at nominal charges. The transport operates on two different routes. Route-1 covers Islamabad whereas; Route-2 facilitates students coming from Rawalpindi. Local transport is also available for students living in close proximity to the University.

Swimming Pool
The all-weather indoor swimming pool provides good leisure time activity to the students all year round. The water of the swimming pool is changed regularly and great attention is paid to maintain excellent hygienic conditions. Students can avail this facility at nominal charges.

Stadium
University stadium, which is presently under construction, is surrounded in East and South by the lush green hills of Margalla mountain range and give a very pleasant and picturesque look. It is the venue for all outdoor sports and is also the popular site for the annual funfair festival.

Gymnasium

"Healthy body keeps a healthy mind". A state of the art gym has been established in HITEC sports complex. Students are encouraged to keep themselves fit and use the gym facilities during their spare time. Separate timings have been laid down for the male and female students to avail this facility. An additional facility of Aerobic Centre is also available for the students who are interested to learn the art of aerobics.

Auditorium

Centrally air-conditioned "Nusrat Auditorium" having a seating capacity for 400 persons and equipped with the latest multimedia/public address system is available for organizing different kind of activities. Student societies arrange their functions and activities like debates, declamation contests, dramas, skits, ramp walk, musical, technical & scientific shows and exhibitions.

Cafeterias

Two cafeterias have been established at the University Campus where fresh, hygienic and healthy food is available to students. Both the cafeterias provide clean atmosphere and serve traditional and fast foods at reasonable prices. Cafeteria performance in terms of quality of food, prices and overall cleanliness of the area is monitored by a Food Committee comprising faculty members and students. Food Committee regulations are also governed by the Student Affairs Office.

Societies

Seven different clubs/societies have been established to look after various interests of students. These are managed by elected Student Office Bearers (Presidents/ Secretaries). The Student Affairs Office holds the annual student body elections and provide guidance to students along with the Faculty-in-charge of the respective society.

Literary Society

This society provides a learning atmosphere and encourages students to undertake literary activities. It holds Inter Department and Inter University debates/ declamation contests and forms part of the Editorial Board of the University Magazine.

Creative Art Society

The society makes efforts in promoting artistic talents of the students. It holds art competitions, variety shows and other cultural events. It also arranges art and craft exhibitions, funfairs and musical programs.

Adventure & Social Welfare Society

The society endeavors to create awareness of environmental issues among the students and

undertakes cleanliness drives, tree plantation drives within and outside the University. It organizes different types of social events to inculcate the spirit of social services, volunteerism and patriotism, among students. The society also organizes student excursion trips, trekking and paragliding activities for the students.

Sports Society

The society promotes sports activities among students by holding Inter Departmental sports competitions and encourages students to participate in all Inter University competitions. Basketball, football, cricket, hockey, volleyball, badminton and table tennis matches are held quite frequently.

Science Society

This society provides a forum to enhance the scientific knowledge of the students. It organizes Inter University project competitions/exhibitions and arranges quiz shows, conferences and seminars, etc. This society also collaborates with other professional and technical student bodies like IEEE, ASHRAE, ASTM, SMEP, etc and provides students with assistance as and when required by them.

Character Building Society

The society has been entrusted with the responsibility to create awareness about importance of character and good working atmosphere through lectures, discussions and essay writing competitions, etc. It inculcates moral and ethical values among students.

Girls Society

Girls Society in HITEC University aims to develop leadership skills in girl students and provides them with equal opportunities to compete in various extra & co-curricular activities without any inhibition.

Financial Assistance

In each semester, University allocates and distributes a large amount of financial assistance to help needy students. During Fall Semester 2015 & Spring Semester 2016 an amount of Rs. 4.4 Million was distributed amongst deserving students on need cum merit basis. In addition to that, all Huffaz students are entitled to receive stipend of Rs. 1000/- per month.

Student Counseling

Student Affairs Office is also responsible to promptly resolve any personal or collective problem faced by the students through private counseling.

Alumni

Up-to-date record of all graduates of HITEC University is maintained by Student Affairs Office. University achievements, news and career opportunities are regularly communicated to the Alumni on a dedicated University Alumni Website. Student Affairs Office also holds online alumni elections every two years.

Open House (Job Fair)

To help students and alumni explore and make successful career choices, this Office assists the employers and the employees in meeting each other in the "Open House" every year, which is attended by a large number of executives of industries and organizations. It also ensures personal and professional development of the students.

Community Service

In order to generate a sense of ownership among the students for our community in general and societal responsibilities in particular a community service club operates under the Student Affairs office. The significant projects of community service that took place in Fall 2015-Spring 2016 are Cleanliness drive of Khanpur Dam recreational spot, Sponsor a child program at Jori,

Sangjani, etc.

Career Placement

Establishing contacts in the industry and working on career placement of fresh graduate engineers is a new directive of the Student Affairs Department. Currently the department facilitates on campus job interviews and tests and keeps a record of CVs of graduating engineers which is provided to the industry for suitable placements.

Dress Code – Students

Boy Students:-
• Formal trousers (Jeans are not allowed)
• Dress shirts only (T-shirt, sports shirt, etc not allowed)
• Shalwar qameez (on Fridays only)
• Blazers jersey, coat, jackets (for winters)
• Closed shoes (slippers, sandals not allowed)
• Display of University student ID cards during University working hours is mandatory.

Girl Students:-
• Any decent shalwar qameez, trousers with dupata / scarf.
• Blazer, jersey, coat, jackets, shawls (for winters)
• Jeans, tights, sleeveless, short qameez not allowed. (length of qameez to be at knee level)
• Closed shoes (sandals, slippers, pencil heals not allowed)
• Wearing of heavy / expensive jewellery and heavy makeup is not allowed.
• Display of University student ID cards during University working hours is mandatory.

Student Achievements in Inter – University Competitions

Students of HITEC University being exceptionally talented in various dimensions are always very keen to participate in inter university events/competitions. Some of these competitions in which our students won 1st/2nd positions are given below:

TECTIQS' 15 AT IQRA UNIVERSITY

Iqra University organized a mega event by the name of TectiQ's15 dated 26th to 29th November 2015. Team "HITONIANS" comprising Afaqul Hassan, Zulqarnain Naveed Bahadur & Muhammad Owais Siddiqui stood first in Pak Food Marketing Plan.

TECHFEST'16 & RENAISSANCE'16 AT GIKI

Under the supervision of SMEP GIKI Chapter, Techfest'16 & Renaissance'16 were held from February 19th to 21st in which more than 15 Universities took part. Team "Hybrid" from HITEC University comprising students Hassnain Kiyani, Daniyal Nadeem, Nouman Nawaz & Muhammad Danial won the event Industrial Technovation. Students took 2nd position in Scavenger Hunt & Mechania Bridge Making competitions as well.

SONY WORLD PHOTOGRAPHY AWARD 2016

Out of 203,103 images from 186 countries including China, USA,UK, India, Italy and many others were shortlisted for the "Sony World Photography Award 2016" in which Zohaib Tariq a student of HITEC University secured a place in Top 10 entries from all around the world.

SPRINT IN 100M RACE AT APCOMS

HITEC University student Aftab Ahmed participated in Sprint 100 m race in APCOMS from 24th -27th March 2016 and stood first in the competition.

BYTE'16 AT BAHRIA UNIVERSITY

BYTE'16 was organized by Bahria University Islamabad from 11th -13th March 2016 in which several students from HITEC University participated and secured two positions. Two teams comprising Sabi Haider & Aamir Iqbal, M Ibtesam Siddique & Siekh Ehsan took 1st and 2nd position respectively in photography competition.

GIKI SCIENCE MARATHON' 16

Students from 2015 batch including Arsala Khan, Aqib Aziz, M.Kamal Ahmad, Usama Rauf Baloch & Umer Saddiq took part in GIKI Science Marathon'16 held from 12th – 14th Feb 2016 and were awarded with 2nd position in the event.

IMEC'16 AT GIKI

HITEC University took part in IMEC'16 held in GIKI from 8th-10th April 2016. Students participated in several

events and secured positions. 2nd and 3rd Prizes were won in Human Powered Vehicle Competition by team Blitz & Team Invincible respectively. All three positions 1st, 2nd and 3rd were won by HITEC University in Mind Crunch Competition while 1st position was won in T- Shirt Design Competition by Talha Hanif. The Ambassadors Afaq-ul-Hassan, Talha Hanif & Hamza Khakwani were declared as the Best Ambassadors for the said event.

DBFC-11 AT GIKI

DBFC-IX was held in GIKI from April 15th – 17th 2016. Two Teams from HITEC University Team Buraq: Bilal Ahmed, Hafiz Moeed ud Din Qureshi and Abdullah Ameen Qazi & Team Sheerdils: Faizan Talib, Muhammad Ehtisham, Moeed Malik Lodhi, Usama Abassi & Saqib secured 1st and 2nd positions respectively.

MUSTIVAL'16

Mirpur University of Science & Technology held MUSTIVAL from March 25th-27th, 2016. In two modules

Brush Art and Present Mania, HITEC University team Hybrids comprising Kashif Maaz, Hasnain Kazmi, Nauman Nawaz and Saad Khalil stood first while in module Clutter Master the teams comprising Hafiz Moeed, Bilal Ahmed, Zia Mustafa and Hamza Rafique was declared runners up.

IST YOUTH CARNIVAL'16

Institute of Space Technology (IST) organized a mega event named "IST Youth Carnival'16" from March 30th – April 1st, 2016. More than 50 universities from all over the country participated in the event and total participation was over 3980 students. The HITONIANS took part in almost all the events and secured a place on the victory stand by winning 34 positions in team and individual events in the field of sports, literary, science and arts competitions. HITEC University won 12 first positions, 10 second and 9 third positions, besides winning the award of the "Best University" due to maximum winnings in the carnival. They also won a Cash prize of Rs. 30,000/- from IST.

FUUAST INNOVATIA '16

FUUAST Innovatia'16 at Federal Urdu University was organized from April 20th -22nd, 2016. HITEC University participated in the event and stood first in Scavenger Hunt competition comprising Afaq ul hassan, Adnan Ahmed , Usama bin Kabir & Sheryar Iftikhar in the team. Runner up in General Knowledge Quiz, team comprising Sarmad Ali Kakakhail & Raza Abbas, and Raza Abbas was also runner up in Photography Competition.

MECHATHON-16

Mecathon'16-Photograph, IMech NUST chapter organized an event on 28th- 29th April 2016, HITEC University student Muaz Ali stood first in a competition

between eight different universities comprising GIKI, PIEAS, FAST, Bahria, AMC, AIR, NUST & HITEC.

MEDIA FIESTA' 16 AT NUST

NUST organized an event on 20th March, 2016 and 1st position was attained by Zulqarnain Naveed Bahadur, Wajihuddin Qazi in two team events of Poster Design Competition and Live Reporting Competition, respectively. First position was also won in individual events by Zulqarnain Naveed Bahadur in Event Photogrpahy, Talha Hanif in Product Photography, Sheikh Ehsan uz Zaman both in Live Exposure photography and Ad making Competitions. 2nd Position was won by Muaz Ali in Silhouette Photography.

NaSCon'16 AT FAST

FAST organized an event from 8th April-10th April, 2016. HITEC University won 2nd position in both a team event called Engineers Developing Society. Team comprised Muhammad Ibtesham Siddiqi, Ahmed Iqbal and Abdullah Multazim. 2nd position was also won in another individual event of Digital Photography Summit by Zulqarnain Naveed Bahadur .

AIRNEXUS-16

Air University, Islamabad organized AirNexus-16 from 29th April 1st May, 2016. HITEC University student stood first in Time Lapse Competition. The team comprised of eight students with team lead by

Muhammad Abubakar.

HITEC OLYMPIAD' 16.

"HITEC Olympiad 16", an Inter University competition organized annually by HITEC University was held from May 12th-14th, 2016. More than 30 different universities and colleges participated in 31 different events from sports like hockey, cricket, futsal, badminton, table tennis, chess to qiraat, naat, declamations, drama, singing, videography, sketching, photography, speed wiring, speed programming, battle of the bands, entrepreneurial project competition, water rocket launcher and e-gamming, etc.

The Olympiad was inaugurated by Engr. Jawed Saleem Qureshi, Chairman Pakistan Engineering Council. Sports activities were held in the lush green lawns of HITEC with scenic Margalla Hills in the background while all indoor competitions were organized in comfortable halls and auditorium of the University.

Events were judged by prominent personalities to ensure non partiality. Funfair was also arranged parallel to the events to give a festive feel to the Olympiad participants. A concert of Asrar Shah was also held to top the list of activities, which was highly appreciated and talked about by the Olympiad Participants.

Lt. Gen. Syed Wajid Hussain HI(M), Chairman Board of Governors of HITEC University and Chairman HIT was the honorable chief guest of closing ceremony. He expressed his appreciation of the event and congratulated the organizers for holding such a successful event and the winners on their achievement.

Contacts

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Directorate of Quality Assurance and Collaborations (QA&C)

Dr. Ejaz Muhammad
Dean, Quality Assurance & Collaborations
PhD
qec@hitecuni.edu.pk

The Directorate of Quality Assurance and Collaborations (QA&C) was established in 2012. QA&C has a primary role of assuring quality in synchronism with the Higher Education Commission (HEC) and Pakistan Engineering Council (PEC) guidelines.

The Directorate is also responsible for establishing and monitoring MOUs meant for collaboration with other universities and organizations of repute.

The foremost function of the Directorate is to assure that teaching, learning and evaluation processes are maintained as per International norms and requirements. An extensive system is in place to solicit feedback from the students, faculty and other stake-holders to bring about continual improvement in the quality of education. The feedback also encompasses the quality of administrative support and other allied services available in the University. The accruing data is analyzed in details and short comings are addressed speedily. The Directorate also keeps a record of all the proceedings and furnishes the required information to PEC and HEC on regular basis. This data is also essentially required for accreditation of our academic programs by various regulatory bodies.

HITEC University has now transformed into an "Outcome Based Education (OBE)" Institute. This shift has added new dimensions to the functions and responsibilities of the Directorate. Therefore, it closely monitors the attainment of "Course Learning Outcomes (CLOs)", "Program Learning Outcomes (PLOs)" and "Program Educational Objectives (PEOs)" quite diligently.

PEOs are those perceived objectives which our Alumni would be pursuing 4-5 years after graduation. It means HITEC University's quality of education assures that our graduates would be proficiently practicing their respective professional activities. OBE philosophy, therefore, essentially requires that all institutions must clearly formulate their PEOs and evidence should be in place to compute attainment of those PEOs through the feedback from the alumni and their employers.

The HITEC University has defined the following four PEOs:-
- **PEO-1:** Our graduates will be proficient engineers in industry, academia or manage self-initiated business activity.
- **PEO-2:** They will exhibit adaptation to advancements in knowledge for creating solutions of complex problems.
- **PEO-3:** They will contribute as effective team members and managers in their organizations.
- **PEO-4:** In dealing with others, they will conduct with

dignity, integrity and demonstrate commitment to social responsibilities.

In consonance with the standard universal practice, the quality of an engineering program must embody the following graduate attributes (also called PLOs). These are :-

- **PLO-1** Engineering Knowledge
- **PLO-2** Problem Analysis
- **PLO-3** Design / Development of Solutions
- **PLO-4** Investigation
- **PLO-5** Modern Tool Usage
- **PLO-6** The Engineer and Society
- **PLO-7** Environment and sustainability
- **PLO-8** Ethics
- **PLO-9** Individual and Team Work
- **PLO-10** Communication
- **PLO-11** Project Management
- **PLO-12** Lifelong Learning

HITEC University ensures that all of its engineering programs conform to these 12-PLOs.

Measuring the attainment of PLOs is also an essential activity of the Directorate of QA&C. Fulfillment of PLOs is dependent on successful achievement of the Course Learning Objectives (CLOs) meant for each course. These are clearly defined goals of every major topic covered in a course.

The University has very active collaboration with University of Strathclyde, Glasgow, UK, Istanbul Technical University (ITU), Turkey, and Universiti Teknologi Malaysia (UTM). These collaborations afford unique opportunity for our students and faculty to benefit from the academic programs and R&D activities of these leading universities.

Those students who opt for studies at University of Strathclyde will spend the first 02 years at HITEC University and remaining 02 years at Strathclyde. They will be awarded the degree of Bachelors of Science in Engineering by the Strathclyde University.

Similarly, our students after completion of 06 semesters at HITEC University, can opt for one year exchange program at Istanbul Technical University (ITU) and Universiti Teknologi Malaysia (UTM). They will be awarded HITEC University Degree.

The Directorate liaises and monitors performance of exchange students who avail this opportunity. Efforts are in hand to establish similar collaborative MOUs with more institutes of repute.

We in HITEC University do not perceive quality assurance as an added layer in our academic programs and services. We do believe and practice "quality assurance" as an embedded attribute in all facets of our pursuits and activities.

Information Technology Services

Engr. Fawad Salam
Manager Information Technology
ME (Computer Engineering)
fawad.salam@hitecuni.edu.pk

Information Technology (IT) is transforming the process of teaching and learning in educational environment and helps reducing barriers to education. IT staff provides core IT infrastructure and application services across the University. It collectively delivers and supports a wide range of applications and services used by students, researchers, faculty and administrative staff.

Many of our services are typical of the corporate world and offer similar facilities: managed PCs and laptops, storage, email, printing, web content management, data and networking, multimedia and production, and the enterprise business applications underpinning finance, HR/payroll, e-Learning facilities management.etc

Computer facilities within the University includes six computer labs and one state of art project lab on open source virtual environment, equipped with 600 high specification desktop computers. All computers are centrally connected on domain based network. The facilities of Internet and Intranet, individuals email addresses and separated storage areas are also provided in these labs. Information Technology Services include:

Application Services

Comprises e-learning, web design, digital library system, admission system and online attendance system:

Campus Management System

The University has Campus Management System software with all major processes of an educational needs such as online admission, semester registrations, student fee, class attendance, student evaluations (assignments, quizzes, mid terms, final etc.) student portal, results compilation and generation / printing of transcripts, degrees & certificates: under one umbrella.

Microsoft DreamSpark

DreamSpark is a Microsoft Program that supports technical education by providing access to Microsoft software for learning, teaching and research purposes. It gives educators the resources to ensure their classrooms always have the latest technologies to challenge, motivate, and keep students engaged in new ways.

Infrastructure Services

Includes customer IT support, facilities management including file servers and domain controller, networks and Wi-Fi quality and administration.

Architecture, Security and Innovation

Ensuring clarity and consistency of overall IT architecture, IT security management, leading on IT service innovation with highly sensitive adaptive security appliances.

File Server and Moodle

The University file server through which students and faculty exchange their assignment and also download necessary software and data.

Intrusion Detection and Penetration Testing

The network team of IT Department provides services on open source IDS to secure HITEC University core network from internal and external attacks.

Internet

A high speed Internet connection of 100 MB dedicated bandwidth is available for students and faculty 24 x 7. The bandwidth quota of 750 KB is allotted to each student for downloading software from Internet.

PERN

The Pakistan Education and Research Network (PERN) from HEC connect HITEC University with other research institutes through high-speed internet bandwidth. The main purpose of this network is to facilitate researchers/students in sharing data and to coordinate with each other though video conferencing.

Data Center

A state of art Data Center provides private cloud and cluster services to facilitate deployment of applications without the cost and complexity of buying and managing the under lying hardware and software layers.

Library Automation

A Gigabyte optical fiber backbone is provided from the data center to the library providing fully automated with EM System and library management system that provides user facilities to log in and check out for borrowing and returning library material.

HEC Digital Library

A pool of public IP is connected at HEC end from HITEC University directly managed by our network team.

HITEC University Library

HITEC University Library forms an essential complement of academic pursuits of our students. The Library provides access to materials and information resources which will help you in your studies. All new students are offered an orientation tour of the Library.

The Library is located in the religious education complex. It is open till late night from Monday to Friday and also functions occasionally on weekends. Library is fully automated with electromagnetic security system and a Library management system (LibMax).Online Public Access Catalog (OPAC) is also available to the users. It helps speedy search of a particular title. Full contents of University Library books and HEC Digital Library can be viewed from any faculty office directly. The Library complies with "Dewey Decimal Classification" System and "Library of Congress Subject Headings (LCSH)" tools. It also provides scanning and photocopying facilities to students and researchers.

Besides being a repository of over 30,000 books covering not only Electrical, Mechanical and Computer Engineering & Computer Science domains, but Humanities, Islamic Studies and a unique collection of titles in Advanced Mathematics as well. It subscribes to 26 national and international printed journals (IEEE, ASME etc) and also provides access to various databases.

Our students and faculty can also access more than 3000 online journals and magazines. Similarly, its audio-visual collection comprises nearly 15019 items, including presentation slides, e-Books and dissertations etc.

Our staff, well qualified in Library Sciences, are always at hand to provide the requisite help in searching and locating resources, information and referral services you may need.

Alumni

Shujahat Hussain
Deputy Director Stores & Procurement HIT
Ministry of Defence Production

Being a student of the pioneering batch of Electrical Engineering of HITEC University, it was certainly a privilege as I gained the maximum of practical learning. This institute has always had the finest of the faculty, which is the most vital aspect of a University. I would like to pay my gratitude to all the teachers of HITEC University and I wish this institute all the best for future.

Mubashir Amir Khan
MTE at Askari Cement Limited

My four years at HITEC University added a blend of learning and fun in my life in such a way that it made me strive for the best and achieve the desired goals with great enthusiasm. All the teachers and authorities have a motivating and guiding relationship with students. HITEC groomed me so well that I am always ready to face my future with confidence and resilience.

Muhammad Lisan Sadiq
Mechanical Site Engineer SSEM (Saudi Services for Electro Mechanical Works),
Riyadh, Saudi Arabia

When I joined HITEC University, it was in its initial stages I observed that it developed from strength to strength. I cherish each and every moment I spent in this great institution. Today, I am very proud to say that I am a HITONIAN. Stay at HITEC University was a golden time of my life.

Muhammad Akbar
Production Engineer
Gulf Steel Works Jubail KSA

You may not always have a comfortable life and you will not always be able to solve all of the problems being faced at once, but don't ever underestimate yourself. History has shown us that courage can be contagious, and hope it can take on a life of its own. HITEC taught me the same lesson and I wish HITEC University a prosperous future ahead.

Engineer Muzzammil Baloch
Chiniot Power Pvt. Ltd.

The communication skills, analytical and leadership attributes that I acquired are only because of HITEC University. It grooms the personality of students and makes them able to lead, whatever the situations. In short, HITEC is like a great fertile soil in which you can plant any seed and expect good fruit.

Sufyan Ahmed Bajwa
Senior Engineer (SE)
Pakistan Nuclear Regulatory Authority

I am working in a strategic organization, which is the most desired destination of young engineers. The highly qualified and dedicated teachers of HITEC University taught me the concepts of mechanical engineering and shaped my future. The faculty members in HITEC University were most encouraging of that I have been associated with throughout my educational experience. I am proud to be a graduate of the Mechanical Engineering program and HITEC University.

Farhaj Ishtiaq Chaudhary
Research Scholar
UET Taxila
HITEC University is a place where students come unsure of what they want to become, with almost little consciousness of what they have been. It was the case with me as well and I was fortunate enough to have such great teachers. When I broke rules, they constantly encouraged me to bend. In short HITEC University is a symbol of excellence having outstanding teaching staff and an excellent learning and grooming environment.

Jazib Raza
Projects Engineer (ACME Groups, UAE)
Education at HITEC University did help me during initial stage of my job. At the time I was hired, companies were mostly looking for graduates with real practical knowledge of tools and technologies used in industries. I had this knowledge, because the education at HITEC University is very different than traditional academic courses that most universities have and I always had the requisite confidence and this is what it takes to get the job done.

Muhammad Tahir
CEO, Tour De Pakistan

My stay at HITEC University has been very productive and it has kept me abreast with the digital pulse of today. Electrical Engineers have the ability to find new horizons of improvement in the highly challenging and competitive world of today. HITEC University equips students with the knowledge and skills required to brace the future challenges with zeal and confidence.

Abdullah Abbas Zaidi
System Design Engineer
Neural Networks, Riyadh Saudi Arabia

HITEC University has provided me with high quality teaching. Being equipped with superb facilities, it is an amazing university that has shaped me into what I am today. I say it with certainty that HITEC University has provided me with opportunities to explore an array of different possibilities for my future, most of which I would not have been aware of.

HOW TO APPLY ONLINE

- Access the admission link : admissions.hitecuni.edu.pk

- Register using your email address

- A Password will be sent at your email address

- Login at the given link to fill Online Application Form

- Upload candidate photograph with blue background (300 kb or less in size)

- Application confirmation will be sent at the given email address within 24 hours of submission

- Print Application Form alongwith challan slip

- Pay the cost of Prospectus @ Rs.2000/- (Rupees two thousand only) in any online branch of Bank Alfalah Ltd.

- Candidates can also send Bank Draft for Rs.2000/- in favour of HITEC University Taxila, instead of Bank Challan. By clearly writing the name of candidate , CNIC Number and Challan Number (mentioned on the challan slip) at back of Bank Draft

- Send the printed Application Form along with paid challan slip (HITEC University Copy) or Bank Draft and attested copies of required academic documents through courier or registered mail to: The Registrar, HITEC University Taxila, Museum Road Taxila Cantt.

- Facility to fill Application Form online is also available in the University.

Contact

Ph: 051-4908146-49 (Ext-309), 051-4908144

Email: assistant.registrar@hitecuni.edu.pk

iram.abdullah@hitecuni.edu.pk

Disclaimer

The information in this prospectus is correct at the time of printing. It provides general guidance to the students and does not form part of any contract. The university would endeavor to provide the courses and facilities described herein, but reserves the right to make alterations in its programs, policies and fees tariff at any time, if necessary