Postgraduate Prospectus

Centre of Excellence in Water Resources Engineering
University of Engineering & Technology, Lahore,
Pakistan

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Location

The Centre of Excellence in Water Resources Engineering is located in an impressive building on Grand Trunk (G.T.) Road, on the premises of the University of Engineering and Technology, Lahore, Pakistan.

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Director
Centre of Excellence in Water Resources Engineering
University of Engineering and Technology, Lahore-54890
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Disclaimer

This prospectus is issued for information only and does not form part of any contract. The Centre reserve the right to modify or alter without prior notice any of the contents published herein.

MESSAGE FROM DIRECTOR

Assalam-o-Alaikum!

I appreciate that you are considering to undertake postgraduate study to specialize in different aspects of water resources. At present, postgraduate studies have become a necessity in the professional careers. This will not only enhance your subject knowledge but also provides you better prosperous future. Before taking any decision, it is important to have sound information before planning your higher studies.

The Centre of Excellence in Water Resources Engineering (CEWRE), generally called as "Centre" is one of the leading academic and research institute in Pakistan. The Centre is imparting high level goal oriented studies in disciplines like Water Resources Management, Water Resources Engineering, Engineering Hydrology and Hydropower Engineering. The Centre has well-established reputation world-wide, a wide range of interests in international cooperation, excellent facilities in water research and a place for flexible postgraduate programs starting from M.Sc. to Ph.D.

This prospectus provides an introduction to the Centre, its faculty, the postgraduate degree programs, financial assistance, and the research facilities available at the Centre. The prospectus has touched almost every aspect of information that a potential applicant wants to know. If you want to know more about the Centre, don't hesitate to contact us.

If you do come here, you will be very welcome as a member of our academic community. I am sure that you will find the Centre stimulating, demanding and very exciting place to study.

Prof. Dr. Abdul Sattar Shakir
Director

THE CENTRE

Water resources development and its management is an intricate and complex engineering problem. Water resources encompass assessment and quantification to the extent of the water available at various locations in different times; harnessing of the water including dams, water reservoirs, barrages and head works; hydrologic and hydraulic study of water conveyance channels as rivers and canals; efficient utilization of water resources; hydro-power developments; study and mitigation of environmental impacts arising out of harnessing/use of water; sustainability of irrigated water management.

To solve water resources problems, a team of hydrologists, irrigation and drainage engineers, water resources managers, water resources engineers, geologists, economists, social scientists, agronomist, soil scientists and environmentalists is required. The basic training that engineers and scientists receive during their initial degree is limited and cannot cope with the demands and challenges for highly specialized and rapid technological advancement encountered in the development and management of water resources. Handling of complex water resources problems becomes sticky with the mere knowledge of the elementary principles learnt in the basic degree programs.

Without proper management skills considerable water resources are lost and/or remain unutilized. Rational management of existing resources and development of new resources has become necessary for future sustainability of the agriculture and industrial base of the country. This requires that engineers be well equipped with the latest knowledge and engineering techniques. Therefore it is imperative to impart advanced training to create adequate research interest in engineers to enable them find balanced solutions to day-to-day technical problems arises in the water sector in the country.

Realizing the above facts, the Government of Pakistan establish the Centre of Excellence in Water Resources Engineering (CEWRE) in 1976 at the campus of University of Engineering and Technology (UET), Lahore as a semi-autonomous institution under the administrative control of the University Grants Commission now called as "Higher Education

Commission" and the Ministry of Education, Government of Pakistan. The Director is the academic and executive head of the Centre. Overall management and supervision of the affairs of the Centre is vested in a Board of Governors, with Vice Chancellor of the University of Engineering and Technology, Lahore as its Chairman.

The Centre was established with the objectives of high level goal oriented teaching and research in the water resources sector in the country. These objectives are being achieved by imparting post-graduate (M.Sc., M.Phil, and Ph.D.) degrees conducting specialized research, dissemination of the knowledge through short courses, seminars, workshops, etc. The Centre is affiliated with University of Engineering and Technology, Lahore for the award of degrees to CEWRE graduates. The Board of Governors of the Centre and the University of Engineering & Technology, Lahore approves all academic programs, Statues and Rules/Regulations of CEWRE time to time.

The Centre started M.Phil degree programs in 1979 in the fields of Water Resources Management and Hydrology. The study program was started initially on part-time basis and then a year later was converted into full-time morning courses. A new discipline of Water Resources Engineering was introduced in 1994 and the discipline of Hydrology was replaced with a new course namely Engineering Hydrology. The Centre started another post-graduate degree program in Hydropower Engineering in January 2000. At present CEWRE is awarding postgraduate degrees in following four water related disciplines:

i) Water Resources Management,
ii) Engineering Hydrology,
iii) Water Resources Engineering, and
iv) Hydropower Engineering.

Further description of these disciplines is given in next sections.

Fresh engineering graduates as well as in-service engineers from various public and private organizations are admitted to various degree programs. More than 230 students have so far successfully completed M.Sc., M.Phil., and Ph.D. degrees in different disciplines over the last 20 years. The Centre graduates include international students from various regional countries (Iran, Somalia, Nepal, Iran, Yemen, Jordan, etc.). More than 100 students

get enrolled at the Centre for M.Sc., M.Phil., and Ph.D. for various degree programs every years. These students are engaged in course work or thesis research.

The Centre's graduates are highly demanding and are employed in national and international organization both in public and private sector. These organizations includes:

- Provincial Irrigation and Drainage Authorities (PIDAs)
- Water and Power Development Authority (WAPDA)
- Pakistan Council of Research in Water Resources (PCRWR)
- International Waterlogging and Salinity Research Institute (IWASRI)
- International Water Management Institute (IWM)
- On Farm Water Management Programs (OFWM)
- Soil Conservation Department (SCD)
- Universities in Pakistan
- Consulting firms/NGOs as NESPAK, ACE, NDC, GTZ, MMP, NRSP and others

Centre also provides good research facilities to students as well as faculty and its faculty mostly engaged in research activities related to the current water resources issues of national concern throughout the year. Mostly the students research is related to water resources problems in Pakistan, foreign students are encouraged to conduct research studies on their country problems. The major areas of interest are: irrigation modeling, systems analysis, surface drainage, rainfall-runoff modeling, groundwater modeling, reservoir operation, probability studies of irrigation requirements, groundwater pumping test analysis, sediment transport modeling, salt water intrusion into inland aquifers, solute movement to groundwater and soil, and water testing. Many national and international organizations collaborate with the Centre to carryout research activities in terms of financing, data collection, analysis and finalization of research reports/Thesis.

THE FACULTY

Prof. Dr. Abdul Sattar Shakir
Director CEWRE, Dean Faculty of Civil Engg.
B.Sc. Engineering (Civil.)
Ph.D. Civil Engineering (Hydraulics and Water Resources Engg.) U.K
Research Interest: River Morphology, Sediment Transport in Channels and Reservoirs, Water Resources Management and Numerical Simulation of Irrigation Canals
Contact: director@cewre.edu.pk

Dr. Ghulam Nabi
Assistant Professor
B.Sc. Engineering (Agri)
M.Sc. Water Resources Engineering (CEWRE)
Ph.D. Water Resources Engineering (CEWRE)
Research Interest: Sediment Transport, GIS and Remote Sensing, Fluid Hydrodynamics, Hydraulic Structures, Open Channel Hydraulics.
Contact: gnabi@cewre.edu.pk

Mr. M. Kaleem Sarwar
Assistant Professor
B.Sc Engineering (Civil)
M.Sc Hydropower Engineering (CEWRE),
Research Interest: Hydraulics, Hydrodynamics , Reservoir Operation, Hydro Power Engineering
Contact: mksarwar@cewre.edu.pk

Mr. Waqqas-ur-Rehman
Lecturer
(On Higher Studies Abroad)
M.Sc. Computer Science
Research Interest: Computer Programming, Software Development and Networking
Contact: waqqas@cewre.edu.pk

Dr. Sajid Mahmood (Azeemi)
Assistant Professor
M.Sc Engineering (Agri.)
Ph.D Water Resources Management (CEWRE),
Research Interest: Field Irrigation Systems, Hydrosalinity, Mathematical Modeling, Wastewater Irrigation, Environmental Pollution
Contact: drsajid@cewre.edu.pk

Mr. Muhammad Masood
Assistant Professor
B.Sc Engineering (Agri),
M.Sc Water Resources Engineering (CEWRE),
M.Sc Computer Sciences (UET)
Research Interest: Open Channel Flow and Computational Hydraulics, Physical & Numerical Modeling, GIS and Data Base Management System, Computer Programming,
Contact: mmasood@cewre.edu.pk

Engr. Muhammad Babur
Lecturer
(On Higher Studies Abroad)
M.Sc. (HPE): Centre of Excellence in Water Resources Engineering, Lahore. Pakistan
Research Interest: Hydrology, Hydraulics, Climate change, Sedimentation
Contact: mbbandeshah@gmail.com

ACADEMIC PROGRAMS

COURSES OF STUDY

Presently, the Centre of Excellence in Water Resources Engineering-offers following post-graduate degree programs.

1. Master of Science (M.Sc.)
2. Doctor of Philosophy (Ph.D.)

Courses of studies at the Centre, offered in the water disciplines is given as:

1. Water Resources Management

This program emphasizes on the techniques, requirements, modalities, constraints, alternatives, etc. for scientific and optimum use of available water resources. Water requirements, water availability, water use policies, water regulations under various demand-availability scenarios, on-site water utilization, irrigation and drainage requirements and design, soil salinity issues, irrigation hydraulics, formulation of project plans for development/use of water resources, socio-environmental aspects of the water uses are presented under this program. In addition students are trained to develop and use computer programs for evaluation of water uses including remote sensing and GIS tools too. This program transforms an engineer to a good water resources manager.

2. Engineering Hydrology

This program focuses on quantification (amounts and quality) of available water resources at different locations and for various time scales in terms of sources (glaciers, rainfall, snow melt, ground water), maximum, average, and minimum flows, floods, droughts, sustainable availability, etc. Thus it accounts for the study of various aspects of hydrologic cycle, interactions between different water sources and uses, impacts of human interventions on water resources, catchment studies, operational strategies for storage and release of water, climatic and environmental interactions, etc. The

engineers become expert in ascertaining sustainable water potential, forecasting droughts, operation of dams and reservoirs.

3. Water Resources Engineering

This program imparts training on the modalities for development and harnessing of water resources for various uses. The studies encompass water availability, dams and reservoirs, river systems, sediment studies, canals and hydraulic structures, construction and project management, environmental impacts and their needed mitigation, etc. This program enables engineers to plan, design and construct water development projects with confidence and reliability.

4. Hydropower Engineering (M.Sc. only)

This program focus on the description of low or high head hydropower generation, power economics, dams and reservoirs needed for high head generation, river hydraulics including sedimentation, site selection, and construction and operational management of hydropower facilities.

Further information about the study programs or research in water resources at the Centre may be obtained by contacting the Director or the Faculty of the Centre.

DURATION OF COURSES

The Centre offers a flexible degree program to suit both full time and part time students and in-service professionals. Minimum and maximum duration of each course is as under:

Degree	Full Time Studies	
	Minimum	Maximum
M.Sc.	1.5 years	3 years
Ph.D.	3 years	5 years

*Replaces the maximum period stated in Ph.D. Regulation No. 7 notified vide Notification No.Univ/Acad/M-76/10/808 dated 30.09.2010.

MEDIUM OF INSTRUCTIONS

English is the medium of instructions for class teaching, writing thesis and dissertations, and examinations.

ADMISSION REQUIREMENTS

- **ELIGIBILITY FOR ADMISSION**

Only those candidates will be eligible for admission who have passed their undergraduate (16 years equivalent) degree by securing a minimum of 60% marks or a CGPA of 3.00 out of a maximum of 4.00. CGPAs on other scales will be translated accordingly.
The applicant shall have to clear General Aptitude Test (GAT) securing at least 50% cumulative score for admission to all M.Sc. programs. Eligibility criteria in various post graduate programs with respect to graduation (B.Sc.) degree in as under:

Water Resources Engineering	B.Sc. Engg. (Civil or Agri.)
Water Resources Management	B.Sc. Engg. (Civil or Agri.)
Engineering Hydrology	B.Sc. Engg. (Civil or Agri.)
Hydropower Engineering	B.Sc. Engg. (Civil)

- **PROCEDURE FOR ADMISSION**
    - Application on prescribed form with requisite documents, complete in all respects should be submitted to the Director, CEWRE on or before the due date.
    - Incomplete applications shell not be entertained.
    - The non-refundable application fee should be remitted/paid through Habib Bank UET branch account No 1400-31 or a bank draft/pay order payable to Director, CEWRE, UET, Lahore with the application.

- **TEST AND INTERVIEW FOR ADMISSION**
  For admission GAT/GRE General Test is required, a written admission test shall also be held by the Ccentre on the fixed

date and interviews shall be held after the test. The candidate must qualify the test and interview.

- **ADMISSION ON MERIT**
  The admission will be granted on merit.

- **DETERMINATION OF MERIT**
  In order to determine the merit for admission, the marks obtained by a candidate in the test and interview will also be added to the academic marks obtained by him/her as given below:-
  Academic 60 marks
  Test 25 marks
  Interview 15 marks

- **PROCEDURE IN CASE OF SELECTED CANDIDATES**
- A candidate selected for admission will be informed through an official notification issued by the Convener Admission Committee/Director CEWRE, a list of selected candidates will also be displayed on the Notice Boards of the Centre and website (www.cewre.edu.pk).
- As per schedule given by the admission cell, the selected candidate will be required to pay the Centre dues.
- On fulfillment of requirements mentioned above, the candidates will be admitted to postgraduate classes. The Director will send immediately a list of admitted students through the Dean concerned for registration.
- No candidate shall normally be admitted after 15 days from the beginning of the classes.

- **INTERNATIONAL APPLICANTS**

- **Application Procedure**
- Centre of Excellence in Water Resources Engineering welcomes international applicants. At present there are student from Iran, Sudan, Yemen, Nigeria, Somalia, Nepal, etc.

- Qualification of a suitable standard from most of the countries in the World are acceptable to the Centre. On submitting an application, the applicant has to submit transcripts of their qualification showing the subjects taken and the grade obtained in each qualification. The Pakistani Mission in the applicant country will provide information regarding the equivalent qualification required for admission. Else you may inquire by writing to the Center and sending copies of the transcripts before applying.
- All the foreign applicants must route their applications through the Pakistan Diplomatic Missions in their country and the Ministry of Education, Training and Standards in Higher Education, Government of Pakistan, Islamabad, Pakistan.
- English Language
- All the international students need to show an adequate knowledge of written and spoken English. Applicants should have to submit a certificate of proficiency in English from Pakistani Mission along with application form.

- **Entry & Study in Lahore, Pakistan**
- An official letter of acceptance will be sent if your application is successful processed and you are admitted in the Centre. Students are then required to get visa from Pakistani Mission in their country to enter into Pakistan and finally you can make arrangements for journey to Pakistan. Lahore is connected to all the major cities in the World through international flights.
- The climate of Lahore varies from mild in winter (Nov. to Mar.) to very hot in summer (May to Aug.). The average living expenses are approximately US$ 250 per month.

- **Rules/Regulation**
- Degree Programs at the CEWRE are governed by the Rules/Regulations of UET Lahore. Details are given in Appendix-B.

RESEARCH FACILITIES

RESEARCH LABORATORIES

The Centre has several laboratories, which are equipped with state-of-the art technical equipment and facilities to conduct basic and applied research. Mechanical workshop facilities are also available for the repair and fabrication of research apparatuses. A brief description of each research laboratory is given below.

Hydraulic Lab.
This laboratory has experimental facilities for open channel flow, sediment transport, hydraulic machinery, flow measurements, design of hydraulic structures and hydraulic model studies. The current meter rating facility is also available to test and calibrate current meters.

Irrigation and Drainage Lab.
This laboratory has facilities for flow measurements, measurement of water course losses, infiltration test apparatus, field and laboratory permeability apparatus, sprinkler and drip irrigation systems testing, soil moisture monitoring and calibration of different flow measuring devices.

Soil Reclamation Lab.
Soil Reclamation Laboratory is well equipped with instruments used for physical and chemical analyses of soils, plant and waters such as pH meters, electrical conductivity meters, textural analyses apparatus, UV spectrophotometer, flame photometer, atomic absorption spectrophotometer, temperature, controlled water bath, centrifuge machine, Muffle furnace, soil moisture determination apparatus, various soil sampling kits and tools.

The facilities for soil and water quality analysis for agriculture, soil reclamation macro and micro- nutrient status of soil, plant and water are also available.

Electrical Analogue & Remote Sensing Lab.
This laboratory has facilities for conducting groundwater flow and seepage studies and flow to wells. Hardware and Softwares for the interpretation of aerial photographs and satellite imageries is available.

Hydrology Lab.
This laboratory is equipped with TV. Bore Hole Camera, Current Meters, Survey and Leveling Instruments, Depth Recorders, Water Level Recorders, Earth Resistivity Meters, and instruments for evaporation studies. This laboratory provides facilities for resistivity surveys, hydrometeorology studies, detecting faults in tubewell bore holes, measuring discharge of the distributaries and canals, measurements of the depth of rivers, lakes upto 70 m.

COMPUTER LABORATORY
The Centre has a more than 30 personal computers (PC) for computational work, laser printers, color printers, scanners. Free Internet service is also available. Various office and computational software for hydrologic, hydraulic/channel flow, ground water flow, solute transport, soil salinity, river system, catchment modeling, uplift pressure, flood flow routing, etc. are available for use. Computer languages available include FORTRAN, C++, Basic, etc. The students are encouraged to have an extensive one-term training on computer programming. Computers uses in their assignments, and design work besides in research studies involving numerical mathematics is common practice in the Centre.

CENTRE'S LIBRARY
The Centre library is one of the best in Pakistan on water resources. It's holdings includes books, journals, seminar proceedings and technical reports relating to water resources engineering and allied fields. Some of the important journals that are subscribed are ASCE, Hydraulics, Irrigation & Drainage Engineering, Water Resources

Planning & Management; Journal of Hydrology, Agricultural Water Management, Hydrological Sciences Journal, Irrigation Science, Journal of Soil & Water Conservation, Journal of Hydraulic Research. Proceeding I.C.E.; Water Resources Research, Water Resources Bulletin, Groundwater, and ASAE Transactions. The library possesses back files of these Journals from 1960 onwards. In addition, proceedings of international seminars, and publications of international agencies, such as ICID, IC1MOD, UNESCO, WMO, World Bank and ESCAP are also available. The library also possesses micro-film reader and video-films some of which have been prepared by the Audio-Visual Section of the Centre. Library has linked with a variety of journals etc through access via internet, as on-line access to journals.

HOSTEL FACILITIES

The Center has a well-furnished independent hostel of its own for use by the Centre students. The hostel is located adjacent to the Centre building and is named as Bilal Hall. It has a capacity of 50 comprising of 10 cubicles (single occupant) and 12 dormitory (2 or 3 occupants) rooms. All rooms have attached bathrooms with hot and cold water. The hostel has a central corridor/lobby, prayer room, game room, TV room, kitchen and dining room. Meals (breakfast, lunch and dinner) are arranged by the occupants on participatory basis. The Centre has provided Cook and crockery for the kitchen. The designated Hostel Incharge supervises the hostel affairs.

The hostel is also used to guest house for participants of different short courses run by the Centre from time to time. The fresh entrants are placed in dormitories. The senior students who are at research stage are placed in cubicles. The hostel lodging is available for limited period (not exceeding two years) to full time students only. Hostel allotment is liable to be cancelled for those students who are not enrolled for full academic load. The hostel fee is very normal and has to be paid in advance.

For female candidates accommodation is arranged in university girls hostels.

FINANCIAL ASSISTANCE AND FEE

Financial assistance/scholarship is available to full time national Centre students on the basis of their academic and research performance and/or financial needs. Scholarships/ fellowships are also awarded by other organization such as Higher Education Commission (HEC), Pakistan Science Foundation (PSF), Pakistan Council of Research in Water Resources (PCRWR), etc. on the recommendation of the Centre.

More than half of the Centre students receive some financial assistance during the study period. Satisfactory progress is required by the student for continuation of all scholarships and financial assistance.

FEE

The following fee shall be charged from the students admitted to M.Sc, and Ph.D degrees.

Nomenclature	Pakistani	Foreign
Non-Recurring Fees		
Admission Fee	Rs. 2000/-	Rs. 5000/-
University Registration Fee	As per UET Policy (Rs. 2000/-)	As per UET Policy (Rs. 4000/-)
Centre's Security	Rs. 2000/-	Rs. 4000/-
Hostel Security	Rs. 2000/-	Rs. 4000/-
Thesis Evaluation M.Sc Ph.D.	As per UET Policy Rs. 3000/- Rs. 15000/-	As per UET Policy Rs. 3000/- Rs. 15000/-
Recurring Fee		
Examination Fee	As per UET Policy	As per UET Policy
Monthly Recurring Fee		
Tution Fee M.Sc./Ph.D. Room Rent including utilities for Cubicle Dormitory	 Rs. 5000*/- Rs. 1800/- Rs. 1200/-	 Rs. 3000/- Rs. 1800/- Rs. 1200/-

Students admitted on open merit are required to pay a tution fee of Rs. 5000/- per month. An amount of fee Rs. 1500/- out of this is charged during the period of study while the remaining amount of Rs. 3500/- per month is treated as financial support/qarz-e-hasna payable by the student after graduation in installments without interest.

COURSES

The course work for different disciplines are summarized below and their contents are given in Appendix A.

i) Courses for Water Resources Management

Compulsory Subjects

CWR-601	Applied Hydrology	(2, 1)
CWR-606	Groundwater Hydrology and Exploration	(2, 1)
CWR-611	Advance Open Channels & Computational Hydraulics	(2, 1)
CWR-631	Drainage Engineering	(2, 1)
CWR-632	Irrigation Engineering and Management	(2, 1)
CWR-633	Water Quality Modeling and Management	(2, 1)

Optional Subjects (any two of the following):

CWR-602	Catchment Modeling	(2, 1)
CWR-603	Statistical Hydrology	(2, 1)
CWR-604	Reservoir Operation and Design	(2, 1)
CWR-605	Flood Estimation and Control	(2, 1)
CWR-612	Dam and Reservoir Engineering	(2, 1)
CWR-613	Design of Hydraulic Structures	(2, 1)
CWR-614	Sediment Transport and River Engineering	(2, 1)
CWR-615	Physical and Numerical Modeling	(2, 1)
CWR-651	Arid Zone Hydrology	(2, 1)
CWR-652	Groundwater Modeling	(2, 1)
CWR-653	Hydrometeorology	(2, 1)
CWR-654	Snow and Ice Hydrology	(2, 1)
CWR-655	Watershed Planning and Management	(2, 1)
CWR-681	Pressurized Irrigation System	(2, 1)
CWR-682	Land and Water Management	(2, 1)
CWR-691	Environmental Impact Assessment	(2, 1)
CWR-692	Project Construction and Management	(2, 1)
CWR-693	Remote Sensing and GIS in Water Resources	(2, 1)
CWR-694	Water Resources Planning and Economics	(2, 1)

CWR-695	Water Resources System Analysis	(2, 1)
CWR-696	Computer Applications in Water Resources	(2, 1)

Seminar & Thesis

CWR-699	Seminar on current issues and special topics	(non-credit)
WR-700	M.Sc. Thesis	(06)
CWR-800	Ph.D. Thesis	(42)

ii) Engineering Hydrology

Compulsory Subjects

CWR-601	Applied Hydrology	(2, 1)
CWR-602	Catchment Modeling	(2, 1)
CWR-603	Statistical Hydrology	(2, 1)
CWR-604	Reservoir Design and Operation	(2, 1)
CWR-605	Flood Estimation and Control	(2, 1)
CWR-606	Groundwater Hydrology and Exploration	(2, 1)

Optional Subjects (any two of the following):

CWR-611	Advance Open Channel & Computational Hydraulics	(2, 1)
CWR-612	Dam and Reservoir Engineering	(2, 1)
CWR-613	Design of Hydraulic Structures	(2, 1)
CWR-614	Sediment Transport and River Engineering	(2, 1)
CWR-615	Physical and Numerical Modeling	(2, 1)
CWR-631	Drainage Engineering	(2, 1)
CWR-632	Irrigation Engineering and Management	(2, 1)
CWR-633	Water Quality Modeling and Management	(2, 1)
CWR-651	Arid Zone Hydrology	(2, 1)
CWR-652	Groundwater Modeling	(2, 1)
CWR-653	Hydrometeorology	(2, 1)
CWR-654	Snow and Ice Hydrology	(2, 1)
CWR-655	Watershed Planning and Development	(2, 1)
CWR-681	Pressurized Irrigation System	(2, 1)
CWR-682	Land and Water Management	(2, 1)
CWR-691	Environmental Impact Assessment	(2, 1)
CWR-692	Project Construction and Management	(2, 1)
CWR-693	Remote Sensing and GIS Applications in Water Resources	(2, 1)

CWR-694	Water Resources Planning and Economics	(2, 1)
CWR-695	Water Resources System Analysis	(2, 1)
CWR-696	Computer Applications in Water Resources	(2, 1)

Seminar & Thesis

CWR-699	Seminar on current issues and special topics	(non-credit)
CWR-700	M.Sc. Thesis	(06)
CWR-800	Ph.D.	(42)

iii) Courses for Water Resources Engineering

Compulsory Subjects

CWR-601	Applied Hydrology	(2, 1)
CWR-611	Advance Open Channel & Computational Hydraulics	(2, 1)
CWR-612	Dam and Reservoir Engineering	(2, 1)
CWR-613	Design of Hydraulic Structures	(2, 1)
CWR-614	Sediment Transport and River Engineering	(2, 1)
CWR-615	Physical and Numerical Modeling	(2, 1)

Optional Subjects (any two of the following)

CWR-602	Catchment Modeling	(2, 1)
CWR-603	Statistical Hydrology	(2, 1)
CWR-604	Reservoir Design and Operation	(2, 1)
CWR-605	Flood Estimation and Control	(2, 1)
CWR-606	Groundwater Hydrology and Exploration	(2, 1)
CWR-621	Design of Hydropower Plants	(2, 1)
CWR-622	Planning and Development of Hydropower Projects	(2, 1)
CWR-631	Drainage Engineering	(2, 1)
CWR-632	Irrigation Engineering and Management	(2, 1)
CWR-633	Water Quality Modeling and Management	(2, 1)
CWR-651	Arid Zone Hydrology	(2, 1)
CWR-652	Groundwater Modeling	(2, 1)
CWR-653	Hydrometeorology	(2, 1)
CWR-654	Snow and Ice Hydrology	(2, 1)
CWR-655	Watershed Planning and Development	(2, 1)
CWR-671	Geological and Geotechnical Investigations	(2, 1)
CWR-681	Pressurized Irrigation System	(2, 1)
CWR-682	Land Water Management	(2, 1)
CWR-691	Environmental Impact Assessment	(2, 1)

CWR-692	Project Construction and Management	(2, 1)
CWR-693	Remote Sensing and GIS Applications in Water Resources	(2, 1)
CWR-694	Water Resources Planning and Economics	(2, 1)
CWR-695	Water Resources System Analysis	(2, 1)
CWR-696	Computer Applications in Water Resources	(2, 1)

Seminar & Thesis

CWR-699	Seminar on current issues and special topics	Non credit
CWR-700	M.Sc. Thesis	(06)
CWR-800	Ph.D. Thesis	(42)

iv) Hydropower Engineering (M.Sc. only)

Compulsory Subjects

CWR-601	Applied Hydrology	(2, 1)
CWR-611	Advance Open Channel & Computational Hydraulics	(2, 1)
CWR-612	Dam and Reservoir Engineering	(2, 1)
CWR-613	Design of Hydraulic Structures	(2, 1)
CWR-621	Design of Hydropower Plants	(2, 1)
CWR-622	Planning and Development of Hydropower Projects	(2, 1)

Optional Subjects (any two of the following)

CWR-602	Catchment Modeling	(2, 1)
CWR-603	Statistical Hydrology	(2, 1)
CWR-604	Reservoir Design and Operation	(2, 1)
CWR-605	Flood Estimation and Control	(2, 1)
CWR-606	Groundwater Hydrology and Exploration	(2, 1)
CWR-614	Sediment Transport and River Engineering	(2, 1)
CWR-615	Physical and Numerical Modeling	(2, 1)
CWR-651	Arid Zone Hydrology	(2, 1)
CWR-652	Groundwater Modeling	(2, 1)
CWR-653	Hydrometeorology	(2, 1)
CWR-654	Snow and Ice Hydrology	(2, 1)
CWR-655	Watershed Planning and Development	(2, 1)
CWR-671	Geological and Geotechnical Investigations	(2, 1)
CWR-691	Environmental Impact Assessment	(2, 1)
CWR-692	Project Construction and Management	(2, 1)
CWR-693	Remote Sensing and GIS Applications in Water Resources	(2, 1)
CWR-694	Water Resources Planning and Economics	(2, 1)
CWR-695	Water Resources System Analysis	(2, 1)

CWR-696	Computer Applications in Water Resources	(2, 1)
CWR-691	Environmental Impact Assessment	(2, 1)
CWR-692	Project Construction and Management	(2, 1)

Seminar & Thesis

CWR-699	Seminar on current issues and special topics	Non credit
CWR-700	M.Sc. Thesis	(06)

APPENDIX-A:
COURSE CONTENTS

CWR-601 APPLIED HYDROLOGY (2,1)

Measurement accuracy and hydrological data evaluation. Rainfall data, DAD anlaysis. Design storm, Evaporation, Infiltration, infiltration models. Water stages and discharge processing. Direct and indirect stream gauging (current meter,. float, chemical and sonic/electric). Velocity formulas. Discharge analysis, Telemetry, Flow duration curves

Hydrograph analysis and synthesis, Unit hydrograph, derivation of unit hydrograph using matrix solution; Mathematical form of S-curve. IUH, Hydrological assessment. Hydrological flood routing. Application of hydrological techniques for the assessment of hydrologic parameters to solve the practical problems. Introduction to HEC-HMS.

Introduction to Rainfall-Runoff modeling. Modeling of ungauged catchments, Discharge data transposition,

Reservoir types and general introduction to reservoir design & operation.

Introduction to data screening, statistical techniques/distributions, Frequency Analysis of floods and droughts.

CWR-602 CATCHMENT MODELING (2,1)

Water on the catchment: catchment morphology, storage on the catchment, characterizing the catchment. Catchment processes and hydrologic losses, details with reference to modeling. Runoff Generation: Basic definitions, Type of runoff, Traditional view of runoff, Factors affecting runoff, what causes runoff? Prevailing theories of runoff generation.

What is catchment modeling. Modelling approaches and their requirements. Black Box, Conceptual Physical based, Semi-distributed, Distributed. Description of Stanford Watershed Model

(STM), TOP model, System Hydrologic European model (SHE model).

CWR-603 STATISTICAL HYDROLOGY (2,1)

Fundamentals of Statistics. Introduction to deterministic and stochastic processes in hydrology. Hydrologic data, types and quality. Properties of random variables; consistency and homogeneity of data. Introduction to statistical and probability theory, application of classical statistical distributions to hydrological problems; flood frequency analysis; statistical inference from hydrological samples. Simple and multiple correlation and regression, analysis of time series. Introduction to stochastic models, their formulation and application.

CWR-604 RESERVOIR DESIGN AND OPERATION (2,1)

General: Classification of reservoir, Purpose of reservoir operation, Single vs. multi-purpose, Type of hydrological data required for reservoir operation & design, Methods to determine water availability for reservoir design/operation project, Direct observation method, rainfall-runoff series method etc., Methods to determine capacity of reservoir, e.g. Ripple mass curve method, Pump storage and its design & operation. Introduction to reservoir operation using system analysis techniques. Conjunctive use of reservoir, Flood control procedure by reservoir operation. Flood routing through a reservoir, Introduction to computer methods for reservoir operation and design, General discussion on the available, widely used, computer models for reservoir operation and design. Reservoir sedimentation, Sediment sluicing/management.

CWR-605 FLOOD ESTIMATION AND CONTROL (2,1)

General: Definitions, classification of floods, Introduction to flood estimation and design, philosophy, meaning of frequency.

Flood Estimation: Peak Flow determination, flood determination for ungauged catchments, flood determination for ungauged catchments with frequency relationship, flood estimation for gauged watersheds, probable maximum flood, flood hydrograph of a given frequency, prediction of the runoff hydrograph from a design storm, flood estimation from catchment characteristics, flood

estimation by statistical methods, regional flood frequency analysis, flood hydrograph estimation using SCS method, estimation of flood using routing techniques, choice of estimation techniques.

Flood Control: General, classification of floods, estimation of peak flood, methods of flood control, flood control by reservoirs, retarding basins, construction of leaves, channel improvement, soil conservation measures, combination of flood control measures, flood forecasting and warning, results of controlling floods, flood control economics. Disaster management/Adjustments: Emergency evacuation and rescheduling, structural adjustment, land use change, insurance.

CWR-606 GROUNDWATER HYDROLOGY AND EXPLORATION (2,1)

Groundwater Hydrology: Need and occurrence of groundwater, groundwater uses and issues, types of aquifer, groundwater reservoir, consolidated & unconsolidated rocks, groundwater resources of Pakistan,

Groundwater storage & supply, groundwater, storage in confined & unconfined aquifers, hydrologic water balance/budget, flow in porous media,

Darcy's law, its validity, Darcy law for 1, 2 and 3 D flow. Determination of aquifer parameters,

Governing equations for flow in confined, & water table aquifers, boundary conditions, solution of groundwater flow problems using analytical, graphical, analog and numerical methods, hydraulics of multi fluids in aquifers, , multi-dimensional flow, one dimensional flow with distributed recharge.

1-D flow and radial flow under steady and unsteady conditions, Well hydraulics, pumping tests, Ground water numerical/computer models.

Groundwater exploration: Surface and subsurface geophysical methods, analysis of aquifer test data, well drilling methods, well screens and methods of sediment size analysis, water well design, well development, water well pumps, water quality protection near wells.

Salt water intrusion, water mining.

CWR-611 ADVANCED OPEN CHANNEL AND COMPUTATIONAL HYDRAULICS (2,1)

Flow resistance, computation of uniform, non-uniform, critical and gradually varied flow. Analysis of flow profiles. Hydraulic jump and energy dissipation. Normal depth in compound channel. Channel design. Rapidly varied flow computation. Characteristic of flow over, weirs, visualization of hydraulic jump, flow over spillway, ogee weir, flow around piers. Flow in converging and diverging channel section.

Unsteady flow. Height and celerity of surge waves. Derivation St. Venant equations and Boussinesq equations, Navier Stokes equations for unsteady flow. Method of characteristics, Finite different methods. Stability of numerical methods. Explicit finite different schemes, implicit finite difference schemes, initial and boundary conditions. Numerical modeling for unsteady flow. Channel network analysis. Two dimensional (2-D) free surface flow. Shallow water wave, kinematic wave theory, diffusion wave theory. Supercritical and split flow analysis. Hydraulic flood routing, floodway and channel improvement analysis.

CWR-612 DAM AND RESERVOIR ENGINEERING (2,1)

Introduction: Description, purposes, single and multipurpose, Classification, Types; Planning-data, team; Site selection, Components, Surveys, Layout; Impacts. *Dam Hydrology and Reservoir Sedimentation*: Purposes, Yield; Flow data: Dependable yield, Reservoir sizing, ripple mass curve, Reservoir operation; Spillway and diversion floods, reservoir routing; Sediment- yield, trap, consolidation, Deposition distribution, Reservoir life.

Dam Geology and Foundation: Purposes, characteristics of foundation, Rock classification and characteristics, Geologic requirements, Dam site investigations, Foundation treatment, Earthquake hazards, Construction materials, Grading, embankment materials, Field and lab tests. *Loads and stresses in dams*, Force analysis, stability requirements.

Earth-fill dam: Design criteria, Types, Foundation design, Seepage-analysis, control and mitigation, Embankment design (core, crest, free board, slopes, materials, filter, slope protection), Stability

analysis. *Rock-fill dam*: Types, Embankment design, Selection of rock materials, Foundation preparation, Seepage control, Slope protection, Stability analysis.

Concrete dams: Loads, Gravity dam -dam stability, stress analysis, profile selection; Arch dam -Layout/arch geometry and profile, arch stress analysis, thin or thick arch, force analysis, abutment strength; Buttress dam-buttress analysis and profile design; Seepage control, Spillways layout and type.

Spillways: Design flood, design discharge, Location, Types, Energy dissipation arrangements. *Outlet works*: Types, Tunnels-design, lining, Inlet, Trash racks, Gates and valves, Energy dissipation.

H*ydropower works*: Layout of tunnels, headrace, fore bay, penstock, surge tanks, powerhouse, forebay and tail race. Powerhouse sizing. *Dam construction*: River diversion, coffer dam. *Dam Instrumentation and Safety*: Failure-Causes, controls, Inspection, Instrumentation.

CWR-613 DESIGN OF HYDRAULIC STRUCTURES (2,1)

Weir and Barrages – theory and design;, Theory and design of canal regulation structures - Head regulators Cross regulators and Escape regulators; Intakes, Fish passes. Retrogression. Barrage operation for irrigation, flood and hydropower operations. u/s and d/s bela formation and control.

Cross drainage works – supper passage, aqueduct, siphon, symphonic aqueduct, level crossing; Highway crossings: bridges culverts, and dips/ causeway, Drainage inlet for surface drains.

Theory and design of drop structures / canal falls. Theory and design of silt excluding structures, Hydraulic design of pumping stations: Theory and design of canal outlets. Design of flow measuring structures i.e. weir, V-notches, flumes. Concept of structure calibration, determination of discharge coefficient of different hydraulic structures (gated and ungated)

Spillway: Types, properties and limitations, Hydraulic design of spillway, energy dissipation devices on and below spillway. Hydraulic design of stilling basins.

Dam outlets/tunnels: types, design, lining, bifurcations, energy dissipation, gates/valves, cavitation

CWR-614 SEDIMENT TRANSPORT AND RIVER ENGINEERING (2,1)

Fluvial System and sedimentation, properties of sediment, individual and bulk properties, hydraulics of sediment transport, interaction of fluid and particle. Flow resistance drag force, lift force concept, resistance flow in open channel with moveable boundaries and bed form. Incipient motion, suspended load, bed load total load computation. Mobile bed visualization, determination of Manning's roughness coefficient. Bed form measurement. Measurement of scour depths around the pier.

Sediment carrying capacity of channel. Erosion and sedimentation of cohesive material. Degradation, aggradations and local scour in alluvial channel. Stable alluvial channel design. Analysis of alluvial bed form. Sediment measurement. Bed load, suspended load measurement. Sediment transport modeling in rivers and reservoirs. Bed material analysis, sieve analysis, VAT method, suspended sediment analysis, pipette method, application of HEC-6 model for river and reservoir sedimentation. Delta formation and movement, reservoir survey. Turbid density currents, sediment flushing and excavation..

River morphology, hydraulics of river flow, river hydrographic survey, river regulation and control. Measurement of river cross-section. River training works, spur, guidelines flood protection works. Effects of river training on flow dynamics. Weir gate regulation and sediment deposition in head ponds. Analysis of river morphology. Stream gauging. Floodway analysis. Application of River Analysis System, HEC-RAS model, Telemetry, River water quality modeling.

CWR-615 PHYSICAL AND NUMERICAL MODELING (2,1)

Basic of physical modeling. Principles and theory of similarity. Dimensional analysis. Scale ratios, scale and boundary effects. Dynamic similarity, kinematic similarity, physical modeling river and flood plains. Distorted models. Geometric model. Mobile bed model. Models for dynamic behavior of structures. Hydrodynamic action on stilling basin. Dynamic actions on break waters. Dynamic wave modeling,

Physical Model testing procedure. Physical modeling for coastal area. Unsteady flow. St. Venant equation for unsteady flow. Mathematical formulation of physical processes. Basic concept of numerical modeling. Finite difference method, explicit and implicit Finite Different schemes. Kinematic diffusion and hydrodynamics modeling. Numerical model for natural channels, Dam break modeling, HEC-RAS Model calibration and data requirement.

CWR-621 DESIGN OF HYDROPOWER PLANTS (2,1)

Waterways: Intakes, Trash rack, Stop-logs, Power canal and tunnel, Cavitation, Surge tank, Penstock,/pressure shaft, Draft tube, Gates/valves, Tail race

Hydro-mechanical components: Turbine and its types, governor, parts, Typical dimensions. Turbine load/efficiency curves, turbine selection, Turbine manufactures.

Power house: Layout, Sizing of generator room, and other ancillaries, Workshop, office, storage, workers and utility area, Loading bay, Height requirements, Pressure relieving structures, Dewatering of powerhouse pit. Ventilation, Disaster prevention, Overhead cranes and jibs.

Electro-mechanical components: Generator, step-up transformer, high voltage switch gear, low voltage switch gear, high voltage circuit breakers, MVILV installations, control and protection.

CWR-622 PLANNING AND DEVELOPMENT OF HYDROPOWER PROJECTS (2,1)

Comparison with other energy source, stages of hydropower development, selection criteria and approval, components, low head and high head, low head developments; civil components; hydro-mechanical, components; electromechanical components and auxiliary equipment. Project layout and sizing, low head and high head, interdependence between layout, sizing and economics; alternative project layout, selection of project components; level of detail of quantities and costs in different stages of project development; estimation of quantities and costs and optimization and selection of the plant size. Peaking plants, Risk analysis for public and private sector investments.

CWR-631 DRAINAGE ENGINEERING (2,1)

General: Introduction, Definitions; Sources of drainage water; drainage requirements; Impacts of deficient drainage; Solutions; Problems identification; Water table surveys.

Sub-surface drainage: Soil-water relations, moisture profile, drainable pore volume; flow equations; soil hydraulic properties, Pipe drainage design; steady state design: unsteady design:, dynamic equilibrium, Pipe drain system; layout; materials; pipe sizes; envelop design; construction; drainage structures; performance monitoring; pipe cleaning, O&M issues, Drainage criteria; steady or unsteady design; humid areas; irrigated areas, Drainable surplus; components; recharge; discharge; water balance quantification; spatial and temporal variability, Tubewell drainage design; layout; components; materials, O&M. Interceptor drains, concept, design: layout.

Surface drainage: Surface drainage system; drainage protection / frequency analysis; flow terminology; factors affecting flow; land forming; Field, farm and main drainage; Drainage ditches; Design discharge: rational method; empirical method; curve number method; temporal runoff distribution: unit hydrograph; design hydrographs; urban drainage. Design of drain; discharge, layout; drain section design; L-section; X-section; surface drainage structures; O&M, pumping stations and flood control.

Planning of drainage projects and investigations: *Drainage Projects in Pakistan*, History, project description, *Drainage projects planning*; Steps; diagnosis, solutions; data; investigations; surface surveys; ground water surveys; processing and interpretation; maps, project formulation.

CWR-632 IRRIGATION ENGINEERING AND MANAGEMENT (2,1)

Objectives of irrigation: scope & major issues, irrigation and food security; Soil-water-plant relationships, soil moisture indicators, available soil moisture, management allowed deficit, soil moisture determination; Flow measurement, water losses and their determination

Irrigation water requirements: reference evapotranspiration (ET), measurement and estimation of ET, crop coefficients, water production functions.

Irrigation scheduling, deficit irrigation water, water distribution at farm: on-demand, continuous and rotational schedules; Irrigation efficiencies, distribution uniformity and water productivities; Conjunctive use.

Concepts of surface irrigation, surface irrigation process, infiltration and infiltration models, measurement of infiltration; Types of surface irrigation systems, their suitability and limitations, Volume balance theory and its application, evaluation of irrigation systems and their improvement, design fundamentals;

Irrigation system layout and operations at division, circle and command level, Water allocation and distribution at canal command, region, country and basin level., Water management at various levels.

CWR-633 WATER QUALITY MODELLING AND MANAGEMENT (2,1)

Water quality parameters, receiving water processes, general concept of water quality modeling, general water quality model components, general mathematical formulations for water quality models, model data requirements and prediction issues, objectives of computer modeling in water quality management studies, cases studies of water quality models, utilization of modeling in water quality management studies, evaluation of wastewater treatment alternatives, wastewater characteristics, water use and wastewater production, wastewater flow, composition of wastewaters, wastewater treatment techniques, development of alternative wastewater treatment schemes, wastewater treatment cost estimation, elements of cost estimation, cost estimates of wastewater treatment techniques, a systems approach to water quality management, institutional aspects of water quality management planning, environmental assessments in water quality management planning.

CWR-651 ARID ZONE HYDROLOGY (2,1)

Introduction, the arid zone environment and hydrological measurements, traditional forms of water use in arid zones.

Rainfall characterized by convective storms, Intensity characteristics of storm rainfall, variability of annual rainfall, long term trends in annual rainfall, statistical analysis of annual point rainfall, spatial variability of annual rainfall, seasonal rainfall. Raingauge networks, the distribution of recording, rainfall intensity analysis, estimation of mean areal rainfall, rainfall depth-duration-frequency relationships, probability of daily rainfall occurrences, double mass analysis with limited and scarce data.

Climatic elements affecting evapotranspiration, temporal and spatial variability of potential evapotranspiration, estimation of evaporation and evapotranspiration in arid zones.

Characteristics of surface runoff, flood events, annual and seasonal runoff amounts in arid zones, Streamgauging network requirements, data processing and analysis. The effects of climate on sedimentation, the sedimentation process in arid lands.

Characteristics of Groundwater in Arid Zones. Special techniques useful in arid zone hydrology. Resource Assessment Methods: Surface water estimation and use, groundwater recharge estimation, artificial groundwater recharge.

CWR-653 HYDROMETEOROLOGY (2,1)

Microclimatic, local and global aspects. Measurement of climatic factors, air masses and fronts, synoptic maps, cyclones and anticyclones. Monsoons, global climatic changes.

Hydrometeorological network planning and design. Precipitation measurement. Accuracy of measurement of hydrometeorological elements.

Precipitation analysis. Depth-Area-Duration. Probable maximum precipitation and probable maximum flood computations. Intensity-duration-frequency analysis. Antecedent precipitation index. Coaxial analysis. The link of hydrometeorological parameters and experimental basin studies.

Land atmosphere interaction.

CWR-654 SNOW AND ICE HYDROLOGY (2,1)

Introduction: Definitions, Snow and its classification, Distribution of snow, Ripening of snow, Snowmelt process, Design of network, Measurement of snow at time of fall, Snow surveying, Factors affecting runoff from snowmelt, Techniques of Analysis of snowmelt for Forecasting runoff, Snow compaction, Snow loads, Properties and Structure of Ice. Distribution of Glaciers and Perennial Ice, Movement of glaciers and their impacts. Introduction to avalanches and their classification.

CWR-655 WATERSHED PLANNING AND DEVELOPMENT (2,1)

Why watershed planning & development? Watershed morphology, storage on the watershed. Characterizing the watershed. Drainage network. Watershed management and large scale changes. Causes of soil erosion.

Watershed development inventory. Watershed development requirements w.r.t. to water resources & hydropower development projects. Watershed management practices required for watershed development. Soil and water conservation engineering practices for watershed development. Land consolidation, water resources development, channel improvement and river training, flood control and management, restructuring the forestry practices.

CWR-671 GEOLOGICAL AND GEOTECNICAL INVESTIGATIONS (2,1)

Formation of soil and soil deposits, origin and composition of soils. Geological investigations for construction of dams, reservoirs, abutments, foundation and location of borrow areas.

Seepage, seepage force, quick condition, flow net theory and applications, seepage through earth dams. Compressibility and settlement, consolidation theory, consolidation tests. Shear strength in soil, Mohr's theory of failure, stability of slopes, methods for prediction of slope stability. Lateral earth pressure, active and passive earth pressure, Rankin's theory and effects of surface loads. Site improvement: compaction stabilization, dewatering and use of geosynthetics. Bearing capacity of shallow foundation, deformation and bearing failure, bearing capacity evaluation, effects of groundwater.

Field and laboratory tests: standard penetration test, permeability, density, rock quality designation, plastic limit, shrinkage limit and liquid limit etc.

Use of drilling equipments. Well logging, lithological well logging and geophysical logs. Collection of disturbed and undisturbed samples from the subsurface formations. Use of investigational tunnels, adits, shafts, test pits, trenches for development for subsurface structures.

Use of aerial photography and geophysical methods for geological investigations. Different types of drilling method and their importance with reference to investigation in different formation.

CWR-681 PRESSURIZED IRRIGATION SYSTEM (2,1)

Adaptability of sprinkler and trickle irrigation systems; Types of sprinkler irrigation systems: portable, semi-portable and permanent systems, hand-move, toe move, side-roll and raingun sprinklers, centre-pivot and linear move systems; Components of a sprinkler system: pump, mainline and laterals, sprinkler heads. Types of sprinkler heads and their characteristics; Water application patterns by stationary sprinklers, effect of wind and drift losses, sprinkler discharge, water application depth and spacing; Evaluation of a sprinkler system: water application uniformity and application efficiency, wind losses and pressure variation; Layout of set sprinklers: number of sprinkler heads & lateral positions, topographic effect, main line layout, preliminary design; Pipe and hydraulic, pressure & friction losses: economical pipe size selection; Centre-pivot sprinkler system: water application rates & patterns, irrigation depth and speed of the system, variation of discharge along the lateral and evaluation; Trickle irrigation system and its components, emitters and their types, criteria for selection of emitters, clogging of emitters and filtration, design of a trickle system.

CWR-682 LAND AND WATER MANAGEMENT (2,1)

Diagnosis and properties of salt affected soils. Diagnostic procedures for evaluating salinity/sodicity of soils. Ion exchange and dynamics of salts. Leaching theory and salt balance. Management of salt affected soils. Reclamation of salt affected soils. Planning for reclamation. Role of crops in soil reclamation.

Significance and scope of soil and water conservation, soil erosion types, factors affecting soil erosion, water erosion control, mechanism of water erosion, vegetative waterways design, terrace design embankments and farm ponds, design of farm ponds, agricultural watershed management.

CWR-691 ENVIRONMENTAL IMPACT ASSESSMENT (2,1)

What is environmental impact assessment (EIA)? Why EIA is required for Water Resources Development projects. Basic principles. Procedure of EIA. Subject oriented requirements. Ecological evaluation. Practical considerations in writing impact statements.

EIA of water resources development projects in general. EIA of dam & reservoirs, Irrigation & Drainage and Hydropower projects. National environmental policy. Future of environmental impact assessment studies.

CWR-692 PROJECT CONSTRUCTION AND MANAGEMENT (2,1)

Manager and management views, problem solving, project supervision. Data, decision making and implementation, Responsibility, interwoven problems, Project organization and strategy, Job planning and management. Project networking and control, project staff behavior, business problems, resource inventory, project finances, Land acquisition and use techniques. Project construction strategy; project phasing, cash flow, staff requirements. Material processing and handling, equipment and machinery, transportation fleet.

Construction plant and machinery – functional classification and application, factors affecting selection of construction equipment. Construction planning techniques, activity sampling, incentives, value engineering, risk analysis, resource leveling. Operational analysis, schedule control. Network analysis techniques, use of CPM/PERT/Primvera. Computer applications to cost engineering, Earthwork excavation, handling and transportation machinery. River diversions during construction, construction of ancillary works. Deep/shallow water construction in rivers and sea. Construction techniques for dams, power stations, irrigation system, flood control measures.

CWR-693 REMOTE SENSING AND GIS APPLICATION IN WATER RESOURCES (2,1)

Components of GIS, function of GIS, vector data, raster data. Coordinate system, map projection. Spatial data input, spatial data management and analysis, overlay operation, attribute data handling. Network analysis. Statistical operation using GIS. Introduction to remote sensing and remotely sensed data. Electromagnetic radiation. Different types of satellite. Data acquisition, digital image processing. Aerial photography. Image analysis, image classification supervised and unsupervised classification, Image enhancement, edge enhancement, digital elevation model, TIN model, geostatistical tools, kriging techniques. Image interpretation for irrigation system, forestry, snow cover, and geology. Watershed delineation. Regional scale concept. Application of ILWIS model for: Irrigation water requirement, Determining of peak runoff, Erosion modeling, Flood hazard analysis, Geological survey, Groundwater pollution vulnerability assessment, GPS, components of GPS. Survey using GPS Errors in GPS survey, Total station.

CWR-694 WATER RESOURCES PLANNING AND ECONOMICS (2,1)

Planning: definitions, importance, characteristics, planning objectives. *Planning process*: levels, phases, steps, planning reports, project appraisal. *WR development* purposes, alternatives and their evaluation, multi-purpose planning, regional planning, Administration of planning programs, Decision making process; Demand projection; Production practices and constraints; Land, water and human resources.

Water resources planning in Pakistan, PC proforma, Water sector plans, development plans, planning organizations. *Planning data*: requirements, analysis and management, data transformation and transposition, forecasting. *Planning aids and tools*: optimization, simulation, remote sensing, GIS, etc, mathematical modeling. *Project impact:* environment, social, Public participation in WR projects.

Project Costs and benefits: Cost - components, construction and O&M costs, direct and indirect costs, cost phasing; Project benefits - primary & secondary, direct and indirect benefits, social and economic benefits;

Adjustments of costs and benefits (shadow prices, subsidies, escalation, taxes).

Engineering economy: Project exclusions, criteria for economic comparison, Time value of money, discounting, compounding, annuity, capital recovery, sinking fund, present vs. future worth, amortization, Annualized costs and benefits, interest, loans (hard, soft), Discounting techniques, BC ratio, NPW, EIRR, sensitivity analysis, Economic Analysis, Financial Analysis, project comparisons and selection.

Planning for irrigation development or intensification projects. Planning for drainage and reclamation projects, Planning for flood control projects, Planning for water storage reservoir dams and hydro-power development projects.

CWR-695 WATER RESOURCES SYSTEM ANALYSIS (2,1)

Basic concepts of system engineering: objective function, constraint equations, decision variables, feasible, basic and optimal solutions, slack and surplus variables; Simplex method: standard and canonical forms, basic and non-basic variables, solution of simplex problems; Linear Programming: formulation of linear programming (LP) model, application of LP model to water resources problems, dual LP models, application of Tora and Lindo softwares, interpretation of solution output, sensitivity & range analysis; Integer Programming (IP) and its application, mixed integer programming; Dynamic programming (DP): stage and state variables, formulation and solution of DP models and their applications.

CWR 696 COMPUTER APPLICATIONS IN WATER RESOURCES (2,1)

Introduction to computers (Analog and Digital Computer). Computer functions (Opening, Saving, Editing and Modifying a file. Changing file name/path/drive. Creating and managing a folder. Printing a file). Internet utilization (Search engines, explore a specific site, E-mail applications, data transfer etc).

Use of Office Package (Word processor, Use of spread sheet for numeric calculations and drawing graphs, use of Power point.).

Creating drawings/graphics using Office Package and specific graphic software as Corel Draw, AutoCAD etc.

Preamble to computer language (Elements of programming. Input/Output, Assignment, and control statements. Loops and structured Programming.

Programming Packages/Soft wares (Installation, Usage, Help file, Reference/Technical/User Manuals, and Application). Case Studies using HEC-RAS, HEC-HMS, HEC-RES and SIC models.

APPENDIX-B:
STATUES, RULES AND REGULATIONS

REGULATIONS GOVERNING THE SEMESTER SYSTEM FOR POSTGRADUATE DEGREE PROGRAMS

1.0 Introduction

The following regulations govern the Semester System for the Postgraduate degrees awarded by University of Engineering and Technology (UET), Lahore.

1.1 Classification of postgraduate degrees offered at the University under Semester System are given in the following table:

Degree Nomenclature	Abbreviation	Areas
Doctor of Philosophy	Ph.D.	Water Resources Engineering, Water Resources Management and Engineering Hydrology
Master of Science (18 years equivalent)	M.Sc.	Water Resources Engineering, Water Resources Management, Engineering Hydrology and Hydropower Engineering

1.2 Masculine gender used in the following regulations implies students of either gender, that is, male students as well as female students.

1.3 The medium of instructions and examinations shall be English for all subjects.

1.4 The term "Academic Year" refers to the period of study at the university/Centre comprising of two regular semesters and an optional summer semester.

1.5 The term "Credit Hour (CH)" refers to a unit of academic credit during a semester.
Each credit hour is related to a one or more "Contact hours per week" according to subject type as defined inthese regulations.

1.6 The contact hours assigned to a curriculum sub-category during summer semester would be double that of those assigned during the regular semester

2.0 Degree Duration

The minimum and maximum duration for various postgraduate degrees is given below in the table. The duration spent by a student is counted from the date of his registration

Degree Programs	Duration (in calendar	
	Minimu	Maximu
Doctor of Philosophy	03	05*
M.Sc. Engineering,	1½.	3
*Replaces the maximum period stated in Ph.D. Regulation No. 7 notified vide Notification No. Univ/Acad/M-76/10/808 dated 30.09.2010.		

Under exceptional circumstances, the Vice Chancellor is authorized to grant extensions up to a maximum period of two years for Ph.D. and one year for other programs on the recommendation of the respective Postgraduate Research Committee (PGRC) and the Dean.

3.0 Students Status

Postgraduate students shall be classified as "Regular" students while enrolled at the university/Centre for the duration of their respective degree program.

4.0 Credit Hours Requirement

4.1 The minimum credit hours requirement for the award of Ph.D. degree shall be 60 credit hours after M.Sc./ Masters/ M.Phil, including a minimum of 42 credit hours of Ph.D.

thesis.

4.2 The minimum credit hours requirement for the award of M.Sc. Engineering shall be 30 credit hours, after an undergraduate degree, including a minimum of 06 credit hours of M.Sc. thesis.

5.0 Semesters Nomenclature and Duration

5.1 There shall be two regular semesters, namely Spring and Fall semesters, and an optional Summer semester during each academic year.

5.2 Duration of Fall and Spring semesters shall be 18 weeks including examination.

5-3 Duration of summer semester will be 9 weeks including examinations

6.0 Curriculum and its Sub-Categories

6.1 The curriculum, subject identification numbers, the credit hours allocated to each subject and detailed syllabus shall be according to the proposals made by the Post Graduate Research Committee (PGRC)/ Board of Studies and the Board of Faculty concerned and by the Academic Council

6.2 Classification of sub-categories are given below:

i "Theory" wherein the primary mode of teaching shall be lectures given by teachers supplemented by home assignments. For the purpose of these regulations, subjects of this type shall be referred to as Type-A;

ii "Practical" wherein the primary mode of teaching shall be experiments, studio laboratory, designs, drawings, assignments and projects conducted/executed by students as specified in the syllabus. For the purpose of these regulations, subjects of this type shall be referred to as Type-B;

iii Postgraduate research culminating into theses *I* dissertation shall be classified as Type-C sub-category.

7.0 Type-A Sub-Category Evaluation and Contact Hours

7.1 In Type-A subjects, there shall be a mid-term examination of one hour duration and a final examination of at least one and a half hour duration. These examinations shall carry 30 and 50 percent weight respectively. The teacher shall schedule additional assessment instruments such as quizzes, assignments, presentations, seminars, group discussions, field study reports etc. as specified in the syllabus or as determined by the teacher. These assessment instruments shall carry the remaining 20 percent weight of the subject.

7.2 There shall be one contact hour per week for the duration of a regular semester for each credit hour assigned to Type-A subjects.

8.0 Type-B Sub-Category Evaluation and Contact Hours

8.1 In Type-B subjects, each Experiment, Studio work, Jury Presentation, Design, Drawing, Project or Assignment shall be considered an independent assessment instrument. Relative weight of each independent assessment instrument shall be determined by the concerned teacher in computing the cumulative performance, on a scale of 100, of all assessment instruments completed during the regular semester.

8.2 There shall be two to three contact hours per week for the duration of regular semester for each credit hour assigned to Type-B subjects.

9.0 Type C Sub-Category Evaluation

9.1 Postgraduate research credits registered towards fulfillment of degree requirement shall not be assigned any grade on the transcript.

9.2 Postgraduate theses evaluation process would be followed as prescribed in relevant rules.

10.0 Award of Letter Grades

10.1 The subject teacher shall award letter grades to the students in consultation with the Chairman of the concerned degree awarding department. Letter grade in each subject shall be awarded on a Relative Scale.

10.2 Following steps in awarding letter grades on a relative scale shall be followed:

i Minimum marks threshold linked to content mastery shall be established for award of a passing letter grade. Students earning marks below this threshold shall be awarded "F" grade;

ii Students earning marks above the minimum threshold are listed in descending order of merit. Passing letter grades are awarded based on a normal curve or any other method as deemed suitable, according to the table given below, with "A+" being the highest passing grade and "D" being the lowest passing grade.

10.3 The letter grades and their corresponding grade points (GP) are given in the table below:

Table Letter Grades & Corresponding Grade Points

A	A	B	B	B-	C	c	C-	D	F	w	W	I
4.	3.	3.	3.	2.	2.	2.	1.	1.	0	-		-

10.4 Subjects repeated to improve grades, excluding "W" or "WF" grades, will be shown on the transcript with a suffix "R".

10.5 All postgraduate theses excluding theses/projects of sixteen years M.Sc. degrees shall be graded as "Approved" on successful completion

11.0 Result Computation Scheme

11.1 The Grade Point Average (GPA) and Cumulative Grade point Average (CGPA) shall be computed according to the following formula:

$$GPA = \sum (GP_x * CH_x) / \sum CH_x$$

x = 1 to n, where n is the number of subjects in the semester for which GPA is computed.

$$CGPA = \sum (GP_y * CH_y) / \sum CH_y$$

y = 1to m, where m is the number of total subjects covered in all semesters up to the semester for which CGPA is to be computed.

11.2 Credit hours earned for theses graded as "Approved" shall not be counted towards computation of CGPA.

12.0 Award of "W", "WF" and "I" Grades

12.1 Withdrawal

i. This option to withdraw shall be available only to students in regular semesters other than first and second semesters.

ii. A student may be allowed to withdraw from a subject in which he is registered.

Applications (on prescribed form Sem-3) to withdraw from a subject shall be entertained latest up to the 9th study week of the semester. Withdrawn subjects shall appear in the transcript with a letter grade "W", and shall not be used in computation of GPA. In the transcript, subjects repeated after withdrawal will not be suffixed with a "R".

iii. Postgraduate student may withdraw at most 6 credit hours for the duration of his study

12.2. Forced Withdrawal:

A student registered in a subject may not be permitted to continue due to shortage of attendance or other disciplinary action. Such students shall be awarded a "WF" (Forced Withdrawal) grade. It shall appear in the transcript as such, and shall not be u s e d in computation of GPA. Subjects repeated after forced withdrawal shall not be suffixed with a **"R".**

12.3. Incomplete Grade:

The students shall be awarded "I" (Incomplete) as an interim grade until the completion of unfinished subjects. This grade shall appear in the transcript as such, and will not be treated as "F" grade. Situation when award of "I" (Incomplete) grade becomes necessary is enumerated below:

A student, who because of illness or any other acceptable reason approved, after verification, by the concerned Chairman, fails to complete the required instruments in any subject, shall be awarded an "I" (Incomplete) grade as an interim grade. The student receiving such a grade shall make up the unfinished portion of his subject to the satisfaction of the faculty member who awarded this grade, and is given a letter grade as per regulation 10 at the discretion of the faculty member without prejudice to the previous grade "I". In case, the student fails to complete the unfinished portion within one calendar year from the date of end of the semester in which he was awarded the "I" grade, his "I" grade would be automatically converted to "F" grade. The responsibility for completing the unfinished portion and satisfying the faculty member lies with the affected student.

13.0 Repetition of Subjects

13.1 The student shall have to earn a passing letter grade in failing and withdrawn core subjects. They may study alternate elective subject for completing the credit hours requirement if they have earned "W", "WF" or "F" grade in an elective subject. Students are permitted to improve grades of passed subjects (Form Sem-2) along with any outstanding **"F",** "W" or "WF" grade, subject to maximum credit hours restriction, if any.

13.2 In case of repetition of a subject, the new grade earned shall replace the previous grade, whether high or low. At the time of graduation, elective subjects with "W", "WF" & "F" grade

will not be shown on the final transcript if alternate elective subjects have been studied for completing the credit hours requirement.

13.3 Postgraduate students shall repeat subjects whenever they are offered.

14.0 Removal From Rolls

Postgraduate students shall be dismissed from the program:

i. If they do not register for two subjects during the first semester after their enrollment;

ii. If they register for less than 4 subjects during the first two semesters after enrollment;

iii. If they earn a CGPA of less than 2.5 after first two semesters at the university;

iv. On the recommendation of PGRC, if they fail to register for two consecutive semesters.

15.0 Official Authority for Computation of Result

15.1 Grade points (GP) in each subject, Semester Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA) of each student shall be computed and notified by the Controller of Examinations at the end of each semester

15.2 Provisional results displayed/ communicated to the student in the department after approval of the chairman before publication of official results may be used for deciding removal cases and for registering students for repetition of subjects by the departments

16.0 Award of Degree

16.1 M.Sc./Master/M.Phil. degree shall be awarded to those students, who have:

a) Earned a minimum CGPA of 3.0 in prescribed course work with no outstanding "F", "W", "WF" or "I" grade in core courses;

b) Have repeated elective subjects in which they have earned "F", "W", "WF" or"I" grade, or have taken alternate elective subjects to complete the subjects credit hours requirements;

c) Completed a thesis as per prescribed requirements.

16.2 Ph.D. degree shall be awarded to those students, who have:

a) Earned a minimum CGPA of 3.3 in prescribed course work with no out standin"F" grade;

b) Have fulfilled prescribed requirements as stated in Ph.D. regulations published separately

17.0 Grade Change Request

A student may submit a Grade Change Request (Form Sem-1) to the Chairman's Office stating the specific reason for change in grade. Grade Change requests must be submitted not later than one week after the first grade was posted or within the first week of the following semester, whichever is later. The request will be submitted to the concerned faculty member. Normally, the only person who can change a grade is the faculty member who gave the grade; however, in case that faculty member is no longer available or cannot be reached, the department chairman has the authority to evaluate the situation and change a grade, ifrequired. When a grade is to be changed, the chairman shall forward the case to the Dean with justification for change. The result will be modified after approval of the Vice Chancellor on the recommendation of the Dean.

18.0 Registration of Students, Fee Payments and Hostel Accommodation

18.1 The students shall register out of subjects being offered in each semester. They shall
also register for research credits during each semester following completion of their course work.

18.2 Registration roll in each subject of the semester shall be dispatched to the Controller of Examinations within first fifteen days of the beginning of each semester.

18.3 All postgraduate students shall pay prescribed university dues twice a year until successful completion of their respective degree requirements. Students deferring studies during this period shall continue to pay university dues as regular students during deferral period.

18.4 Admission of students defaulting on six monthly dues shall be canceled. Students whose admission has been canceled due to non-payment of dues may apply to the Vice Chancellor for reinstatement. On approval of their reinstatement request, they shall pay their unpaid dues and additional re-admission charges.

19.0 Deferment of Studies (Freezing) for Students

19.1 Students enrolled in the first semester or second semester cannot apply for deferment.

19.2 There shall be no relaxation in the maximum degree duration period for students seeking deferment.

19.3 A student may defer studies for at most two consecutive regular semesters, for medical or other genuine reasons. In

such cases, the student shall apply (Form Sem-4) to the Chairman concerned, at least 15 days before the commencement of the semester, for approval of deferment by the concerned Dean. CAC, after approval, shall notify deferment for a specified period.

20.0 Attendance Requirements

20.1 Students failing to register, or attend classes, or failing to re-join after expiry of approved deferment, during the first three weeks after commencement of a semester or after the date of their admission in case of new entrants in the first semester (Fall or Spring), shall have their admission canceled automatically.

20.2 Students (except the students studying under distance learning programmes) failing to maintain a minimum attendance of 75% in a subject during a semester shall be awarded a "WF" grade. The Dean concerned may allow maximum 10% relaxation in attendance. Any relaxation in excess of 10% shall be forwarded to the Vice Chancellor through the respective Dean forfinal decision.

21.0 Re-Admission Policy

Students dismissed under Regulation 14 shall not be eligible for re-admission. Such students may, however, apply for admission as fresh candidates.

22.0 Special Provisions

22.1 In all cases where the regulations are silent, the decision of the Vice Chancellor shall be final.

22.2 Interpretation of these rules and regulations by authorized officers of the University shall be final.

22.3 The University authorities reserve the right to make any changes in the existing regulations, rules, fee structure and courses of study that may be considered necessary at any time without prior notice.

22.4 No student is allowed to maintain simultaneous enrollment in any other program of studies in the university or any other educational institution within or outside Pakistan, unless permitted by the competent authority as an Exchange Student.

22.5 In case a student enrolled in this University is found to be a regular student of some other university/ institution whether local or foreign, his admission in this university shall be canceled.

22.6 Students are required to know the rules and regulations mentioned in the prospectus and notified time to time. Ignorance of rules and regulations does not absolve them of their responsibilities and shall not be treated as an excuse.

RULES

1.0 Evaluation Process of Subjects

1.1 Evaluation of Type-A Sub-Category

i. For mid-term and final examinations of Type-A subjects, the teacher of a subject shall set the question paper of that subject, supervise its examination, mark the answer books and prepare the award list.

ii. Every teacher of Type-A subjects shall return the marked quizzes, assignments, etc. and mid-term examination scripts to the students for review, and in case of presentations etc. display the earned score of each student, within one week of the event. Mid-term scripts, however, would be recovered from the students and deposited with the chairman concerned.

iii. At the end of scheduled teaching period of a semester but before commencement of the final examinations, the teacher shall prepare and display the Interim Award List. Composition, display, correction, and reporting requirements/procedures of Interim Award List shall be as prescribed in these rules.

iv. Teachers would mark the final examination scripts, and prepare and display Comprehensive Award List within two weeks of the examination of the subject.

v. The students may be shown the final examination marked scripts before submission of Comprehensive Award List to the Controller of Examinations, if they so desire.

1.2 Evaluation of Type-B Sub-Category

i. Teachers of Type-B subjects shall keep all students informed of their performance at every stage in each category of task performed. Immediately after the end of each stage/assessment event, teachers shall prepare and display a list of earned score of each student in that stage/assessment event.

ii. At the end of semester and before the end of examination period, teachers shall prepare and display the Interim Award List. Content and other requirements regarding Interim Award List shall be as prescribed in these rules.

iii. After following the procedures and requirements regarding Interim Award List, the teachers shall prepare and display Comprehensive Award List within one week of the end of the scheduled teaching period.

1.3 Thesis Evaluation

1.3.1 Ph.D. thesis evaluation would be processed as per approved prescribed regulations for the purpose.

1.3.2 M.Sc. /Master/M.Phil. theses evaluation process would be followed as prescribed below:

i. The External Examiner for the thesis shall be appointed by the Vice Chancellor on the recommendation of the PGRC/Dean of the relevant Department from a panel of proposed external examiners.

ii. The Final Report on the Thesis and Viva Voce Examination by the Examiners shall be submitted on the prescribed proforma.

iii. In case there is a difference of opinion between the Examiners, the Vice- Chancellor, shall appoint a third Examiner on the recommendations of the Board of Postgraduate Studies of the department, whose opinion shall be final.

iv. If a candidate, whose thesis has not been approved, is permitted to revise his thesis, he must submit the revised thesis for evaluation not later than six months from the announcement of the decision requiring him to revise the thesis.

1.4 Interim Award List

i. Interim Award List would show the percentage as well as weighted score of each stage/assessment instrument of that subject including the mid-term examination in case of Type-A subjects.

ii. One copy of the list shall be submitted to the Chairman and additional copies shall be displayed on the Notice Boards for at least two working days to permit students to point out any anomalies, errors, omissions etc. in the list.

iii. The teachers shall give due consideration to any anomalies, errors, omissions etc. in the list pointed out by any student, and may correct the list. Any corrections etc. in the list shall be reported by the teacher to the Chairman.

iv. Any further processing of the list shall be carried out only after it has been displayed on the Notice Boards for the mandatory period and decisions regarding all matters pointed out by students have been taken.

1.5 Comprehensive Award List

i The Comprehensive Award List shall show, for each student:

a) The Comprehensive award showing weighted combination of the Interim Award and Final Examination award in percentage format.

b) Letter Grades corresponding to the comprehensive award.

ii The teacher would assign letter grades to the comprehensive award in consultation with the chairman as prescribed in the rules.

iii The Comprehensive Award List shall be displayed on the notice boards for students to see and discuss anomalies, if any.

iv One copy of the Comprehensive Award List shall be sent to the Controller through the Chairman of the Department and one copy each shall be retained by the chairman and the teacher

2.0 Conduct of Examination of Type A Subjects Under Semester System

2.1 Question Papers

a) All question papers are set by the concerned teacher.

b) The paper setters, who also ensure their correctness, supervise the photocopying or duplicating of the papers.

c) Question papers are kept in the safe custody of the teacher till the start of examination. He shall bear legal and moral responsibility for the safe custody and secrecy of the question papers.

2.2 Reference Material during Tests/ Examinations

Prior to class tests, mid term/final examination, the subject teacher announces such books, notes or other material that can be referred to by the students during the test or examinations. All other books, notes, papers, etc., are withdrawn from the examines.

2.3 Examination Schedule

The Chairman of the department publishes the mid term and final examination schedule at least two weeks before start of the examinations in accordance with the university academic calendar.

2.4 Conduct of Mid-Term and Final Examinations

The subject teacher shall be the Superintendent for the conduct of examination. The chairman shall depute teachers or staff as Deputy Superintendent and Invigilator for the conduct of examinations. The Superintendent shall ensure the following:-

a) That all answer books used in the examination are signed or initialed. The teacher may require the students to answer on the question paper itself. No other answer books are to be used in these cases.
b) Answer books are issued to the invigilator 5 minutes before the commencement of the examination and retrieved at the end of the examination.
c) The absentee report, if any, is prepared and forwarded to the Chairman's office at the end of each examination

2.5 Teachers or Staff acting as invigilator are detailed bythe respective Chairman. They ensure the following:

i. That the students are identified through means such as university identification card.
ii. That the students are warned against the use of unfair means and have been advised to surrender mobile phones, notes, papers or other unauthorized material before the commencement of the examination.
iii. That the students are not allowed to talk with or copy from other students during the examination.
iv. That no student is allowed to join the examination 30 minutes after its commencement.
v. That no student is allowed to submit the answer sheet and leave the examination room within 30 minutes of commencement of examination. Visits to toilets are carefully controlled.
vi. That the question papers and answer books of a student detected using unfair means or assisting another candidate, are taken away and the matter is reported to the Controller of Examinations through respective chairman. The superintendent records all available evidence to be used as written proof later on.
vii That the students write their registration numbers, name and class on the front cover of each additional answer sheet used. If more than one answer book is used, these are stapled together

2.6 The Superintendent(s), shall supervise distribution of the question papers to the students according to the schedule published. In case of multiple Examination Centers, subject teachers shall be available in or near the examination center during examination of their subject to clarify any query and to collect answer books after the examination.

3.0 Degree Completion

Students, who are eligible for the award of degree, are required to submit a Degree Requirements Completion Form to their respective chairman for onward submission to the Controller of Examinations. Degree status would be decided only after receipt of this form.

4.0 Disposal of Answer Scripts

Answer sheets of midterm and final examinations will be stored in the respective department for two calendar years after declaration of result of that semester. The sheets would be destroyed subsequently

5.0 Migration into Postgraduate Programs

No migration is permitted into any of the post graduate programs. Candidates are required to apply afresh, fulfilling all the requirements laid down by the university in this regard, into the program they are aspiring to undertake. Admission shall be based on merit as per the admission policy

6.0 Exemption of Subjects

Exemptions may be granted by the competent authority on the recommendations of the Postgraduate Research Committee (PGRC) and Dean of the concerned department/faculty to students admitted in the postgraduate program, subject to the following conditions:

i. That the subject has been studied at HEC recognized institution within last five years from the date of admission.
ii. The subject under consideration has not been given credit towards award of a degree.
iii. The subject must correspond to a subject currently offered by the concerned department or be deemed equivalent in depth and intensity to a current subject.
iv. The student must have earned at least "60%" marks in case of term/annual system or a minimum of CGPA 3.0 out of 4.0 in a semester system similar to the one in this university for determining transfer of M.Sc./ MPhil. Subjects

v. The student must have earned at least "70%" marks in case of term/annual system or a minimum of CGPA 3.3 out of 4.0 in a semester system similar to the one in this university for determining transfer of PhD subjects.

vi. The credits transferred shall be counted towards the degree requirements of the student. However, GPA of transferred credits shall not be counted towards the calculation of CGPA, and that only "Transferred" shall be written against those subject(s) in which transfer of credits was allowed