Program Handbook

College	College of Computer Sciences and Information Technology
Department	Department of Computer Science
Program Title	Master of Science in Computer Science

Table of contents

Definitions

The following words and phrases, wherever they appear in these rules, shall have the meanings indicated opposite each unless stated otherwise.

Term	**Definition**
University	King Faisal University
Student	Any enrolled male or female at the university, regardless of educational level.
Values	Virtuous morals guide behavior toward goodness.
Objectives	Enhancing ethical competence and self-regulation.
Student Behavior	Actions reflecting students' morals and values, aligning with societal and legal standards.
Violations	Actions or statements violating university rules or public decency.
Disciplinary Penalties	Penalties specified in these rules.
Disciplinary Committee	Committee responsible for student discipline.
National Qualifications Framework	Framework issued by the Education and Training Evaluation Commission on 6/6/1441 AH, subject to updates.
Deanship/Administration/Unit	Entity responsible for academic procedures in graduate studies.
Vice President of the University	Official in charge of graduate studies, per the university structure.
Academic Program	Collection of courses, thesis, or exams required for a degree or higher certificate.
Weekly Theoretical Lecture	Weekly class or seminar lasting at least fifty minutes or specified by a time plan.
Examination	Any test taken by a student, including mid-terms and finals, according to university regulations.
Course	Subject in each program plan, including a code and description, subject to evaluation and may have prerequisites.
Admission Deferral	Pausing a student’s enrollment period to obtain a degree after studies commence.
Withdrawal	Students' final termination of enrollment before completing their program.
Enrollment Cancellation	University’s termination of a student’s enrollment before program completion for specific reasons stated in the regulations.
Re-enrollment	University’s reinstatement of a student who has canceled their enrollment.
Comprehensive Exam	Assessment of knowledge and skills required for advanced degrees, possibly serving as a final qualification for some degrees except for a doctorate.
Graduation Project	Research project defined by topic that qualifies a student for their degree and is part of the program.
Thesis	Scientific document representing research and findings submitted for degree attainment.

1 Introduction

This guide serves as a comprehensive resource for students enrolled in the Master of Science in Computer Science (MSCS) program. It provides detailed information about the program structure, objectives, curriculum, and the various resources available to support students' academic journey. The guide's importance lies in its role as a roadmap to help students navigate their studies effectively and make informed decisions about their educational and professional growth.

2 College of Computer Sciences and Information Technology

The College of Computer Sciences and Information Technology is dedicated to advancing knowledge in computer science and information technology through high-quality education and research. It offers a range of undergraduate and graduate programs, including the MSCS, tailored to meet the needs of a dynamic and evolving technological landscape.

The college comprises state-of-the-art facilities, including 16 classrooms, nine specialized laboratories, and a library with extensive resources. The college is housed in Building 15 and (59) on the university campus, fostering a collaborative environment for learning and innovation.

3 Department of Computer Science

The Department of Computer Science offers advanced programs designed to equip students with theoretical knowledge and practical skills. The department is home to the MSCS program, which focuses on preparing students for research and professional careers in computer science. Faculty members are experts in diverse areas, such as artificial intelligence, distributed systems, and software engineering. The department is located on the second floor of Building 15, facilitating close interactions between students and faculty.

4 Master of Science in Computer Science (MSCS)

The Master of Science in Computer Science (MSCS) program at King Faisal University provides a strong foundation in core computer science principles while offering flexibility through research and coursework tracks. The program emphasizes five key areas: Algorithms and Complexity, Intelligent Systems, Information Management, Software Engineering, and Computational Science.

Students are equipped with advanced skills through a carefully designed curriculum that combines core courses, specialized electives, and the option of either a research-focused dissertation or an applied project. This structure ensures graduates are prepared to address both technological and societal challenges.

Tailored to meet the needs of academia and industry, the MSCS program enables students to excel as researchers, software engineers, and technology consultants or to pursue advanced research opportunities. Further details on the program's mission, goals, structure, admission requirements, learning outcomes, and career pathways are provided in the subsequent sections.

- ## Program Mission

The mission of the College of Computer Sciences and Information Technology is to:

- Prepare highly qualified graduates in all Information Technology areas, possessing the necessary theoretical as well as applied skills in Computer Science and Information Technology
- Cooperate with specialized national and international institutions for developing systems and programs on the national and international levels and exchanging opinions related to Computer Science fields
- Raise the standards of teaching and research through organizing national and international academic meetings and conferences
- Provide state-of-the-art quality education relevant to the national and international markets by conducting theoretical and practical studies in the Computer Science areas with the support and participation of the private sector.

- ## Program Goals

The Master of Science in Computer Science (MSCS) program will prepare participants to:

1. Demonstrate excellence in problem-solving by applying theory to practice.
2. Focus on design and development techniques for construction, validation, and verification of various software systems.
3. Build academic or professional career and pursue life-long knowledge and learning in the area of computer science.
4. Face challenges conducting community-based applied research and share knowledge with the scientific societies of the world.

- ## Degree

Master of Science in Computer Science (MSCS)

- ## Admission Requirements

The eligibility criteria for candidates applying for admission to the MSCS program are listed below:

1. Fulfil the conditions stated in the graduate studies rules for Saudi Universities.
2. Have a bachelor's degree, from a recognized university by the Ministry of Education, in any of the following fields:
    a. Computer Science, Computer Information Science, Computer Engineering, Computer Networks, Information Technology.
    b. Mathematics, Statistics (with a prior exposure to programming).
    c. Electrical Engineering, Communication Engineering.
    d. A related field with substantial Computing and Mathematics contents.
3. Have a minimum CGPA in the bachelor's degree as 3.75/5.00 or equivalent in the bachelor's degree. It is the decision of the department council to accept less or more than this GPA in line with the university regulations.
4. Demonstrate English language proficiency through one of the followings:
    a. Scoring 61 or above in Test of English as a Foreign Language Internet-Based Test (TOEFL-iBT), 5.0 in International English Language Testing System (IELTS), or equivalent
    b. Earning the bachelor's degree with English language as medium of instruction.
5. Provide two letters of recommendation from either faculty at a prospective student's undergraduate institution, or from current employers/managers. If neither is available, applicants will need to provide a clear explanation why this is the case.
6. Provide a letter of approval from the employer if the candidate is currently employed.
7. Pass entrance exam and/or personal interview that will be conducted by the department.

It is the department council's decision to add or remove or modify any of the above conditions, if needed, and in line with the university/college regulations.

- Program Study Plan

The curriculum of the degree program includes a balance between theory, applications and research. Further core and elective requirements are set to complete the master in computer science. The students are allowed to choose one of the following two tracks:

A. Research Track
B. Course Work Track

Both of the above tracks will provide students with a theoretical background and solid foundation in computing. Further, the students will be exposed to the latest tools, techniques and technologies to have innovative ideas in the area of computer science.

A. Research Work Track

The objective of research track is to provide students with advanced level of knowledge in computing while developing their ability to work independently and develop their research skills. As the research track needs some original and creative thinking carrying out a research work and writing a dissertation requires a good grasp of the subject, time commitment and full command of the technical and business writing. Therefore, this option is suitable for those students who are interested in research careers and further research-based learning such as PhD. The program is composed of 36 units which are distributed according to the course categories as presented in Table 1. The learning material is comprised of core courses, elective courses and Dissertation. It is to be mentioned that dissertation is compulsory for completion of the Master of Science in Computer Science by research track.

Table 1: MSCS program- Units distribution of research track

Category	Units
Core Courses	15
Elective Courses	12
Dissertation (Compulsory)	9
Total Units (10 Courses)	**36**

The semester-wise distribution of the courses is given in Table 2.

Table 2: MSCS program- Study plan of research track

Year	First Semester			Second Semester		
	Course #	**Course Title**	**Unit**	**Course #**	**Course Title**	**Unit**
1	0911611	Advanced Algorithms	3	0911614	Advanced Software Engineering	3
	0911612	Distributed Systems	3	0912615	Research Methodology	3
	0911613	Advanced Computer Architecture	3	0911-11XXX	Elective 1	3
	Total		**9**	**Total**		**9**
2	**First Semester**			**Second Semester**		
	Course Code	**Course Title**	**Unit**	**Course Code**	**Course Title**	**Unit**
	0911-11XXX	Elective 2	3	0911700	Dissertation	9*
	0911-11XXX	Elective 3	3			
	0911-11XXX	Elective 4	3			
	Total		**9**	**Total**		**9**

*** Dissertation can be repeated within the maximum time limit of the degree**

B. Course Work Track

The objective of course work track is to provide students with an advanced level of knowledge and skills that will enable them to be valuable professionals for practicing in industry. This objective will be achieved through projects in collaboration with governmental and private industrial institutions, where students will have the opportunity to apply the state-of-the-art techniques they have learned. The objective is to meet the current and future demands of the industry by highly trained computer science specialists.

In this track, an effort will be made to help the individuals, to enhance their technical and managerial effectiveness in the field. This program will provide a strong foundation in theory and practice in the area of computer science and applications providing them with new professional skills and critical analytical thinking that are necessary to work in the competitive market of today. The program is comprised of 42 units for which the distribution is given in Table 3.

Table 3: MSCS program- Units distribution of course work track

Category	Units
Core Courses	15
Elective Courses	18
Dissertation (Compulsory)	9
Total Units (12 courses)	**42**

For Course Work Track, the semester-wise distribution of the courses is given in Table 4.

Table 4: MSCS program- Study plan of course work track

Year	First Semester			Second Semester		
	Course #	**Course Title**	**Unit**	**Course #**	**Course Title**	**Unit**
1	0911611	Advanced Algorithms	3	0911614	Advanced Software Engineering	3
	0911612	Distributed Systems	3	0912615	Research Methodology	3
	0911613	Advanced Computer Architecture	3	0911-11XXX	Elective 1	3
				0911-11XXX	Elective 2	
	Total		**9**	**Total**		**12**
2	**First Semester**			**Second Semester**		
	Course Code	**Course Title**	**Unit**	**Course Code**	**Course Title**	**Unit**
	0911690	Project Proposal	3	0911700	Project Implementation	6*
	0911-11XXX	Elective 3	3	0911-11XXX	Elective 6	3
	0911-11XXX	Elective 4	3			
	0911-11XXX	Elective 5	3			
	Total		**12**	**Total**		**9**

*** Project can be repeated within the maximum time limit of the degree**

- Program Learning Outcomes

At the time of graduation, students will have:

a. A solid skill in the areas of computer science focusing on modeling, algorithms, software, and computer systems, and apply it to various problem-solving techniques
b. An ability to analyze, design and implement software systems of varying complexity and critical nature
c. A critical thinking, innovative skills and ability to investigate the recent developments in the field of computing
d. An ability to identify the current issues of theoretical or practical nature and learn the various methodologies for conducting research

e. A skill to analyze and solve research or project type problems, produce the technical documents, publish the results and present it orally
f. An ability to work independently or in a team to accomplish a common goal and communicate with a wide range of audiences

- Professions/jobs

The graduates of the program will be able to occupy one of the following positions: Intelligent Systems Developer; Intelligent Systems Engineer; Intelligent Data Analyst; Knowledge Perception Manager; Vision Systems Designer; Vision Systems Engineer; Automated Knowledge Engineer; Intelligent Software Engineer; Machine Learning Robotics Engineer; Robotics Engineer; Intelligent Systems Consultant; Intelligent Secure Software Developer; Machine Learning and Image Analysis Engineer; Machine Learning Developer; Automation Data Scientist; Data Analytics Engineer; Robotic Perception Engineer; Autonomy Engineer; Radar Perception Engineer; Autonomous Vehicle Engineer; Machine Learning Engineer; and Intelligent Solutions Specialist.

Graduates of the MSCS program at King Faisal University are prepared for diverse roles, including academic and research scientists, and contributors to national and international R&D organizations. They can excel in software development, IT consulting, and specialized industries like telecommunications, defense, healthcare, and the oil sector. Additionally, opportunities in project management, technology leadership, and entrepreneurship equip them to meet the evolving demands of the tech-driven world.

- Number of credit hours

The number of credit hours required to graduate from the program is 36 credit hours for the research track and 42 credit hours for the Coursework track. Students in the Coursework track will complete 1260 learning hours, while those in the Thesis track will have 1080 learning hours, ensuring a comprehensive educational experience in computer science.

- Program Courses

The study plan for the MSCS program includes eight key knowledge areas in intelligent systems, along with foundational concepts in computer science. The main areas of specialization are:

- Algorithms and Complexity
- Architecture, Networks and Systems

- Graphics and Visual Computing
- Intelligent Systems
- Information Management
- Software Engineering
- Computational Science
- Research Work

5 Laboratories and Equipment

The MSCS program is supported by research laboratories equipped with cutting-edge technology and software that operate on multiple operating systems, providing flexibility for various programming and development tasks. Open throughout the week, these AI research laboratories create a suitable environment for hands-on experimentation and project work, accessible to all MSCS students, faculty, and staff.

Faculty members can reserve labs for research projects or workshops, while students may request reservations for collaborative initiatives. The Deanship of Information Technology (DIT) oversees the maintenance and support of laboratory facilities, ensuring a robust infrastructure for AI research.

For additional software needs, equipment borrowing, or technical support, students can contact the MSCS program administration via Contact us webpage or visit the office on campus. Faculty members submit software requests to the Infrastructure Management Committee, which facilitates the installation of software. For new hardware in research labs, requests are submitted to the Department coordinator, who forwards them to the Planning Department for vendor selection.

Technical support staff maintain lab equipment and handle upgrade and maintenance requests, ensuring that the college is informed when new software and hardware become available for research use.

6 Services Provided by the University

The university provides the student and teaching staff with many educational and non-educational services that the student needs during his educational journey, and these services include the following:

- ## The Central Library

The Central Library is located in Building No. 33 and is open from Sunday to Thursday, 8:00 AM to 8:00 PM. The library includes several sources of information in both hardcopy and digital forms to cover all areas of knowledge and various specializations. The library provides loan services and many electronic services including access to an online catalog. The services provided by the Central Library can be viewed through the following electronic General Administration of Libraries. The library offers access to databases, supports researchers, provides printing and internet services, and promotes self-learning and community service through regular workshops.

- ## Medical Polyclinic

The medical polyclinic is located in building no. 114, Where the Medical Clinics Center provides primary health care including:

A. Healthcare Services

- Patient Diagnosis and Treatment: Medical examinations and treatment for common diseases (diabetes, high blood pressure, asthma).
- Referrals: Coordination of complex cases to Ministry of Health hospitals.
- Pregnancy Care: Gynecological check-ups and advice for mothers.
- Emergency Care: First aid for severe cases until hospital arrival.
- Medical Tests: Conducting necessary tests for disease diagnosis.
- Vaccinations: Childhood vaccinations according to the Ministry of Health program.
- Student Medical Exams: Initial medical assessments for male and female students.
- Health Education: Organizing awareness and educational sessions.
- Driving License Exams: Medical examinations for obtaining a driving license.
- Medical Reports: Preparation of medical documentation.

B. Laboratory Testing Procedures

- Analysis Requests: Conducted based on doctor's requests, with explanations provided by lab staff.
- Sample Submission: Samples accepted in the morning (7:30 AM - 10:00 AM) in designated containers.

- Result Delivery: Test results delivered to patient files at 12 PM or 5 PM; lab staff cannot provide results verbally or over the phone.

C. Sick Leave Policy

- Medical Examination Required: Sick leave granted only after a medical assessment.
- Review of External Sick Leaves: Sick leaves from other parties reviewed by the affiliated college.
- Urgent Medical Excuses: Students must present to the medical committee at least an hour before exams for evaluation.

D. Operating Hours

- Schedule: Sunday to Thursday, 7:30 AM to 4:00 PM.

The services provided by the medical polyclinic can be viewed through the following electronic link

• The Deanship of Student Affairs

The Deanship of Student Affairs is a key support unit at the university, serving as the primary service center for students. It offers a variety of services related to student activities that help students engage in the university environment.

A. Services Provided by the Deanship:

- Housing: The deanship provides accommodation for university students.
- Facilities: The Deanship of Student Affairs building includes a restaurant, student clubs, and a sports hall.
- Nutrition Services: Affordable meal options are available for students.
- Student Activities: The deanship emphasizes activities that enhance students' skills and personalities, organizing seminars, workshops, and cultural competitions.
- Hobby Development: Efforts are made to cultivate and refine students' hobbies through social activities and outdoor trips, encouraging strong interpersonal relationships and healthy social habits.

B. Main Components of the Deanship:

The Deanship of Student Affairs organizes seminars, workshops, and cultural competitions. It is interested in developing and refining students' hobbies. The deanship comprises two main components: the student activities system and the student services system.the student clubs provide

diverse activities to explore interests, such as leadership, volunteer work, fine arts, sciences, and sports. The student services system also includes several specialized units like the disability unit, guidance and skill development unit, and the scholarship student care unit that offer additional support. The student fund provides financial assistance through grants and loans, helping students focus on their studies. The scholarship student care unit also offers comprehensive care to students from Gulf region, Arab countries, and Islamic nations during their time at the university as per the regulations.

For more information on the services offered by the Deanship of Student Affairs, please visit: KFU Student Affairs. For guides and regulations, please check this link: KFU Regulations.

7 Services Provided by The Program/College

- Orientation Programs

At the start of each academic year, the MSCS program holds an orientation program for new students. This event helps students understand their responsibilities, familiarize themselves with their academic program, and receive guidance on registration procedures. The orientation covers essential topics like college departments, academic programs, university regulations, and e-learning systems like Banner, postgraduate portal and Blackboard. The program encourages students to ask questions, ensuring they have the necessary support and understanding of their responsibilities. Faculty members and advisors are also introduced, offering ongoing academic, social, and psychological guidance throughout the students' time in the program.

- Student Clubs

The Student Activities Committee at the College of Computer Science and Information Technology and the MSCS program aims to enhance students' skills and values through diverse educational and recreational activities. It organizes various events, including scientific, athletic, cultural, and entertainment activities. The committee collaborates with the Deanship of Student Affairs, evaluates student events, and manages information related to student clubs. Student clubs in the college include the Programming and Computer ScienceClub, Cybersecurity Club, Peer Learning Club, and Google Developers Club. These activities enhance personal development, community engagement, and contribute to a vibrant college life. Students are encouraged to propose new activities through their clubs and interact with the college administration for

continuous improvement of student experiences. For additional details on college activities and student clubs, please visit the following link: College Activities and Clubs.

- Training Programs

Regular workshops and training sessions are organized to develop students' academic and professional skills. These sessions include topics such as study skills, time management, and industry engagement events, offering opportunities for students to connect with professionals and explore career options. The training programs provide various learning opportunities for students to further their education, including summer school programs that offer specialized educational experiences during breaks. Additionally, the college offers seminars, workshops, and collaborative research projects for postgraduate students, along with a range of AI courses covering topics such as machine learning, deep generative models, neural networks, and natural language processing.

- Academic Guidance

MSCS students benefit from academic guidance provided by qualified advisors. This support includes course and track selection, setting educational goals, and planning academic pathways. Each student is assigned an advisor to assist with academic, social, or psychological needs. Moreover, academic support programs, including tutoring and workshops, are available to help students reach their full potential. For more details about the advising services, please refer to the corresponding Section 10.

8 Registration of The Courses

Each semester, students must register for the courses they intend to take, dependent on successfully passing the previous level and any required prerequisites.

- Responsible Units

The following units are involved in the course registration process:

Table 8: Course registration process units and responsibilities

Unit	Responsibilities

The Department	• Specify the courses to be delivered and the number of sections for each course. • Provide support and advice to students. • Manage the registration process.
Academic Advisor	Assist students in course selection and academic planning.
Deanship of Admissions	Oversee the registration process and student admissions.
Deanship of Information Technology	Implement and manage the information technology systems related to registrations.

- ## Course Registrations

Registration will occur through the Banner system, managed by the Registration Department in the Deanship of Admissions and Registration, Postgraduate program management. The process includes the following steps:

- The department council defines the courses to be offered in the upcoming semester.
- Students must register early during the 10th to 12th weeks of the preceding semester, allowing them to confirm, drop, or add courses per the approved study plan within the permissible academic load.
- Students must confirm their registrations for each semester. The confirmation period runs from the end of final exams of the preceding semester until the end of the first week of the new semester. Failure to confirm will result in cancellation of their registration, and they will be considered discontinued from their studies.
- Students can add or withdraw courses during the first week of the semester.
- Students may apply for a postponement of their studies up to two weeks before the semester starts; if not applied for, they will be deemed discontinued from their studies.
- For more information visit postgraduate program management Registration Guides.

- ## Academic Procedures

Chapter 8 of Regulations and Guides details the academic procedures for Saudi universities and their implementation at King Faisal University, emphasizing key articles:

Postponement: Students may postpone studies with department council recommendations and college council approval per Article 22.

Withdrawal: Students may withdraw from courses or all courses after registration, following department recommendations and college dean approval per Article 23.

Re-enrollment: Graduate students who withdraw may face current admission criteria upon reapplication per Article 24.

Withdrawal Status: Students are considered withdrawn if they do not register during the specified periods per Article 25.

Enrollment Loss: Students may lose enrollment if they withdraw per Article 26, fail complementary courses, maintain a GPA below "Very Good" for two semesters, or if admission was based on false information.

Readmission: Students whose enrollment is canceled may be readmitted based on acceptable circumstances. If over three years have passed, they are treated as new students; if three years or less, specific courses must be retaken per Article 27.

Exceptional Opportunities: The college council may grant up to one academic year of exceptional opportunity based on the department council's recommendation per Article 28. The permanent committee may also grant a similar opportunity based on recommendations per Article 29.

Transfer Policy: The executive administration may accept transfers from licensed institutions if the student was not expelled per Article 30. Students may also transfer between programs based on departmental recommendations per Article 31 and take courses at other universities with credit applicable to their degree per Article 32.

- ## Examination and Grading Procedures

Examinations for postgraduate courses and grade recording will follow the undergraduate study and examination regulations, with specific exceptions related to required passing grades and performance in complementary courses.

A. Exam Regulations:

Students must achieve at least a "very good" grade to be considered successful in a course. Additionally, they are required to pass a remedial course on their first attempt with a " very good " grade and maintain a cumulative GPA of "very good" across all remedial courses. Furthermore, decisions regarding alternative exams and courses that span multiple semesters will be made by the college council based on departmental recommendations.

B. Comprehensive Exams:

The evaluation committee in MSCS program operates on two tracks: coursework and research. In the coursework track, students are evaluated through four assessments if a course project is involved. For the research track, the postgraduate committee monitors progress with supervisors. The university council sets the rules for comprehensive exams, both written and oral, as determined by departments. Students can postpone their exams for one semester based on departmental recommendations, counting against their allowed extensions. A committee is established each academic year to oversee the exams, and students pass if they achieve 70% or higher on both components. Articles [34-35].

C. Research Projects and Supervision

The university council oversees the registration of research projects and theses for graduate students, including the selection of supervisors. To submit a thesis project, a student must complete at least 50% of their coursework with a minimum GPA of "very good". Thesis topics for postgraduate students must be original and contribute to knowledge in their field. Theses must be written in the English language, with a summary in Arabic. Faculty members, including assistant professors with the necessary publications, may supervise graduate research, subject to specific conditions, Articles [36-37].

D. Supervision Standards

Supervisors are mandated to evaluate students' progress at the end of each semester, ensuring consistent monitoring of their development. If a student shows a lack of commitment, they may receive a warning, and after two warnings, their enrollment can be canceled based on departmental recommendations, Articles [38-42].

E. Defense and Evaluation

After a student completes their thesis, the supervisor submits a report to the department chair to initiate the defense process. The university council establishes the criteria for selecting committee members for thesis defenses and outlines the procedures for conducting these defenses, Articles [47-50].

- ## Graduation and Degree Awarding

The department head is required to submit the discussion committee's report to the college dean within two weeks for executive management review. Students are eligible for graduation upon successfully completing program requirements with a minimum GPA of "very good". Furthermore, to obtain a master's or doctoral degree, students must publish at least one research

paper from their thesis as the primary author in a peer-reviewed journal, effective from 1/1/1445 AH. Finally, the relevant deputy must present the recommendation for awarding the degree to the university council for approval. Articles [53-56].

A. High Diploma

If a student completes part of a master's or doctoral program but does not qualify for the full degree, the university may award a high diploma or a master's degree based on the completed coursework. This can occur if the student chooses not to continue or faces academic challenges like not meeting the GPA requirement or exceeding the time limit for graduation. Additionally, a certificate of completion may be issued for partial completion of graduate-level courses, as per Article 57.

9 Study Regulations and Tests

- Study Regulations

The university follows specific guidelines when validating academic programs, including the national qualification framework in Saudi Arabia, which is based on the decision made by the Education and Training Evaluation Commission on 16/06/1441, Article 4. The MSCS program complies with the university's general study regulations, which include:

- The academic year is structured according to the approved curriculum, allowing for two or more semesters and potentially a summer session, with each academic level consisting of a minimum of four weeks, totaling at least 40 weeks annually (Article 5).
- The university council may adopt various educational styles for programs based on proposals from colleges or institutes, in line with defined criteria (Article 7).
- The curriculum must include at least 10% of courses offered through alternative educational methods besides in-person instruction, subject to university approval (Article 8).
- Students who complete a number of credit hours but do not meet degree requirements may be awarded a diploma, following the established criteria and aligned with the Saudi classification and national qualification framework (Article 10).

- Tests Regulations

Chapter 8 of the Study and Test Regulations details the rules and policies for studies and examinations, which the college enforces in accordance with the university's guidelines.

- The university council sets the grading method, ensuring semester work accounts for at least 30% of the total grade, with varied assessment methods to accurately measure learning outcomes (Article 29).
- The college organizes final exams according to the academic calendar, with strict rules on exam timing and grading oversight by department heads and deans (Article 30).
- Students absent from the final exam receive a zero for that exam, with the overall grade based on semester work (Article 31).
- Students with an acceptable excuse for missing a final exam can take a makeup exam, but failure to do so results in a failing grade (Article 32).
- Incomplete course requirements must be fulfilled by the following term, or an incomplete grade (IC) is replaced with a failing grade (F) (Article 33).
- Research-based courses spanning multiple semesters receive a continuing grade (IP) until completion, or the grade turns into an incomplete (IC) (Article 34).
- Students in full-year programs may be allowed a second-chance exam for failed courses, depending on the number of failed units, before the next academic year (Article 35).
- Students can appeal their final course grade within fifteen days of its finalization, as detailed in the executive regulations. (Article 36).

10 Academic Advising and Counselling Services

Academic advising and counseling services are support systems provided by KFU to help students navigate their academic journey and personal development. These services typically include:

- Academic Advising:

Academic advising plays a vital role in guiding students throughout their university education. Its purpose is to support and counsel students in maximizing their potential, developing their skills, and motivating them to achieve academic excellence and innovation. Furthermore, academic advising helps students stay on track to complete their studies and graduate within the designated timeframe. Through this process, students gain valuable academic knowledge and practical skills, preparing them to successfully enter the job market. The academic advising process guides students toward achieving optimal results while helping them adjust to the university environment and take advantage of available opportunities.

In this regard, all staff members share the responsibility for academic advising. Every university professor acts as a mentor to their students, providing guidance and support. Professors should also caution students about potential mistakes and challenges they may encounter in their academic journey. This role extends beyond being the designated advisor assigned by the department, making academic advising a collective duty of all faculty members.

An academic advisor is a faculty member appointed by the CCSIT academic affairs to provide academic guidance to students upon their enrollment in postgraduate programs. The primary duties of an academic advisor include guiding students through their academic journey, selecting a thesis topic, and assisting with the creation of a research plan.

Unified Regulations for University Sciences in Saudi Arabia and its Rules in Action at King Faisal (Article Forty-One): “Each graduate student shall have a scientific advisor at the beginning of their enrollment in the program to guide students in their studies, assist them in choosing the thesis topic, and prepare the research plan in accordance with the rules approved by the University Council based on the recommendation of the Graduate Studies Deanship Council”.

A. Academic advisor Tasks

The academic advisor mentors' students throughout their studies, assisting them in overcoming any challenges or difficulties they may encounter. The academic advisor’s responsibilities include the following:

- Informing students about their rights and responsibilities as outlined in the Unified Regulations of Postgraduate Studies.
- Helping students become acquainted with the university’s academic system.
- Offering students accurate information regarding educational policies and academic programs.
- Improving students' academic performance, enhancing their abilities, and helping them overcome challenges encountered during their studies.
- Alerting students of the academic failure problem and the method to avoid it.
- Offering guidance and support to graduate students dealing with academic challenges.

- Guiding, supporting, and monitoring struggling students to help improve their academic performance.
- Recognizing, encouraging, and promoting the innovations of outstanding and talented students.

To Support Special Need Students (low achievers, disabled, gifted and talented), the revised academic advising process developed by the Academic Advising Committee identifies students who are in trouble based on the progress they have made in the program. Students who do not achieve certain progress toward their degree are placed in 2 sequential zones according to certain criteria: CCSIT Warning zone and KFU Warning and Disqualification zone.

A student is in the CCSIT Warning zone if his/her GPA falls below 3.0. In this case, it is recommended to:

- Hold the student's record.
- Attend CCSIT advising sessions and seminars.
- Attend counseling workshops and seminars provided by Deanship of Student Affairs.
- Student (based on the academic advisor's request) meets regularly some/all.
- Mathematics, Programming, and Databases helpdesk to improve their performance.

Outstanding students with high GPA are invited to a special lunch with the Dean, Vice Deans, Program Chairs and Committee Chairs where they are awarded excellence certificates for their exceptional performance in academics.

The college campus is equipped with accessible entrance, restrooms and parking to facilitate **students with disabilities**. Furthermore, on the request of the program chairs / academic affairs, students with disabilities are given additional time in examinations based on the need of the student.

- General Guidance and Counselling Services:

The Guidance and Skills Development Unit in the Deanship of Students' Affairs is responsible for providing the students with advice, assistance and a range of specialized developmental, and preventive programs related to academic, social, psychological and educational issues for all students.

A. The Services of the Guidance and Skills Development Unit

- Providing social and family counseling.
- Providing academic and educational consultations
- Providing psychological counseling.
- Providing general consultations related to youth guidance and special needs.
- Providing a set of seminars, workshops and special training programs in related to students' professional development.

The Guidance and Skills Development Service assists students to realize their unique potential and get the most out of their studies and university life. Professional counselling staff respond sensitively to the effects that challenging circumstances can have on individuals. The service helps students to improve their educational progress, and to achieve balance of personal, educational, vocational and social activities in a way that makes them happy and able to direct their own lives with insight and intelligence, in accordance with the principles and standards of Islamic education. The service offers confidential, professional support to explore individual situations and assist in making appropriate choices, as well as promoting an understanding of psychological and emotional well-being throughout the university ensuring healthy conditions for the growth of individual personalities.

Student Guidance and Counselling is delivered using a set of guiding ways based on religion, free time and reality through:

- Therapeutic counselling sessions-individual and collective
- Directed and undirected reading
- Special Groups
- Lectures and seminars
- Phone calls and self-help information online
- Campaigns and programs build the students values, protect them from some of the risks they face, develop their potential and meet their needs.

B. The Service Helps Students To:

- Recognize the early signs of any emotional and mental health

- Calm themselves down if stress has got the better of them
- Gain a greater sense of relaxation so that anxiety states are not so easily triggered
- Feel more resourceful in the present moment
- Recognize that there is an alternative to the downward spiral of automatic negative thinking which can unwittingly escalate when feeling overwhelmed
- Increase self-esteem and confidence
- Tap into the inner resources they have but don't always recognize, and develop a sense of trust that they can cope with the challenges that life brings

C. Students Receive a Counselling and Pastoral Service That Conforms to An Ethical Framework:

- A service that puts their needs and interests first and treats them with respect and dignity
- An initial appointment (for face-to-face counselling)
- Follow-up appointments and/or referral to other agencies as appropriate.
- A Counselling Service that operates within a specific confidentiality and privacy code irrespective of the information (personal, family, academic etc)
- Use of resources, projects, available materials and various programs to develop themselves without interference and force.
- Choose their own way and style of life and how to achieve their goals in the light of national standards and regulations prevailing in the society
- Enjoyment of the sovereignty of laws and regulations governing the relationship between students and the supervisor working in partnership to ensure the freedom to display information and maintain confidentiality.

Services request feedback from students, for example what aspects of the service helped to meet their needs most effectively or not and hence any ideas to improve the Service. This is achieved by inviting students to complete an Evaluation Questionnaire at the end of a counselling and pastoral session. The questionnaire is anonymous and will not be seen by the counsellor. Students are also informed as to how to complain if they feel they have not had good service from counsellors.

For More details about Students Guidance and Skills Development click here.

11 Complaints and Grievances

- The Complaints and Grievances Regulations and Procedures for Students

An academic complaint or grievance concerning academic issues may involve matters such as admission, grades, academic suspension, misinformation, plagiarism, intentional falsification of information, submitting work completed for one course in another, and copyright infringement.

Non-academic complaints encompass, but are not limited to, harassment (whether verbal or physical), threats, disruptive or abusive behavior on campus, fines, fees, or exclusion from specific services, discrimination, and issues related to access to records or policy violations. KFU upholds a fair policy in its interactions with students and their relationships with administrators, faculty, staff, and other members of the university community. The goal is to establish and implement policies and procedures for addressing both academic and non-academic grievances.

CCSIT typically has established procedures for handling grievance and complaints procedures. These procedures are designed to ensure fairness and transparency, and they provide students with a means to voice their concerns or complaints (Grievance and complaints)

A. Code of Ethics and Professional Conduct

The Code of Ethics and Professional Conduct of KFU is a published agreement that includes a set of ethical principles, professional standards and duties that are agreed upon by all parties of the university. The content of this Code is based on the regulations, systems and public morals in Saudi Arabia. All KFU parties have pledged to adhere this Code in all honesty, honor and integrity and work to transform it into practical practices to contribute to the advancement of the academic and administrative system and ethical performance at the University.

B. Definitions of Academic Misconduct

- *Plagiarism*

Plagiarism is the reproduction or paraphrasing, without acknowledgement, from public or private (that is unpublished) material (including material downloaded from the internet) attributable to, or which is the intellectual property of, another including the work of students. Plagiarism may be of written and also non-written form and therefore would also include the unacknowledged use of computer programs or software, mathematical/computer models/algorithms, macros, spreadsheets, web pages, databases, designs/models/displays of any sort, diagrams, graphs, tables, drawings,

works of art of any sort, digital images, computer-aided design drawings, GIS files, photographs, maps, music/composition of any sort, posters, presentations and tracing.

Examples of plagiarism are:

- Intentionally including in a student's submission extracts from another person's work, without explicitly marking the text as a quotation and accrediting the source.
- Intentionally using of the ideas of another person including images and other creative work without acknowledgement of the source.
- Intentionally paraphrasing or summarizing another person's work without acknowledgement.
- Cutting and pasting from electronic sources without explicit acknowledgement of the source of the URL or author and/or without explicitly marking the pasted text as a quotation.
- Submitting a piece of work entirely as a student's own when it was produced in collaboration with others, and not declaring that this collaboration has taken place.
- Intentionally submitting appropriated imagery or creative products without indicating the source of the work.

- *Cheating*

Cheating is any action taken before, during or after an assessment or examination which seeks to gain unfair advantage or assists another student to do so.

Examples of cheating are:

- Gaining access to, or using, unauthorized notes or other material relating to an assessment
- Introducing any information, including electronically stored information, into the examination room unless expressly permitted by the examination or course regulations
- Communicating during an examination with any person outside the examination room or with other students within the examination room
- Copying the work of another student whether in examinations or in other assessments
- Amending and resubmitting work following a final mark being issued in order to gain a better mark.

- *Falsification*

Falsification is any attempt to present fictitious or distorted data, evidence, references, experimental results or other material and/or knowingly to make use of such material.

Examples of falsification are:

- Presenting data based on controlled investigations, experiments, surveys or analysis falsely claimed to have been carried out by you
- The invention of references and/or false claims; including data etc. in your work which you know to be false or incorrect, whether or not this has been created by you.
- In connection with programs leading to a professional qualification, falsely claiming to have completed non-academic requirements such as hours in practice, or to have achieved professional competencies may lead to disqualification to practice.

- *Other breaches of academic integrity*

There may be other breaches of academic integrity which are not specifically referred to above and some breaches may fall into more than one category. Where a member of staff is concerned that a student has submitted work that is substantially different to other work which has been submitted previously the faculty may investigate.

- Disciplinary breaches

All students are subject to the disciplinary regulations as defined in the following articles:

- Breaches in the rules, regulations and traditions of the University will be considered a disciplinary offence.
- A student who cheats in an examination will be formally reported by the examination observer to the Dean of the College. The Dean will report the offence through the President of the University or his authorized representative to the Disciplinary Committee who will decide the punishment. A breach of the examination system will be reported by the Dean to the Vice President or his authorized representative to take action.

C. Disciplinary Action

A student who cheats in the examination or initiates cheating, and is caught in the act, is removed from or excluded from the hall by the observer of the exam. The observer or invigilator reports in detail what had happened, and provides documents to the Dean. The Dean delivers the record and documents to the President of the University or his authorized representative to refer an application to the Disciplinary Committee to decide the appropriate punishment.

If a student who cheats in the examination system, then the Dean or his authorized representative has the right to estimate the situation to drive out the student from the exam hall, or allow him to

continue according to the case, and the Dean delivers a report to the Vice President or his authorized representative to take the required procedure.

If the student is removed or excluded from the exam hall, the exam becomes void in the course in which he was testing (given fail estimate) and the student's exams are not repealed in other courses except that based on a decision of the Disciplinary Committee. The decision is based on the report of the Dean, and the results of the students are not announced in these courses until a decision of the Disciplinary Committee is issued.

D. Disciplinary penalties are:

1. Written notification.
2. Ultimatum.
3. Deprivation of the enjoyment of some or all of the advantages of university students.
4. Cancellation of the exam of the student in one course or more and is given the estimate (failed).
5. Depriving the student of the exam in one course or more and is given the estimate (failed)
6. Dismissal from the University for a semester or more.
7. Final dismissal from the University.

The decisions of disciplinary penalties reserved in the student's file and as a consequence of final dismissal the student is not to allow to re-register and the decision of the disciplinary penalty may be announced within the University, and the guardian of the student may also be notified.

E. Competent Authorities of Imposing Disciplinary Penalties Are:

1. **The competent Dean**: Has the imposition of penalties (1 and 2) shown in Article (IV) based on the proposal of the competent officials concerning what the students may commit during lectures, tutorials or otherwise.
2. **The President**: Has the imposition of penalties (1,2 and 3) shown in Article (IV) after consulting with the competent Dean, and when referring the student to the Disciplinary Committee he has the right to prevent him from entering the university and its facilities to the day appointed for his appearance before the Committee.
3. **The Disciplinary Committee**: Has the imposition of the penalties mentioned in Article (IV) with taking into account that imposition of the any of the penalties prescribed in this Article shall not be made only after conducting the required investigation.

4. The Disciplinary Committee comprises the relevant Vice President as the Chairman, the Dean of the concerned Faculty, the Dean of Admission and Registration and the Dean of Student Affairs as members. The Secretariat of the Committee shall be managed by one of the legal advisers to university, in the case of the Committee could not be held as previously mentioned, it is constituted by a decision of the University President.
5. A student assigned to the Disciplinary Committee to appear before the committee by the date specified by the Chairman of the Disciplinary Committee by a registered letter to the address indicated in his file or through a letter delivered to him personally.
6. Resolutions issued by the competent authorities to impose Disciplinary Penalties in accordance with Article (V) shall be conclusive and reported to the student or his guardian in writing by a registered letter or delivered to him personally, and without prejudice to the provisions of Article (III), student may appeal to the University Council from the decision of one of the penalties set forth in paragraphs (4, 5, 6 and 7) of Article (IV) and the appeal request should be submitted by the student to the President of the University during the fifteen days of notification of the decision to the student.

F. Appeals of Examination Results, Submitted by University Students

By creating a unit to examine appeals submitted by the students, the University aims to achieve the following:

1. A homogeneous University community in the spirit of mutual cooperation among its employees.
2. Adoption of the principles of justice and equity as a backbone in building a perfect society within the University.
3. Support the rights of students on the basis of laws and regulations, applicable in the University, Support the investigation of appeals and adjudicates on appeals submitted by students to further develop the culture of justice and equity among students.

G. Appeals Submitted to Re-Correct The Answer Sheets:

1. Appeals shall be submitted to the Dean or his/her authorized representative within two weeks from the date of reporting student results.
2. The Dean may accept the application of the student or refuse it.
3. In the event of accepting the application, the College Council shall determine the faculty member who is responsible for the re-correction.

4. After the re-correction of the answer sheet the council will reconsider it and arrive at a decision. The decision of the College Council is final.
5. The College Council has the final decision about student's appeal within a period beyond the start of the final test of the next semester and in the acceptance or otherwise of the appeal application.

See also:

• Regulation of the Study & Examinations of the University Stage and the Executive Rules of King Faisal University (click here).

• King Faisal university code of conduct (click here).

• Students' rights and responsibilities (click here).

- ## The Complaints and Grievances Regulations and Procedures for Teaching Staff

KFU adopt policies and regulations for discipline, complaints and disputes about or by faculty members and staff, from the "Regulations for Saudi Universities Personnel Including Staff Members and the Like" articles 82 to 91.

A. The responsible Units:

The Disciplinary Committee Initiate the disciplinary action Deanship of Academic affairs complete all the action resulted from the disciplinary.

B. Procedures:

2 A Disciplinary Committee looking into the misconduct of staff members or equivalents shall be formed based on a resolution issued by the University Rector.

3 If the staff member and the like are believed to have violated any of her/his duties, a dean shall be assigned by the University Rector to conduct an investigation in accordance with the staff disciplinary rules and report the investigation results the University Rector.

4 The University Rector may issue a resolution to suspend any staff member and the like pending investigation. The suspension penalty is applied with a maximum of three months except on the basis of a resolution from the Disciplinary Committee.

5 The University Rector shall notify the staff member and the like, who is subject to investigation by the Disciplinary Committee, of the charges, and provide her/him with a copy of the investigative report through registered mail fifteen days before the defined date of the disciplinary session.

6 The staff member and the like, who is referred to the Disciplinary Committee, may review the minutes of the conducted investigation on the dates defined by the Rector.

7 The Disciplinary Committee shall investigate the reported misconduct charges as follows:

a) The Committee shall meet upon the President's call, and the member under investigation shall be notified through registered mail to be present before the Committee for hearing and defense.

b) The Committee sessions shall be attended by the member under investigation or her/his delegate. However, if neither the member in question nor the delegate is present, the investigation procedures may be carried out, but the investigations and examinations shall be carried out in closed sessions. The Committee maintains the right to call witnesses when necessary.

c) The Committee's resolutions shall pass on the basis of the majority of votes, and sessions shall not be valid unless attended by all the members. The Committee shall refer the minutes of the resolutions, and the investigation file to the University Rector within a maximum time of two months from the date of referring the investigation to the Committee for approval.

d) If the University Rector does not approve of the Committee resolution, the file shall be referred back to the Committee, which, in case of persistence, shall refer the case once more to the University Council, the resolution of which shall be conclusive.

e) The University Rector shall notify the staff member and the like of the Committee resolution once it is issued in writing.

f) The staff member and the like, may file an appeal against the resolution through a letter submitted to the University Rector within a maximum time of thirty days from the notification date; otherwise, the resolution shall be considered final. If the appeal was delivered before the end of the defined duration, the University Rector shall refer the case once more to the Disciplinary Committee for further investigation, and if the Committee persisted, the case shall be referred once more to the University Council, the resolution of which shall be conclusive.

8 The disciplinary sanctions which may be inflicted on the staff member and the like are as follows:

a) Written censure.

b) Reprimand.

c) Reduction in salary, if forfeiture does not exceed a three-month net salary, nor should the sum deducted each month exceed one third of the monthly salary.

d) Denial of one periodical increment.
e) Adjournment of promotion for one year.
f) Transference from academic work and assignment to another for a maximum period of five years.

12 Appendix A:

Program Study Plan for Master of Science in Computer Science (MSCS)

The Program Study Plan is designed to provide a balance between theoretical knowledge and practical skills, offering flexibility through two tracks: the Research Track and the Coursework Track. Each track includes core courses, electives, and either a dissertation or an applied project.

12..1 **Research Track**

Total Credit Hours: 36

- Core Courses: 15 credits
- Elective Courses: 12 credits
- Dissertation: 9 credits

Table 9: Semester-Wise Distribution

Year	Semester	Course Title	Credits
1	First Semester	Advanced Algorithms	3
		Distributed Systems	3
		Advanced Computer Architecture	3
	Second Semester	Advanced Software Engineering	3
		Research Methodology	3
		Elective 1	3
2	First Semester	Elective 2	3
		Elective 3	3
		Elective 4	3
	Second Semester	Dissertation	9

12..2 **Coursework Track**

Total Credit Hours: 42

- Core Courses: 15 credits
- Elective Courses: 18 credits
- Project: 9 credits

Table 10: Semester-Wise Distribution

Year	Semester	Course Title	Credits
1	First Semester	Advanced Algorithms	3
		Distributed Systems	3
		Advanced Computer Architecture	3
	Second Semester	Advanced Software Engineering	3
		Research Methodology	3
		Elective 1	3
2	First Semester	Elective 2	3
		Elective 3	3

		Elective 4	3
	Second Semester	Project Proposal	3
		Project Implementation	6

12..3 Course Distribution Across Semesters

1. **Core Courses (15 Units):**
   - Advanced Algorithms
   - Distributed Systems
   - Advanced Computer Architecture
   - Advanced Software Engineering
   - Research Methodology

   Core courses are completed in the first year, providing foundational knowledge for advanced topics.
2. **Elective Courses (12–18 Units):**
   Students choose from a variety of specialized electives, such as:
   - Machine Learning
   - Cryptography
   - Computer Vision
   - Software Validation and Verification
   - Advanced Modeling and Simulation

   These electives allow students to align their studies with career or research interests.
3. **Dissertation/Project (9 Units):**
   - Research Track: Students conduct original research culminating in a dissertation.
   - Coursework Track: Students engage in an applied project integrating multiple disciplines.

12..4 Knowledge Areas

The curriculum is designed around eight core knowledge areas inspired by ACM/IEEE standards:

1. Algorithms and Complexity
2. Architecture, Networks, and Systems
3. Graphics and Visual Computing
4. Intelligent Systems
5. Information Management
6. Software Engineering
7. Computational Science
8. Research Work

12..5 Course Descriptions

The details of all courses including core and elective courses are given in this section. These details include the following:

- Basic information including course name, units, contact hours, track, level and pre-

requisites (if any)

- A short course description
- Course outcomes
- Grading criteria
- Recommended books

Course Name	**Advanced Algorithms**						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CS611	**0911611**	**3**		**3**	**0**	**3**
Department	☒ Comp Science ☐ Information System ☐ Comp Engineering ☐ Comp Network						
Track	☒ Core ☐ Elective						
Level	1st	**Prerequisite**	None				

Course Description:

Underlying mathematical theory, Induction and recursion techniques, Asymptotic notations, Divide and conquer technique, Randomized algorithms, Parallel and heuristic algorithms, Brute force approach, Dynamic algorithms, Greedy algorithms, Importance of algorithms in graph theory, Optimization algorithms using graphs and trees, Minimal spanning tree algorithms, Variants of shortest path problem, Matrix operations, Algorithms for solving systems of linear equations, Linear programming algorithms, Numerical approximations, Polynomials and fast Fourier transformation, Number theoretic notations and algorithms, RSA cryptosystems, String matching, Pattern matching, Automata theory in algorithms designing, Computational geometry, NP completeness, NP completeness proofs and reducibility, Approximation algorithms.

Course Outcomes: At the end of the course students will be able to

- Develop mathematical models and algorithms of computational problems
- Prove correctness and evaluate efficiency of algorithms
- Analyze and compare the complexities of different algorithms
- Analyze variants of traditional algorithms
- Solve scientific and engineering problems efficiently

Grading (%)	☒ **Mid-term**	**25**	☒ **Project**	**15**	☒ **Quizzes**	**10**
	☒ **Final**	**40**	☒ **Assignments**	**10**	☐ **Review Paper**	

Text Book:

- Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, 3rd Edition, MIT Press, 2009. ISBN: 0262033844.

Reference Book:

- Algorithms by S. Dasgupta, C. H. Papadimitriou and U. V. Vazirani, McGraw-Hill, 2006. ISBN: 0073523402.

Course Name	**Distributed Systems**						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CS612	**0911612**	**3**		**3**	**0**	**3**
Department	☒ Comp Science	☐ Information System	☐ Comp Engineering			Comp Network	
Track	☒ Core	☐ Elective					
Level	1st	**Prerequisite**	None				

Course Description:

Loosely and Tightly Coupled Hardware and Software, Multiprocessing Systems, Network Operating Systems, Distributed and Parallel Time Sharing, Design Issues of Distributed File System, Transparency, Global States and Coordination, Data Sharing and Transactions, Concurrency Control, Replication, Protocols for Replication, Distributed Shared Memory, Designing Distributed Objects, Principles of Object- Oriented Middleware, Object Synchronization, Dynamic Object Requests, Object Security, Locating Distributed Objects, Object Naming, Object Trading, Object Naming Issues, Naming Scheme, Name Servers, Life Cycle of Distributed Objects, Composite Object Life Cycle, Object Persistence, Distributed Shared Memory, Distributed Security, Fault Tolerance, Remote Procedure Calling, Distributed Databases, Grid Computing, Cloud Computing.

Course Outcomes: At the end of the course the students will be able to

- Learn building distributed systems, algorithms, protocols and recent advancements
- Describe the problems and challenges associated with these systems
- Explain the design issues and performance of distributed systems
- Evaluate effectiveness and shortcoming of the current solutions for these problems
- Recognize how the principles are applied in modern distributed systems

Grading (%)	☒ **Mid-term**	**25**	☒ **Project**	**20**	☒ **Quizzes**	**10**
	☒ **Final**	**40**	☒ **Assignments**	**5**	☐ **Review Paper**	

Text Book:

- Distributed Systems: Principles and Paradigms by Andrew S. Tanenbaum and Maarten Van Steen, 2nd Edition, Prentice Hall, 2007. ISBN: 0132392275.

Reference Book:

- Distributed Systems: Concepts and Design by George Coulouris, Jean Dollimore, Tim Kindberg and Gordon Blair, 5th Edition, Addison Wesley Publications, 2011. ISBN: 0132143011.

Course Name	**Advanced Computer Architecture**						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CE613	**0913613**	**3**		**3**	**0**	**3**
Department	☐ Comp Science	☐ Information System	☒ Comp Engineering		☐ Comp Network		
Track	☒ Core	☐ Elective					
Level	1st	**Prerequisite**	None				

Course Description:

Assessing and evaluating performance of computer, Language of Computer, Operations and operands of hardware, Conversion of higher level to assembly language, Working of compiler, Addressing modes, Processor design, Data paths and control of UP, Single and multi-cycle processor design, Pipelining, Data hazard and forwarding, Branch hazards and solutions, Pentium Systems design, Superscalar processors, Speculation and software pipelining, Hardwired and Micro programmed Control section, Micro- programmed control section, Microprogramming concepts, Memory management, I/O devices, Memory management system, Memory management system of Pentium System, Parallel Processing, Multiple processor organization, Symmetric multiprocessors, Cache coherence and MESI Protocols clusters, Vector computations, VHDL, Design of sequential logic circuit.

Course Outcomes: At the end of the course students will be able to

- Analyze general principles affecting performance, and quantify the measurements
- Understand fundamentals of technologies and advanced architectural features
- Visualize complete computer system including processor, memory and I/O
- Relate modern architectural performance and support to programming languages
- Enumerate various methods for enhancing cache and memory performance
- Describe difference between multiprocessor architectures

Grading (%)						
	☒ **Mid-term**	**25**	☐ **Project**		☒ **Quizzes**	**10**
	☒ **Final**	**40**	☒ **Assignments**	**10**	☒ **Review Paper**	**15**

Text Book:

- Computer Organization and Design by David A. Patterson and John L. Hennessy, 4th Edition, Morgan Kaufmann, 2008. ISBN: 0123744938.

Reference Book:

- Computer Organization & Architecture by William S., 8th Edition, Prentice Hall, 2009. ISBN: 0136073735.

Course Name	**Advanced Software Engineering**						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CS614	**0911614**	**3**		**3**	**0**	**3**
Department	☒ Comp Science ☐ Information System ☐ Comp Engineering ☐ Comp Network						
Track	☒ Core ☐ Elective						
Level	1st	**Prerequisite**	None				

Course Description:

Requirements Engineering, Functional and Non-Functional Requirements, Procedures for Gathering Requirements, Use Case Model, Functional Specifications, Software Architecture, Deployment Diagrams, Component Based Software Engineering, Reusability and Design Patterns, Anti-Patterns, Abstract Factory, Refactoring Techniques, Software Verification and Validation, Correctness, Formal Methods, Efficiency, Performance and Reliability, Attitude of Industry towards Reliability and Performance, Software Quality, Software Metrics, Function Point Analysis, Cost Constructive Model, Use Case Based Estimation, ISO Quality Assurance and Control, Capability Maturity Model, Project Management, Software Project Planning, Risk Analysis, Project Scheduling and Tracking, Project Evaluation and Review Techniques, Critical Path Method, Inspections and Walkthrough.

Course Outcomes: At the end of the course students will be able to

- Learn, use and evaluate a range of software development tools
- Apply a range of software engineering techniques to develop large software systems
- Propose engineering process models and standards
- Refine different techniques and standards for specification and design process
- Criticize object-oriented design, quality metrics and configuration management
- Recognize and correct design flaws in software

Grading (%)						
	☒ **Mid-term**	**25**	☒ **Project**	**15**	☒ **Quizzes**	**10**
	☒ **Final**	**40**	☒ **Assignments**	**10**	☐ **Review Paper**	

Text Book:

- Software Engineering by Sommerville I., 9th Edition, Pearson, 2010. ISBN: 0321313798.

Reference Books:

- Software Engineering: A Practitioner's Approach by Roger S. Pressman, 7th Edition, McGraw-Hill, 2009. ISBN: 0073375977.
- Object-Oriented and Classical Software Engineering by Stephen R. Schach, 7th Edition, Irwin, 2006. ISBN: 0073191264.

Course Name	**Research Methodology**						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	IS615	**0912615**	**3**		**3**	**0**	**3**
Department	☐ Comp Science ☒ Information System ☐ Comp Engineering ☐ Comp Network						
Track	☒ Core ☐ Elective ☐ Pre-Requisite						
Level	2nd Semester	**Prerequisite**					

Course Description:

The philosophy of Science, basics of doing research including problem solving and research, defining the research problem, writing a literature review, theory and theory building, conceptual modeling and research design, case study research, survey and observations, primary data collection, experiments, histories and simulations, interventions including benchmarking, action research and pilot studies, sampling and measurement, instrument and questionnaire design, analysis methods including qualitative, quantitative and mixed data analysis, grounded theory, usability evaluations, research ethics, peer review process, reporting and publishing including displaying data and writing up results.

Course Outcomes: After completing this course the students will be able to

- Develop and apply fundamental research skills, including literature reviews, collection and analysis of data and designing a research project
- Identify a research topic and justify its worth
- Improve understanding of the research process and creation of knowledge
- Study research approaches, tools, techniques and methodologies used in computing research
- Develop research writing and presentation skills

Grading (%)	☒ **Assignments**	**20**	☒ **Micro Thesis**	**50**	☐ **Discussions**	
	☒ **Presentation**	**30**				

Text Book:

- The Craft of Research: Chicago Guides to Writing, Editing and Publishing by Booth, Colomb & Williams, 3rd Edition, University of Chicago Press, 2008. ISBN: 0226065669.

Reference Book:

- Statistics for Engineers and Scientists by William Navidi, 2nd Edition, McGraw-Hill, 2007. ISBN: 0073309494.
- Avison, D. and Pries-Heje, J. "Research in Information Systems: A Handbook for Research Students and Their Supervisor", Elsevier Butterworth Heinemann, Oxford, 2005, ISBN: 0750666552

Course Name	**Theory of Computation**						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CS621	**0911621**	**3**		**3**	**0**	**3**
Department	☒ Comp Science	☐ Information System	☐ Comp Engineering		☐ Comp Network		
Track	☐ Core	☒ Elective					
Level		**Prerequisite**					

Course Description:

History and Preliminaries, Determinism and Non-determinism, Checking vs. Computing, Finite State Systems, Deterministic and Non-deterministic Models, Pumping Lemma, Decision Algorithms for Regular Sets, Pushdown Automata, Context-Free Languages (CFL's), Derivation Trees, Simplification of Context-Free Grammars (CFG's), Normal Forms, Properties of CFL's, Pumping Lemma for CFL's, Closure Properties of CFL's, Decision Algorithms for CFL's, Universal Models of Computations, Turing Machines, Computable Languages and Functions, Church's Hypothesis, Properties of Recursive and Recursively Enumerable Languages, Universal Turing Machines, Translation Between Models, Model Independence, Decidability and Un-decidability Problem, Recursive Function Theory, The Chomsky Hierarchy, Computational Complexity Theory, Complexity Classes, Model-independent Complexity Classes, Reduction, Reducibility among Problems, Tractability and Intractability, NP-completeness, Space Complexity, Provably Intractable Problems, Proving Problems Hard and Complete.

Course Outcomes: At the end of the course the students will be able to

- Have a comprehensive knowledge of computability and complexity
- Construct abstract models of computation and evaluate these models by formal reasoning that what could be achieved through computing
- Answer the fundamental questions, for example, whether a problem is computable and if it is how efficiently it can be computed

Grading (%)						
	☒ **Mid-term**	**25**	☐ **Project**		☒ **Quizzes**	**10**
	☒ **Final**	**40**	☒ **Assignments**	**10**	☒ **Review Paper**	**15**

Text Book:

- Introduction to the Theory of Computation by M. Sipser, Course Technology, 2006. ISBN: 0534950973.

Reference Book:

- Theory of computation by A. M. Natarajan and P. Balasubramani, New Age International, 2007. ISBN: 8122414737.

Course Name	**Cryptography**						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CS622	**0911622**	**3**		**3**	**0**	**3**
Department	☒ Comp Science	☐ Information System	☐ Comp Engineering			☐ Comp Network	
Track	☐ Core	☒ Elective					
Level		**Prerequisite**					

Course Description:

Basic concepts in Number Theory, e.g., Euclidean algorithm, Euler's function, Fermat's theorem and Euler's generalization, Chinese remainder theorem, primitive roots and discrete logarithms, quadratic residues, Legendre and Jacobi Symbols and familiarity with various basic cryptographic concepts, tools and algorithms including DES and differential and linear cryptanalysis, AES, RSA system, Digital signatures, El Gamal signature, digital signature standard, one time undeniable and fail stop signature, hash functions, and coding and information theory, Probability Review, Entropy, Huffman Codes & Perfect Secrecy, The course also covers Error Correcting Codes, Bounds on General Codes, Linear Codes, Hamming Codes, Golay and Cyclic Codes, BCH Codes, Reed-Solomon Codes and Quantum Techniques in Cryptography.

Course Outcomes: At end of the course the students will be able to

- Explain encryption, decryption, security and efficiency of various cryptographic techniques and algorithms, number theoretic concepts required for cryptosystems
- Describe digital signature techniques and algorithms
- Describe various error correcting codes and information theory

Grading (%)						
	☒ **Mid-term**	**25**	☒ **Project**	**15**	☒ **Quizzes**	**10**
	☒ **Final**	**40**	☒ **Assignments**	**10**	☐ **Review Paper**	

Text Book:

- Understanding Cryptography: A Textbook for Students and Practitioners by Christof Paar, Jan Pelzl and Bart Preneel, 2nd Edition, Springer, 2010. ISBN: 3642041000.

Reference Books:

- Cryptography and Network Security: Principles and Practice by William Stallings, 5th Edition, Prentice Hall, 2011. ISBN: 0136097049.
- Introduction to Cryptography with Coding Theory by Wade Trappe and Lawrence Washington, 2nd Edition, Prentice Hall, 2002. ISBN: 0131862391.

Course Name	**Image Processing and Analysis**						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CS623	**0911623**	**3**		**3**	**0**	**3**
Department	☒ Comp Science ☐ Information System ☐ Comp Engineering ☐ Comp Network						
Track	☐ Core ☒ Elective						
Level		**Prerequisite**					

Course Description:

Today, much of this information is represented and processed digitally. Digital image processing is ubiquitous, with applications ranging from television to tomography, from photography to printing, from robotics to remote sensing. This course will provide an introduction to the basic techniques of digital image processing. The student will learn modern approaches to image acquisition and display, image enhancement, image compression and image analysis. The course will covers topics such as: sampling and quantization of images, matrix representation of image forming, Filtering, color representation, image restoration, and feature extraction of images. A significant amount of mathematics background is required since a good portion of the course deals with spatial domain and frequency domain image operators, their underpinnings in algebra and calculus, and the understanding of their application.

Course Outcomes: At the end of the course students will be able to

- Have basic concepts that are widely used in digital image processing
- Understand image process techniques, e.g., sampling, quantization, enhancement
- Know histogram modification, image restoration, features detection and noise reduction
- Expose the current technologies and issues specific to image processing techniques
- Develop hands-on experience in using computers to process images
- Familiarize with MATLAB Image Processing Toolbox

Grading (%)	☒ **Mid-term**	**25**	☒ **Project**	**15**	☒ **Quizzes**	**10**
	☒ **Final**	**40**	☒ **Assignments**	**10**	☐ **Review Paper**	

Text Book:

- Digital Image Processing Using MATLAB by Richard E. Woods and Steven L. Eddins, 2nd Edition, Gatesmark Publishing, 2009. ISBN: 0982085400.

Reference Book:

- Digital Image Processing by R. C. Gonzalez and R. E. Woods, 2nd Edition, Prentice-Hall, 2002. ISBN: 013168728X.

Course Name	**Machine Learning**						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CS624	**0911624**	**3**		**3**	**0**	**3**
Department	☒ Comp Science	☐ Information System	☐ Comp Engineering		☐ Comp Network		
Track	☐ Core	☒ Elective					
Level		**Prerequisite**					

Course Description:

Introduction, Basics of Probability, Examples of Machine Learning Applications, Learning Associations, Concept Learning, Inductive Learning, Find-S Algorithm, Version Spaces, Candidate Elimination, Inductive Bias, Bayes Learning, Decision Trees, ID3 Algorithm, Inductive Bias, Over-fitting, Missing Data, Neural Networks, Perceptrons, Backpropagation, Generalization, Error Functions, Hope Field Networks, Classification, Regression, Unsupervised Learning, Reinforcement Learning, Correct (PAC) Learning, Introduction to Clustering, Mixture Densities, k-Means Clustering, Expectation-Maximization Algorithm, Mixtures of Latent Variable Models, Supervised Learning after Clustering, Hierarchical Clustering, Choosing the Number of Clusters.

Course Outcomes: At the end of the course students will be able to

- Distinguish and use different techniques of machines learning
- Understand and differentiate between different concepts of machine learning
- Implement machine learning algorithms on simulated and real world problems
- Evaluate learning algorithms and compare with alternative techniques

Grading (%)	☒ **Mid-term**	**25**	☒ **Project**	**20**	☐ **Quizzes**	
	☒ **Final**	**40**	☒ **Assignments**	**15**	☐ **Review Paper**	

Text Book:

- Introduction to Machine Learning by Ethem Alpaydin, 2nd Edition, MIT Press, 2009. ISBN: 026201243X.

Reference Book:

- Machine Learning by Tom Mitchell, 1st Edition, McGraw Hill, 1997. ISBN: 0070428077.

Course Name	Applications of Artificial Intelligence						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CS625	**0911625**	**3**		**3**	**0**	**3**
Department	☒ Comp Science	☐ Information System	☐ Comp Engineering			☐ Comp Network	
Track	☐ Core	☒ Elective					
Level		**Prerequisite**					

Course Description:

This course examines goals, problems, concepts and methods of artificial intelligence, heuristic versus algorithmic methods. It looks into techniques to solve complex problems in a particular domain, typically independent of knowledge used to direct the search for an optimal solution. Approaches include simulated annealing, genetic algorithms etc. It covers modern techniques for computers to represent task-relevant information and make intelligent decisions towards the achievement of goals. It covers advanced topics in artificial intelligence such as Machine Learning, Knowledge Discovery, Neural and Evolutionary Computation, Planning Systems, Perception, Natural Language Processing.

Course Outcomes: At the end of the course students will be able to

- Formulate a problem as constraint-satisfaction one
- Solve problems using local search algorithms
- Explain various learning such as supervised, reinforcement, and unsupervised
- Understand decision trees, neural networks, and belief networks
- Define the concept of a planning system

Grading (%)						
	☒ **Mid-term**	**25**	☒ **Project**	**25**	☒ **Quizzes**	**10**
	☒ **Final**	**40**	☒ **Assignments**		☐ **Review Paper**	

Text Book:

- Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig, 3rd Edition, Prentice Hall, 2010. ISBN: 0136042597.

Reference Books:

- Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition by Jurafsky and Martin, 2nd Edition, Prentice Hall, 2009. ISBN: 0131873210.
- Pattern Recognition and Machine Learning by Christopher M. Bishop, 2nd Edition, Springer, 2007. ISBN: 0387310738.

Course Name	**Formal Software Specification and Design**						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CS626	**0911626**	**3**		**3**	**0**	**3**
Department	☒ Comp Science ☐ Information System ☐ Comp Engineering ☐ Comp Network						
Track	☐ Core ☒ Elective						
Level		**Prerequisite**					

Course Description:

Equivalence of propositional and predicate logic, Formal specification, Transformation specification to code, Specification analysis and proof, Program verification, Equality and definite description, Uniqueness and one point rule, Objects and its types, Sets and set types, Bags and types, Sequence and its type, Modeling with sequences and bags, Tuples and Cartesian product types, Generic and axiomatic definitions, Bindings and schema types, Modeling with relations and functions, Domain/range restrictions and subtractions, Notations and properties of relations and functions, Free types, Primitive recursion and induction, Proof by induction, Schemas: properties, type, declaration, predicate, operators. Generic constructions, The Z language, Syntactic conventions, Schema references, Schema texts, Schema expressions, Sequential systems, Modeling with mappings, Consistency and completeness, Visualization,
Systematic testing, Relationships between Z and VDM, Validation and verification techniques/tools.

Course Outcomes: After studying this course, the students will be able to

- Specify, validate and verify the software systems in model oriented approaches
- Find a relationship between Z and VDM and apply it in systems development
- Know usage of VDM toolbox and Z/Eves for description and analysis of systems
- Apply the model checking and theorem proving approaches for complex systems construction

Grading (%)						
	☒ **Mid-term**	**25**	☒ **Project**	**25**	☒ **Quizzes**	**10**
	☒ **Final**	**40**	☐ **Assignments**		☐ **Review Paper**	

Text Book:

- Understanding Z: A Specification Language and its Formal Semantics by J. M. Spivey, Cambridge Tracts in Theoretical Computer Science, 2008. ISBN: 0521334292.

Reference Book:

- Validated Designs for Object-oriented Systems by John Fitzgerald, Peter Gorm Larsen, Paul Mukherjee, Nico Plat and Marcel Verhoef, Springer Verlag, 2005. ISBN: 1 85233-8814.

Course Name	**Theory of Programming Languages**						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CS627	**0911627**	**3**		**3**	**0**	**3**
Department	☒ Comp Science ☐ Information System ☐ Comp Engineering ☐ Comp Network						
Track	☐ Core ☒ Elective						
Level		**Prerequisite**					

Course Description:

Introduction to the main constructs of contemporary programming languages and criteria used for evaluating programming languages and language constructs: influence on language design, and design tradeoffs; Syntax and Semantics description: problems and formal methods; Lexical and Syntax Analysis; Characteristics of variables: Name bindings, type checking and scopes; Data types: Primitive data, character strings, user defined, arrays, record, union, pointer and reference types; Expression and assignment statements; Statement-level control structures: selection and iterative statements, unconditional branching, guarded commands; Subprograms and their implementation: fundamentals, design issues and implementation of simple subprograms; data abstraction facilities: Abstract data types and encapsulation constructs; Concurrent program units; exception handling and event handling; Alternative programming paradigms: functional programming and logic programming.

Course Outcomes: At the end of the course students will be able to

- Understand the structure of programming languages
- Describe the design issues of programming languages
- Develop skills in describing and using the features of programming languages
- Analyze the features of programming languages
- Differentiate logic and imperative and functional programming languages

Grading (%)	☒ **Mid-term**	**25**	☐ **Project**		☒ **Quizzes**	**10**
	☒ **Final**	**40**	☒ **Assignments**	**10**	☒ **Review Paper**	**15**

Text Book:

- Concepts of Programming Languages by Robert W. S., 9th Edition, Addison-Wesley, 2009. ISBN: 0136073476.

Reference Book:

- Theories of Programming Languages by John C. Reynolds, 1st Edition, Cambridge University Press, 2009. ISBN: 0521106974.

Course Name	Compiler Design and Construction						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CS628	**0911628**	**3**		**3**	**0**	**3**
Department	☒ Comp Science ☐ Information System ☐ Comp Engineering ☐ Comp Network						
Track	☐ Core ☒ Elective						
Level		**Prerequisite**					

Course Description:

An introduction to Front End of the compiler, Lexical, Syntax and Semantic Analyzers, Intermediate code generator, Code generator, The detail and in-depth discussion will be on the advanced topics of back end including: Issues in the Design of a Code Generator, The Target Language and Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Simple Code Generator. Various optimization techniques and algorithms both machine dependent and machine independent will also be discussed that can be applied to obtain an optimal code generator.

Course Outcomes: At the end of the course the students will be able to

- Acquire knowledge on the issues in the design of a code generator
- Develop a simple code generator
- Acquire knowledge on various machine dependent and independent optimization tools and techniques
- Apply these techniques to the simple code generator to make it optimal and hence to obtain an efficient code generator

Grading (%)						
	☒ **Mid-term**	**25**	☒ **Project**	**25**	☒ **Quizzes**	**10**
	☒ **Final**	**40**	☐ **Assignments**		☐ **Review Paper**	

Text Book:

- Compilers: Principles, Techniques, and Tools by Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, Addison-Wesley, 2006. ISBN: 0321486811.

Reference Book:

- Modern Compiler Design by Dick Grune, Addison-Wesley, 2010. ISBN: 0471976970.

Course Name	Software Validation and Verification						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CS629	**0911629**	**3**		**3**	**0**	**3**
Department	☒ Comp Science ☐ Information System ☐ Comp Engineering ☐ Comp Network						
Track	☐ Core ☒ Elective						
Level		**Prerequisite**					

Course Description:

The validation and verification of software systems is a major issue in the IT industry. The main focus of this course will be proving and ensuring correctness of software systems. The topics include quality assurance, safety, fault tolerance, reliability, Techniques for validation and verification, Research-oriented in-depth study of Verification and Validation, Quality assurance at requirements and design phases, Software testing at unit, module, subsystem and system levels, Automatic and manual techniques for generating and validating test cases, Testing process including static vs. dynamic analysis, functional testing, inspections, and reliability assessment. Some other advanced topics will include Lambda Calculus, Natural Deduction, Term Rewriting, Functional Programming, Sets and Rule Induction, Data types and Recursion, Calculational and Monadic Reasoning, Imperative Program Verification and Hoare Logic, Separation Logic, Proofs.

Course Outcomes: At the end of the course students will be able to

- Understand the fundamental approaches and concepts of the state-of-the-art software validation and verification techniques
- Acquire a knowledge of various aspects related to software quality assurance
- Apply fundamental and rigorous principles, and can benefit from for the many years to come regardless of the evolution of technology
- Act as future computer scientists and real software engineers

Grading (%)						
	☒ **Mid-term**	**25**	☒ **Project**	**15**	☒ **Quizzes**	**10**
	☒ **Final**	**40**	☒ **Assignments**	**10**	☐ **Review Paper**	

Text Book:

- Software Testing and Analysis: Process, Principles, and Techniques by M. Pezzè, M. Young, Wiley, 2007. ISBN: 0471455938.

Reference Books:

- Logical Analysis of Hybrid Systems: Proving Theorems for Complex Dynamics, Springer, 2010. ISBN: 3642145086.
- Software Testing by Ron Patton, 2nd Edition, Sams Publishing, 2006. ISBN: 0672327988.

Course Name	**Principles of Distributed Computing**						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CS630	**0911630**	**3**		**3**	**0**	**3**
Department	☒ Comp Science ☐ Information System ☐ Comp Engineering ☐ Comp Network						
Track	☐ Core ☒ Elective						
Level		**Prerequisite**					

Course Description:

This course covers algorithms and lower-bounds for fundamental problems in distributed computation, e.g., Self–organization, Distributed approximation, Leader election, Information dissemination, Consensus problems, Consistent snapshot computation and atomic actions concepts, distributed graph traversal termination detection, and monitoring distributed systems and garbage collection in distributed systems. This course explores essential and the most significant algorithmic ideas and lower bound techniques, basically the "pearls" of distributed computing.

Course Outcomes: At the end of the course students will be able to

- Understand the principles of distributed computing
- Introduce the basic abstractions for modeling distributed systems
- Investigate the algorithms for fundamental problems in distributed computation
- Study the algorithms complexity of different solutions for these problems
- Investigate the optimal or approximations solutions of these problems

Grading (%)	☒ **Mid-term**	**25**	☐ **Project**		☒ **Quizzes**	**15**
	☒ **Final**	**40**	☒ **Assignments**	**5**	☒ **Review Paper**	**15**

Text Book:

- Distributed Computing: Principles, Algorithm, and System by Ajay D. Kshemkalyani, Mukesh Singhal, Cambridge University Press, 2008. ISBN: 0521876346.

Reference Books:

- Distributed Systems: An Algorithmic Approach by Sukumar G., CRC Press, 2006. ISBN: 1584885645.
- Introduction to Reliable Distributed Programming by Rachid Guerraoui and Luis Rodrigues, Springer, 2006. ISBN: 3540288457.

Course Name	Computer Vision						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CS721	**0911721**	**3**		**3**	**0**	**3**
Department	☒ Comp Science ☐ Information System ☐ Comp Engineering ☐ Comp Network						
Track	☐ Core ☒ Elective						
Level		**Prerequisite**					

Course Description:

Vision is one of our senses that allow us to build a powerful internal representation of the world. The goal of computer vision is to "discover from images what is present in the world, where things are located, what actions are taking place" (Marr 1982). To achieve this goal, we need to know how light is reflected off surfaces, how objects move, and how this information is projected onto an image. This course is an introduction to basic concepts in computer vision and research topics. First, an introduction to low-level image analysis methods, including image formation & image sensing, edge detection, feature detection, and image segmentation. Image transformations (e.g., warping, morphing, and mosaics) for image synthesis. Methods for reconstructing three-dimensional scene information using techniques such as depth from stereo, structure from motion, and shape from shading. Motion and video analysis. Three-dimensional object recognition.

Course Outcomes: At the end of the course students will be able to

- Know the basic concepts in computational vision
- Have an understanding of image processing for computer vision
- Have knowledge of processing of images and determination of various structures
- Reconstruct shape from stereo and shading
- Recognize three dimensional objects

Grading (%)						
	☒ **Mid-term**	**25**	☒ **Project**	**15**	☒ **Quizzes**	**10**
	☒ **Final**	**40**	☒ **Assignments**	**10**	☐ **Review Paper**	

. **Text Book**:

- Computer Vision: Algorithms and Applications by Richard Szeliski, 1st Edition, Springer, 2010. ISBN: 1848829345.

Reference Book:

- Computer Vision Three-dimensional Data from Images by R. Klette, K. Schluns, A. Koschan, Springer-Verlag, 2001. ISBN: 9813083719.

Course Name	Software Requirements Engineering						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CS722	**0911722**	**3**		**3**	**0**	**3**
Department	☒ Comp Science ☐ Information System ☐ Comp Engineering ☐ Comp Network						
Track	☐ Core ☒ Elective						
Level		**Prerequisite**					

Course Description:

The requirements engineering process, including identification of stakeholders, requirements elicitation techniques such as interviews and prototyping, analysis fundamentals, requirements specification, and validation. Use of Models: State-oriented, Function-oriented, and Object-oriented. Documentation for Software Requirements. Informal, semi-formal, and formal representations. Structural, informational, and behavioral requirements. Use of requirements repositories to manage and track requirements through the life cycle. Case studies, software projects, written reports and oral presentations will be required.

Course Outcomes: At the end of the course students will be able to

- Learn about the requirements engineering process
- Practice requirements analysis, modeling, elicitation, and specification
- Learn to work with a team on requirements elicitation on medium sized projects and practice soft skills such as communication, presentation, and asking questions
- Become familiar with requirements management tools and techniques
- Conduct latest research in requirements engineering area

Grading (%)						
	☒ **Mid-term**	**25**	☒ **Project**	**15**	☒ **Quizzes**	**10**
	☒ **Final**	**40**	☒ **Assignments**	**10**	☐ **Review Paper**	

Text Book:

- Software Engineering: A Practitioner's Approach by Roger S. Pressman, 7th Edition, McGraw-Hill, 2009. ISBN: 0073375977.

Reference Books:

- Object-Oriented and Classical Software Engineering by Stephen R. Schach, 7th Edition, Irwin, 2006. ISBN: 0073191264.
- Software Requirements: Styles and Techniques by Soren L., Addison-Wesley, 2002. ISBN: 0201745704.
- Managing Software Requirements: A Use Case Approach by Dean Leffingwell, Don Widrig, 2nd Edition, Addison-Wesley Professional, 2003. ISBN: 032112247X.

Course Name	**Pattern Recognition**						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CS723	**0911723**	**3**		**3**	**0**	**3**
Department	☒ Comp Science	☐ Information System	☐ Comp Engineering		☐ Comp Network		
Track	☐ Core	☒ Elective					
Level		**Prerequisite**					

Course Description:

A survey of modern methods for computer recognition of patterns in varied applications such as digital images, human speech and sound, and grammar-based sequences. Various approaches are developed, including statistical techniques, heuristic search, Fourier analysis, Markov models, template matching, grammatical inference and neural networks. Computational aspects and efficiency of different methods and algorithms are emphasized. Students must complete a project using methods developed in the course and some software tools like Matlab.

Course Outcomes: After completing this course the students will be able to

- Understand modern methods for recognition of patterns in varied applications such as digital images, human speech and sound, grammar-based sequences
- Use different approaches like: statistical techniques, heuristic search, Fourier analysis, Markov models, template matching, grammatical inference and neural networks
- Develop applications of pattern recognition systems with software

Grading (%)						
	☒ **Mid-term**	**25**	☒ **Project**	**20**	☐ **Quizzes**	
	☒ **Final**	**40**	☒ **Assignments**	**15**	☐ **Review Paper**	

Text Book:

- Pattern Recognition & Matlab Intro: Pattern Recognition by Sergios Theodoridis and Konstantinos Koutroumbas, 4th Edition, Academic Press, 2008. ISBN: 1597492728.

Reference Book:

- Pattern Recognition and Machine Learning, Christopher M. Bishop, Springer, 2007. ISBN: 0387310738.

Course Name	**Stochastic Processes**						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CS724	**0911724**	**3**		**3**	**0**	**3**
Department	☒ Comp Science ☐ Information System ☐ Comp Engineering ☐ Comp Network						
Track	☐ Core ☒ Elective						
Level		**Prerequisite**					

Course Description:

Sample Space and Events, The Notion and Axioms of Probability, Equally Likely Events, Conditional Probability, Independent and Dependent Events, Total Probability, Bayes Rule, Random Variables, Distribution Functions, Discrete Random Variables and Probability Mass Functions, Continuous Random Variables and Probability Density Functions, Mean and Variance, Some Special Distributions, Conditional Distributions, Bivariate Random Variables, Joint Distribution Functions, Covariance and Correlation Coefficient, Functions of Random Variables, Expectation, Moment Generating Functions, The Law of Large Numbers, Central Limit Theorem, Stochastic Processes, Characterization of Stochastic Processes, Markov Processes, Classification of States, Classification of Chains, Discrete-Parameter Markov Chains, Continuous-Time Markov Chains, Birth Processes and Poisson Process, Brownian Motion Processes, Power Spectral Densities, White Noise, Fourier Transform of Stochastic Processes, Queuing Systems, Birth-Death Process, The M/M/1, M/M/s, and M/M/s/K Queuing Systems.

Course Outcomes: At the end of the course the students will be able to

- Understand probability and perform for calculating single and joint random variables
- Understand concepts of stochastic processes and essential mathematical tools
- Use stochastic processes for modeling of real world systems
- Apply probabilistic and stochastic methods for engineering problems

Grading (%)	☒ **Mid-term**	**25**	☒ **Project**	**15**	☒ **Quizzes**	**10**
	☒ **Final**	**40**	☒ **Assignments**	**10**	☐ **Review Paper**	

Text Book:

- Introduction to Probability Models by Sheldon M. Ross, 10th Edition, Academic Press, 2009. ISBN: 0123756863.

Reference Book:

- Stochastic Processes and Models by David S., 1st Edition, Oxford University, 2005. ISBN: 0198568134.

Course Name	**Game Modeling and Development**						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CS725	**0911725**	**3**		**3**	**0**	**3**
Department	☒ Comp Science ☐ Information System ☐ Comp Engineering ☐ Comp Network						
Track	☐ Core ☒ Elective						
Level		**Prerequisite**					

Course Description:

There is a growing demand of the programmers from this industry who can design computer games. This course helps students to understand and learn the technology and programming skills that are required to build a computer game. This class introduces students to an object-oriented game engine scripting language. It covers a range of topics that include: Game Memory Management; Multithreading in Games; Sprites & bitmap animation; Collision detection; Differing game types, modes, & perspectives; Game & level design; Path finding algorithms; Sound & Music; Game input devices; Artificial Intelligence in games; Physics based modeling; Advanced Lighting Techniques; Networked Gaming Algorithms; Special Effects etc.

Course Outcomes: At the end of the course students will be able to

- Understand range of possibilities for games engines, including their limitations
- Understand algorithms used in developing games
- Program various input and output devices used in games
- Use game engines to construct a simple game

Grading (%)						
	☒ **Mid-term**	**25**	☒ **Project**	**25**	☒ **Quizzes**	**10**
	☒ **Final**	**40**	☐ **Assignments**		☐ **Review Paper**	

Text Book:

- Introduction to Game Development by Steve Rabin, 2nd Edition, Charles River Media, 2009. ISBN: 1584506792.

Reference Book:

- 3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics by David Eberly, 2nd Edition, Morgan Kaufmann, 2006. ISBN: 0122290631.

Course Name	Computational Geometry						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CS726	**0911726**	**3**		**3**	**0**	**3**
Department	☒ Comp Science ☐ Information System ☐ Comp Engineering ☐ Comp Network						
Track	☐ Core ☒ Elective						
Level		**Prerequisite**					

Course Description:

This course will provide an introduction to the fundamental and key concepts of computational geometry. The Problems, techniques and structures within the computational geometry including concepts of points, lines, planes, spheres, duality and subdivisions will be discussed. The line intersections, convex hull, Voronoi diagram, triangulations, Delaunay triangulation, overlay of subdivisions, range searching will be covered. The techniques of sweep-line, randomized incremental construction, fractional cascading will also be discussed. The other topics include double-linked edge-lists, interval trees, segment trees, and priority search trees, Kd-trees, range trees, models of computation, lower bound techniques, geometric primitives, geometric, transforms, Planar convex hulls, higher dimensional convex hulls, randomized, output-sensitive, and dynamic algorithms, applications of convex hull, Intersection detection, segment intersection, line sweep, map overlay, polyhedral intersection and geometric searching.

Course Outcomes: At the end of the course the students will be able to

- Construct algorithms for simple geometrical problems
- Implement computational geometry algorithms in various disciplines
- Learn application of computational geometry in robotics, computer graphics, GIS, spatial databases and machine learning

Grading (%)						
	☒ **Mid-term**	**25**	☐ **Project**		☒ **Quizzes**	**10**
	☒ **Final**	**40**	☒ **Assignments**	**10**	☒ **Review Paper**	**15**

Text Book:

- Computational Geometry: Algorithms and Applications by Mark de Berg, Otfried Cheong, Marc van Kreveld, Mark Overmars, 3rd Edition, Springer-Verlag, 2008. ISBN: 3540779736.

Reference Book:

- Handbook of Discrete and Computational Geometry by J. E. Goodman and J. O'Rourke, 2nd Edition, CRC Press LLC, 2004. ISBN: 1584883014.

Course Name	Advanced Modeling and Simulation						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CS727	**0911727**	**3**		**3**	**0**	**3**
Department	☒ Comp Science ☐ Information System ☐ Comp Engineering ☐ Comp Network						
Track	☐ Core ☒ Elective						
Level		**Prerequisite**					

Course Description:

As simulation is increasingly applied to more complex applications, exploiting efficiencies in model design and hence model execution has becomes a challenging task. The aim of this course is to provide students with the ability to model simulate and analyze complex systems in a reasonable time. This course is divided into three parts and covers advanced techniques in simulation model design, model execution and model analysis. A selection of model design techniques such as conceptual models, declarative models, functional models, constraint models, and multi-models will be discussed. Model execution techniques include discussion of serial and parallel discrete-event simulation algorithms. For model analysis, topics include input-output analysis, variance reduction techniques and experimental design.

Course Outcomes: At the end of the course the students will be able to

- Understand concepts in discrete-event simulation, serial algorithms and model design techniques
- Practice parallel and distributed simulation, input and output data modeling and analysis
- Know components and organization of discrete-event simulation

Grading (%)						
	☒ **Mid-term**	**25**	☒ **Project**	**20**	☒ **Quizzes**	**15**
	☒ **Final**	**40**	☐ **Assignments**		☐ **Review Paper**	

Text Book:

- A First Course in Mathematical Modeling by Frank R. Giordano, William P. Fox, Maurice D. Weir, Cengage Learning, 2009. ISBN: 0495011592.

Reference Book:

- Mathematical Modeling by Mark M. Meerschaert, Elsevier, 2007. ISBN: 0123708575.

Course Name	**Advanced Database Management Systems**						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	IS611	**0912611**	**3**		**3**	**0**	**3**
Department	☐ Comp Science ☒ Information System ☐ Comp Engineering ☐ Comp Network						
Track	☐ Core ☒ Elective						
Level	1st Semester	**Prerequisite**					

Course Description:

This course covers advanced topics in the design and management of database systems including record storage and primary file organizations, index structures and access methods for files, directory management, query processing, query optimization, transaction processing, nested transactions, concurrency control techniques, deadlock management, fragmentation and its control, integrity constraints, database recovery, distributed databases, object and object-relational databases, deductive databases and data integration in multi-databases.

Course Outcomes: At the end of the course students will be able to

- Learn advanced concepts involved in performance tuning of databases
- Learn efficient retrieval of information especially when massive data storage is involved
- Get an insight to the internal working of DBMSs
- Have an insight to the issues and challenges involved in database design and management
- Learn alternate solutions to these issues and challenges

Grading (%)	☒ **Mid-term**	**25**	☒ **Project**	**25**	☒ **Quizzes**	**10**
	☒ **Final**	**40**	☐ **Assignments**		☐ **Review Paper**	

Text Book:

- Database System Concepts by Abraham Silberschatz, Henry Korth, and S. Sudarshan, McGraw-Hill, 2010. ISBN: 0072958863.

Reference Books:

- Database Systems: Design, Implementation, and Management by Carlos Coronel, Steven Morris and Peter Rob, 9th Edition, Course Technology, 2009. ISBN: 0538469684.
- Database Processing by David M. Kroenke and David Auer, 11th Edition, Prentice Hall, 2009. ISBN: 0132302675.

Course Name	Information Retrieval and Extraction						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	IS627	**0912627**	**3**		**3**	**0**	**3**
Department	☐ Comp Science ☒ Information System ☐ Comp Engineering ☐ Comp Network						
Track	☐ Core ☒ Elective						
Level		**Prerequisite**					

Course Description:

This course will cover traditional material, as well as recent advances in Information Retrieval (IR), the study of indexing, processing, and querying textual data. Basic retrieval models, algorithms, and IR system implementations will be covered. The course will also address more advanced topics in "intelligent" IR, including Natural Language Processing techniques, and "smart" Web agents. Topics: Introduction to IR models and methods, Perl tutorial, Text analysis / Web spidering, Text properties, Vector-based model, Boolean model, Probabilistic model; other IR models, IR evaluation and IR test collections, Relevance feedback, query expansion, Web search: link based and content based, Query-based and content sensitive link analysis, Search engine technologies, Search engine user interfaces, Text classification and clustering.

Course Outcomes: After completing this course students can

- Get familiar with indexing, processing, and querying textual data
- Use basic retrieval models, algorithms, and IR system implementation
- Understand advanced topics in intelligent IR, including natural language processing techniques, and smart web agents

Grading (%)						
	☒ **Mid-term**	**25**	☒ **Project**	**15**	☒ **Quizzes**	**10**
	☒ **Final**	**40**	☒ **Assignments**	**10**	☐ **Review Paper**	

Text Book:

- Modern Information Retrieval: The Concepts and Technology Behind Search by Ricardo Baeza-Yates and Berthier Ribeiro-Neto, Addison-Wesley, 2nd Edition, 2011. ISBN: 0321416910.

Reference Book:

- Information Retrieval: Algorithms and Heuristics by D. A. Grossman and O. Frieder, 2nd Edition, Springer, 2004. ISBN: 1402030045.

Course Name	**Multimedia Systems Design**						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	IS628	**0912628**	**3**		**3**	**0**	**3**
Department	☐ Comp Science ☒ Information System ☐ Comp Engineering ☐ Comp Network						
Track	☐ Core ☒ Elective						
Level		**Prerequisite**					

Course Description:

Interactive multimedia systems are becoming increasingly widespread in many domains including games, arts and business. This subject introduces fundamental principles of interactive multimedia and associated tools. Topics include digital multimedia applications, social and ethical considerations. Enabling technologies such as digital representations, hardware and software requirements, Introduction to computer graphics: vector graphics and bitmapped images, image manipulation and compression, Digitized video standards, video compression, streamed video, video editing and post-production, Captured animation and image sequences, key frame and 3-D animation, Digitized sound, sound compression, sound format, combining sound and picture, hypermedia, synchronization-based presentation, Multimedia and Networks: computer network and transport protocols, multicasting, quality of service, server-side computation, protocols applications.

Course Outcomes: At the end of the course students will be able to

- Get background knowledge of the different components of digital media, text, images, sound & video, their representations and media carriers
- Get practical knowledge in processing digital media and integration of its components
- Design and program digital media applications
- Acquire necessary knowledge to work in a team of digital media designers and developers

Grading (%)						
☒ **Mid-term**	**25**	☒ **Project**	**25**	☒ **Quizzes**	**10**
☒ **Final**	**40**	☐ **Assignments**		☐ **Review Paper**	

Text Book:

- Digital Media Primer by Wong Y-L, International Edition, Pearson/Prentice Hall, 2009. ISBN: 0132239442

Reference Books:

- The Science of Digital Media by Burg J., Prentice Hall, 2008. ISBN: 0132435802
- Digital Art: Its Art and Science, Wong Y-L, Prentice Hall, 2009. ISBN: 0131757032.
- Digital Multimedia by Nigel Chapman and Jenny Chapman, 3rd Edition, Wiley, 2009. ISBN: 0470512164.

Course Name	New Trends in Computer Networks						
Course Information	Course Code	Course No	Credit Units	Contact Hours	Lec.	Lab.	Total
	CN621	**0914621**	**3**		**3**	**0**	**3**
Department	☐ Comp Science ☐ Information System ☐ Comp Engineering ☒ Comp Network						
Track	☐ Core ☒ Elective						
Level		**Prerequisite**					

Course Description:

Review of LANs, internet and TCP/IP protocol, Resource sharing through multiplexing, Circuit and packet switching technologies, Design issues, Traffic and service classes, Broadband access networks, Internet service provider, T-1 Lease Lines, DSL, Cable access networks, High speed WANs, Frame relay, Asynchronous transfer mode, High speed switched LAN, Traffic modeling, IP multicasting, Optical networks and architectures, Synchronous optical networking, Overview of wireless networks, Mobile IP, Mobile ad-hoc networks, The OSI model, packet and circuit switching, Integrated services digital networks, The TCP/IP protocol stack, Internet control message protocol, Routing, RSVP, Next generation IP, Wireless communication systems, Voice over IP, VPNs, Network security, Quality of service, Distributed systems, Management Protocols.

Course Outcomes: At the end of the course the students will be able to

- Have advanced network services and emerging ultra-fast network technologies
- Practice broadband multimedia applications including IP multicasting and present a host of multicast routing procedures, ultra-broadband and optical networking technologies
- Use current trends and leading research in the computer networking area
- Perform evaluation and analysis of computer and communications networks

Grading (%)	☒ **Mid-term**	**25**	☐ **Project**		☒ **Quizzes**	**10**
	☒ **Final**	**40**	☒ **Assignments**	**10**	☒ **Review Paper**	**15**

Text Book:

- Computer Networks-A Systems Approach by Larry L. Peterson and Bruce S. Davie, 5th Edition, Morgan-Kaufmann, 2011. ISBN: 0123850592.

Reference Book:

- UNIX Network Programming, The Sockets Networking API by W. Richard Stevens, 3rd Edition, Prentice Hall, 2003. ISBN: 013490012X.

Course Name	**Project Proposal**		
Course Information	Course Code	Course No	Credit Units
	CS690	**0911690**	**3**
Department	☒ Comp Science ☐ Information System ☐ Comp Engineering ☐ Comp Network		
Track	☒ Core ☐ Elective		
Level		**Prerequisite**	Department Approval

Course Description:

The Project Proposal emphasizes on application of the theoretical concepts of software analysis and design learned during the course work. The analysis component comprises of preparing formal Software Requirements Specifications (SRS) document including problem statement, scope, justification, requirements, cost estimation, assumptions, limitations, methodology and tools to be used in project development. The assumption should be taken in such a way that scope of the problem becomes clear and well defined in the problem statement. All the functional and non-functional requirements of the system must be identified and analyzed in the proposal. The students will be encouraged to develop/describe logical model of the proposed system based on the requirements. The design component of the course includes prototype including input and output of the proposed system.

Course Outcomes: At the end of the course, students will be able to

- Identify and define problem statement
- Define and justify scope of the problem
- Gather and analyze system requirements
- Propose an optimized solution among the existing solutions
- Practice software analysis and design techniques learned during the course work
- Develop technical report writing and oral presentation skills

Grading (%)	☒ **Supervision & Progress Reports**			**30**
	☒ **Project Report Evaluation**	**35**	☒ **Project Oral Examination**	**35**

Textbook(s):

- Lynn E. Miner & Jeremy T. Miner, "Proposal Planning and Writing", Third Edition, Greenwood Publishing Group, 2003, ISBN: 1573564982

Reference Book(s):

- Statistics for Engineers and Scientists by William Navidi, 2nd Edition, McGraw-Hill, 2007. ISBN: 0073309494.

Course Name	**Project Implementation**		
Course Information	Course Code	Course No	Credit Units
	CS695	**0911695**	**6**
Department	☒ Comp Science ☐ Information System ☐ Comp Engineering ☐ Comp Network		
Track	☒ Core ☐ Elective		
Level	4th Semester	**Prerequisite**	Project Proposal

Course Description:

In this course the students will be required to implement proposed design of the project. The students will review the design specification and make any necessary enhancements to synchronize the implementation details. The students will identify and learn the use of tools required for the project implementation. The students will be expected to: prepare application architecture, code, debug, document, and test the application software within suggested timeframe. A key focus of the course is to emphasize the quality of software project through various evaluation aspects such as professional coding style, documentation of code, intuitive user interface design, input validation, verification and user guide. The students will be further required to evaluate the developed system by generating test cases of the critical components of the designed model.

Course Outcomes: At the end of the project, students will be able to

- Develop a functional application based on the software design
- Apply the coding, debugging and testing tools to enhance the quality of the software
- Construct new software systems based on the theory and practice gained through this exercise
- Prepare the proper documentation of software projects following the standard guidelines
- Learn technical report and oral presentation skills

Grading (%)	☒ **Supervision & Progress Reports**			**30**
	☒ **Project Report Evaluation**	**35**	☒ **Project Oral Examination**	**35**

Textbook(s):

- Lynn E. Miner & Jeremy T. Miner, "Proposal Planning and Writing", Third Edition, Greenwood Publishing Group, 2003, ISBN: 1573564982

Reference Book(s):

- Statistics for Engineers and Scientists by William Navidi, 2nd Edition, McGraw-Hill, 2007. ISBN: 0073309494.

Course Name	**Dissertation**		
Course Information	Course Code	Course No	Credit Units
	CS700	**0911700**	**9**
Department	☒ Comp Science ☐ Information System ☐ Comp Engineering ☐ Comp Network		
Track	☒ Core ☐ Elective		
Level	4th Semester	**Prerequisite**	Department Approval

Course Description:

Student will choose a research topic under supervision of a faculty member. After approval of the dissertation subject, the student needs to define objectives of the research and prepare the research proposal. In the proposal, he/she will be required to (i) conduct an exhaustive survey (ii) identify and define the problem clearly (iii) decide scope of the problem and provide its assumptions and limitations (iv) ensure the originality of the research proposal (v) suggest the approach and methodology used in the research and (vi) present the expected results. At the successful presentation of the proposal, student will be asked to submit the proposal. The student will apply the proposed methodology to solve the problem. After completion, student will submit the dissertation. Then student will defend the dissertation.

Course Outcomes: At the end of the thesis students will be able to

- Conduct survey of research issues
- Practice research techniques, tools and methodologies
- Work independently and take initiatives in academic or professional environment
- Develop writing and oral presentation skills

Grading (%)		
	☒ **Dissertation Evaluation**	**40**
	☒ **Dissertation Oral Examination**	**60**

Text Book(s):

- The Craft of Research: Chicago Guides to Writing, Editing and Publishing by Booth, Colomb & Williams, 3rd Edition, University of Chicago Press, 2008. ISBN: 0226065669.

Reference Book(s):

- Statistics for Engineers and Scientists by William Navidi, 2nd Edition, McGraw-Hill, 2007. ISBN: 0073309494.