## **Courses Offered by the Department of Mathematics for the B.Sc. Degree**

Course	Course Title		Contents	Hours/Week		
No. & Code	Course fille	Pre- requisites		L	P/T	C
M100	General Mathematics(1)	-	Calculus: Functions of one variable - Limits and Continuity - Derivatives - Applications of Differentiation - Taylor and McLauren series, Indefinite and definite integrals. Algebra: Mathematical induction - series - Partial fractions - Matrices and systems of linear equations - Approximate solutions of non-linear equations.	2	- 2	3
M105	General Mathematics(2)	M100	Calculus: Techniques of integration - Definite integrals and their properties- improper integral – numerical integration - Applications of definite integrals. Geometry: Coordinate systems in the plane - Straight lines and circles in general forms - Conic sections - Geometric transformations in the plane - Coordinate systems in the space - The plane and the straight lines in the space and surfaces of revolution of second order and ruled surfaces.	2	- 2	3
MC100	Computer	-	Fundamentals of programming and computer languages - Algorithm and Flowcharts - Elements of Language under case - Basic Instructions in Language under case - Control Instructions - Arrays and dimension statement – Subprograms - Some applications.	1	2 -	2
M211	Advanced Calculus	M105	Functions of several variables - Partial Derivatives and their applications - Multiple integrals (double – triple) and their applications - Line and Surface integrals - Using Mathematica, and Matlab programs for graphing some Surfaces and calculate some integrals.	2	- 2	3
M212	Differential Equations (1)	M211	Formation of ordinary Differential Equations (ODE's) - ODE's of first Order and first Degree – ODE's of first Order and higher Degrees - Applications – Linear ODE's of higher Orders with constant Coefficients and its applications - Linear ODE's of higher Orders with Variable Coefficients - Simultaneous Linear ODE's.	2	- 2	3

Course No.	Course Title	Pre-	Pre- Contents		Hours/W		eek
& Code		requisites		L	P/T	1	С
M214	Differential Equations for non-mathematical students	M105	Formation of ordinary differential equations (ODE's) - ODE's of first order and first Degree – ODE's of first order and higher degrees – Applications – Numerical solution of ODE's of the first order and the first Degre – Linear ODE's of higher Orders with constant Coefficients - Linear ODE's of higher orders with Variable Coefficients (Euler and Lagrange methods). Applications.	2	-	2	3
M221	Linear Algebra and Geometry	M105	Vector spaces – Linear transformations – Properties of linear transformations (range and kernel) - Algebra of linear transformations- Eigenvalues and Eigenvectors -Inner product spaces- Self adjoint transformations Bilinear and quadratic forms. Reduction of quadratic forms in Rn – Applications in Geometry.	2	-	2	3
M223	Discrete Mathematics	M105	Sets – Relations – Equivalence relations – Mappings – Binary operations – Counting – Rules of inference – Graph theory – Graphs and multigraphs – Planar graphs – Colorations, Trees – Boolean Algebra – Duality – Basic theorems – logic Gates and Circuits.	2	-	-	2
M231	Newtonian Mechanics	M105	Statics in plane - Applications on equilibrium of two-dimensional force systems - Statics in space – Friction - Center of gravity and centroid - Virtual work - Kinematics of a particle in a straight line - Kinematics of a particle in a plane - Relative motion in a plane - Kinetics of a particle - Simple harmonic motion - Central orbits – Dynamics of a rigid body in a plane.	2	-	2	3
M232	Analytical Mechanics	M231	Dynamics of a particles in three dimensions - Rotating axes – Components of velocity and acceleration in different coordinate systems – Faucolt's pendulum – Dynamics of rigid body in three dimensions - Eulerian angles – Moment of inertia – Equations of motion – Euler's equations - Impulsive motion - Motion of a system of particles - Constraints - Generalized Coordinates - Lagrang's equations – Hamilton's canonical equations - Ignorable or cyclic coordinates - Routh's equations - Phase space- Liouville's theorem – Hamilton's principle of least action - Canonical or contact transformation - Invariants – Hamilton-Jacobi equation.	2	-	2	3
MS241	Biostatics	M105	Some basic probability concepts – Some important sampling distributions – Estimation Hypothesis testing – Analysis of variance - Regression and correlation – Multiple regression and correlation – Goodness of fit test.	3	-	-	3

Contents of the Co	ourses-Credit Hour S	System Bylaw – Facu	ltv of Science – Assir	t University – 2009
Contents of the Co	Juises-Creat Hour	Jystem Dynaw I acu	ity of belefice Assic	a Oniversity 2007

Course No.	Course Title	Pre-	- Contents		Hou	·s/W	eek
& Code	Course The	requisites		L	P/7	[	C
MS242	Probability (1)	M211	Sample Space - Random Variables - Some Discrete Distributions - Some Continuous Distributions - Bivariate and Multivariate Random Variables - Some special bivariate Distributions.	2	-	2	3
MC251	Object-Oriented Programming	M105	Objects and classes - Understanding class definitions - Object interaction - Grouping objects - More sophisticated behaviour - libraries - Well-behaved objects - testing, maintaining, debugging - Designing classes.	2	2	-	3
MC252	Data Structures	MC251	Data representation – arrays and matrices – lists stacks and queues – hashing – binary trees, balanced and B-trees – splay trees and tree traversals using stacks – expression trees – expressions and conversions – graphs – graph algorithms – minimum-cost spanning trees – inheritance – exceptions, interface and design by contract – basic design patterns and reuse.	2	2	-	3
MC300	Mathematical and Statistical Packages	MC100	Using the mathematical and statistical packages (Matlab, Mathematica, Min Tab, SPSS,etc) for matrices – Functions – Graphics – Data Fitting – Applied Statistics	2	2	-	3
M312	Real Analysis (1)	M211	Real number systems - Real sequences - Continuous functions - Differentiation - Riemann integral- Sequence of functions- Measure on the real numbers.	3	-	-	3
M313	Differential Equations (2)	M212	Existence and uniqueness Theorems – Series solution – Ordinary Differential Equations in three variables – Partial Differential Equations (first Order – Linear of higher orders with constant and variable coefficients).	3	-	-	3
M314	Dynamical Systems	M313	Introduction on dynamical systems – Stability analysis – The method of averaging – Chaos theory - Lorenz equations- Fractals sets - Lyapunov exponents – Hamiltonian systems	3	-	-	3
M315	Special Topics in Mathematics	Dept. concept	Elected by Math. Dept. to meet new directions in Mathematics.	3	-	-	3
M317	Numbers Theory	M223	Integers-Divisibility- Prim numbers- Prim factorization- Euclidean algorithm- fundamental theorem of arithmetic – Fermat's number – linear and quadratic, Diophantine equations - congruence – Chimes remainder theorem – Euler theorem – special congruences – applications in computer sciences.	3	-	-	3

Course No.	Course Title	Pre-	Contents	Н	ours/We	ek
& Code		requisites		L	P/T	С
M318	Partial Differential and Special Functions	M212	Partial differential equations – Partial differential equations of first order – Linear partial differential equations of second and higher orders with constant coefficients – Gamma and Beta functions – solution in infinite series of linear differential equations (Frobenius method) – Hypergeometric functions (Gauss functions) – Bessel, Hermite, and Laguerre functions.	3		3
M319	Tensors	M211	n-dimensional spaces – Coordinate transformations - First and second order tensors - Covariant and contravariant - Lows of transformations - Higher order tensors – Algebraic operations on tensors – Metric form – Metric tensor and its conjugate - Christoffel symbols of first and second kinds - Covariant derivative - Intrinsic derivative - Physical and geometrical applications.	3		3
M321	Groups Theory	M223	Groups – Permutation groups – Subgroups – Co-sets – Normal subgroups – Cyclic groups – Factor group – Lagrang's theorem – Homomrphism – Isomorphism.	2		2
M322	Theory of Rings and Fields	M321	Rings – Commutative rings – ring with identity, Division rings, Internal domain, Fields, Subring, Ideal, Principal ideal, Quotient rings, Ring Homomorphism and ring isomorphism, subfield – Order integral domain – Integers Quotient numbers, Real numbers complex numbers and Gausian numbers, The filed of polynomials.	2		2
M323	Numerical Analysis (1)	M212	Errors in Numerical computation - Solutions of Non-linear Equations - Direct and Iterative Methods for Solving Linear Systems - Interpolation and Polynomial approximations - Numerical differentiation - Numerical Integration.	3		3
M326	Operation Research (1)	M211& M221	Standard form of the Linear Programming Problems (LPPs) – Methods for solving LPPs - Sensitivity analysis - Network flow problems – Integer programming – Shortest path problems.	3		3
M331	Mathematical Foundations of Quantum Theory &Statistical Mechanic (1)	M232	Comparison between classical mechanics and optics – Old quantum theory – Particle wave duality – Schrodinger wave equation – Wave function – Uncertainty principle – Solution of Schrodinger equation in one and three dimensions – Thermodynamics – Condition for statistical equilibrium – Micro canonical distribution – Canonical distribution – Ideal gas – Maxwell–Boltzmann distribution of velocities – Applications.	2	- 2	3

Course No.	Course Title	Pre-	Contents	He	ours/V	Nee	k
& Code		requisites		L	P/T		C
M332	Mathematical Foundations of Electromagnetic Theory and Special Theory of Relativity (1)	M231	Vector Analysis - Principal equations of Electromagnetic fields in space - Electrostatic field in space - Slow & Quasi steady Motion- Principal Equations of Electromagnetic Field in Substances - Electrostatic field in material medium - Electromagnetic field in material medium - Special theory of Relativity – Relativistic mechanics- particles mechanics- applications.	2	- 2	2	3
M334	Mathematical Methods	M212	Laplace transforms - Gama, Beta, Bessel, Lagender and Hermite functions - Laplace transforms of special functions - Solutions of some differential equations using Laplace transforms - Solutions of integral equations - Fourier series - Equivalent forms of Fourier's integral theorem - The convolution theorem for Fourier transforms - Applications of Fourier integrals and transforms.	2	-	-	2
M335	Special Topics in Applied Mathematics	Dept. concept	Elected by Math. Dept. to meet new directions in Applied Mathematics	3		-	3
MS341	Statistical Inference (1)	MS242	Populations and samples-sample moments and distributions – Point estimation - Sufficient, Unbiased and consistent estimator - minimum variance unbiased estimator - methods of estimation - Interval estimation	3	- ,	-	3
MS342	Statistical Inference (2)	MS341	Statistical hypotheses – Neyman – Pearson lemma – power function of a test – likelihood ratio test – Tests concerning means and differences between means – Tests concerning variances – Tests concerning proportions and differences between proportions – contingency tables – goodness of fit.	3	_	-	3
MS343	Sampling Theory	MS242	Simple random sampling – Stratified random sampling – Ratio estimates – one- stage cluster sampling – subsamplings: with units of equal and unequal size – Double sampling.	2	-	-	2
MS344	Analysis of Regression and Correlation Models	MS242	Simple linear regression and correlation - Multiple Linear Regression - Polynomial Regression Models.	3	-	-	3
MS346	Stochastic Processes and Its applications	MS242	Role of the theory of stochastic processes – Normal processes and covariance stationary processes – counting processes and Poisson processes – Renewal counting processes – Morkov chain : discrete parameter – Markov chains: continuous parameter.	3	_	-	3

Contents of the Courses	-Credit Hour System I	Bylaw – Faculty of Science –	Assiut University – 2009

Course No.	Course Title	Pre-	Title Pre- Contents Ho		ours/V	Veek
& Code		requisites		L	P/T	С
MS347	Probability (2)	MS242	Conditional probability and distribution functions – Independence of random variables – Expectation of functions of two variables – Conditional expectation – Correlation and moment generating function in more than one variable – Bivariate normal – Distributions of functions of random variables.	3		3
MS348	Statistical Quality Control	MS242	Sampling Distribution of proportions, variance, range and standard deviations. Single sampling plans Double and sequential planes. Item-by- item sequential planes. Multiple sampling plan. Causes of violation in quality control limits.	3	- ·	3
MS349	Time Series Analysis	MS242	Time series – Graphs of time series – Characteristic movements of time series – Classification of time series movements – The analysis of time series – Moving averages – Smoothing of time series – Estimation of trend – Estimation of seasonal variations – Seasonal index – Deseasonalization of data.	3	[	3
MC351	Operating system	MC251	Introduction to function, design, and implementation of operating system – co-ordination and synchronization processes – scheduling and dispatch – physical and virtual memory organization – paging and segmentation – device management – file systems – security and protection – communications and networking – distributed systems.	2	2 -	3
MC352	Artificial Intelligence	M223 & MC252	Goals and methods of artificial intelligence. Methods of general problem solving. Introduction to mathematical logic. Mechanical theorem proving. Game playing. Natural language processing.	2	2 -	3
MC353	Algorithms	M223& MC252	Divide and conquer algorithms – recurrences – greedy algorithms – dynamic programming – graph search – NP-completeness and its implications – randomized algorithms – amortized analysis – lower bounds approximation algorithms – on-line algorithms – applications	2	2 -	3
MC354	Computer Networks	MC351	Network architectures and protocols, placing emphasis on protocols used in the Internet. Specific topics include application layer protocols, network programming, transport protocols, routing, multicast; data link layer issues, multimedia networking, network security, and network management. Simulation of the network/transport layer functions, routing, congestion control, an Ethernet controller, and applications using TCP/IP or remote procedure calls. Intended audience: computer science and computer engineering majors.	2	2 -	3

Course No.	Course Title	Pre-	Contents	He	ours/	We	ek
& Code	Course Thie	requisites		L	P/T		С
MC355	Special Topics in Computer Science (1)	Dept. concept	Elected by Math. Dept. to meet new directions in Computer Science.	2	2	-	3
MC356	Introduction to Scientific Computations	M323 & MC252	Practical introduction to computational problem solving. Floating point arithmetic, conditioning and stability of algorithms – Mathematical software packages, MATLAB, Maple (etc) – Spreadsheets programs – Traditional programming languages; C and FORTRAN – Nontraditional programming environments – applications.	2	2	-	3
MC357	Databases	MC252	Introduction to database system – operational data – data independence – relational system – the architecture of a database system – relational algebra and calculus –recovery and concurrence security and integrity, database product family.	2	2	-	3
MC361	Logic Circuits	MC100	Basic logic concepts – combinational logic – multiplexers and de- multiplexers, encoders, decoders, adders and subtractors – look-ahead carry – comparators – programmable logic arrays and memories – design with MSI, logic families, tri-state devices, CMOS and TTL logic interfacing – Sequential logic – analog and digital conversion – data acquisition – microprocessors.	2	2	-	3
MC362	Systems Simulation	MC252	Animation hardware and software – parametric blending techniques – modeling physical and articulated objects – forward and inverse kinematics – key-frame, procedural, and behavioral animation – free-form deformation.	2	2		3
MC363	System Evaluation	MC362	Basic techniques of system performance evaluation. Specific topics include: performance modeling, discrete event simulation, verification and validation of simulation models, analysis of simulation output, analysis of single server queue and queuing networks, modeling of computer systems, networks, and other queuing or non-queuing systems.	2	2	-	3
MC364	Programming Languages Theory	MC252	Inductive Definitions - Levels of Syntax - Binding and Scope - Static and Dynamic Semantics - Functional Core Language - Recursion, Iteration, Fixed Points - Products and Records - Sums and Variants - Polymorphism - Data Abstraction - Recursive Types – Subtyping	2	2	-	3

\_

Course No.	Course Title	Pre-	Contents	Ho	ours/W	'eek
& Code		requisites		L	P/T	С
MC366	Image Processing	MC353	Scope and applications of image are proceessing.Perspective transformations (Modeling picture taking, perspective transformations in homogeneous coordinates and with two reference frames) .The spatial frequency domain (the sampling theorem, template matching and the convolution theorem, spatial filtering). Enhancement and Restoration, image segmentation. Image representation :( spatial differentiation and smoothing, template matching, region analysis, contour following). Descriptive methods in scan analysis. Hardware and software considerations.	2	2	3
MC367	Formal Language and Automata	MC 353	Alphabets and languages. Finite representation of language. Deterministic and non- deterministic finite automata and their applications. Equivalence considerations. Regular expressions. Context-free languages. Regular languages, pushdown automata. Properties of context-free languages. Determinism and parsing top-down parsing and bottom-up parsing. Turing machines: computing with Turing machines, combining Turing machines, and nondeterministic Turing machines.	2	2 -	3
MC368	Computer applications in statistics	MC252& MS242	Some Statistical applications using applications software.	2	2 -	3
M411	Functional Analysis	M312	Metric spaces - Banach Fixed Point Theorem - Normed and Banach spaces - Inner product and Hilbert spaces.	2		2
M412	Complex Variables	M312	Complex Numbers - Elementry functions - Limits and continuity - Complex Sequences - Complex Series - The Derivatives - Complex Integration - Contour integrals, and different types - Complex functions transformation - linear and bilinear transformation – Applications.	3		3
M413	Real Analysis (2)	M312	Functions on sets – Measurable Sets – Measurable Functions – Measurable Space – Abstract Integration – Convergence Theorems – Lebsgue Integration – Borl's measure - LP-Space – Riesz Representation – Differentiation and absolute Continuous – Inner Measures – Outer Measure – Product Measure.	3		3

Course	Course Title	D		Hours/Week					
No. & Code		Pre- requisites	Contents	L	P/T	С	3		
M417	Measure Theory and Integration	M312	Measurable functions – measure and Lebesge integral - convergence in measure – fatou's lemma - measure space – Radon theorem - product measures –Integral operators.	3	-	-	3		
M419	Mathematical analysis	M211	System of real numbers – real sequences – continuous functions – differentiable functions – complex numbers – elementary functions- limits and continuity – complex sequences – complex series – derivatives- complex integral – types of contour – integrals.	2	-	2	3		
M421	Topology and Differential Geometry (1)	M312	Topology of the real line - topological spaces – relative topology- base and sub bases - Vector Fields - Frenet formulae for an arbitrary curve - Congruent Curves.	2	-	2	3		
M422	Topology and Differential Geometry (2)	M421	Homeomorplism and topological property – Separation Axioms – Compactness - Surfaces and differentiable manifolds – Normal curvature and Geodesic Gaussion curvature - Integration an Riemannian Manifolds.	2	-	2	3		

\_\_\_\_\_

Course No.	Course Title	Pre-	Contents	He	ours	/We	eek
& Code	Course The	requisites		L	Р/Л	[	С
M424	Numerical Analysis (2)	M323	Iterative methods for linear system - Approximation theory – Eigenvalues - Numerical solutions of the initial value problems - Numerical solutions of the boundary value problems - Numerical solutions of partial differential equations.	3	-	-	3
M426	Operations Research (2)	M326	Classical optimization techniques – Numerical methods for unconstrained and constrained optimization problems – Calculus of variation – Optimal control problems (Pontriagen's maximums principals – Bellman's dynamic programming).	3	-	-	3
M427	Special Topics in Mathematics	Dept. concept	Elected by Math. Dept. to meet new directions in Mathematics	3	-	-	3
M431	Hydrodynamic & Elasticity(1)	M232	Analysis of Stress - Analysis of Strain - Generalized HookE's Law – Applications - Motion of compressible fluid turbulence motion – equation turbulence motion Deduced energy equation – mass transform through porous and non porous medico – Applications.	2	2	-	3
M432	Hydrodynamic & Elasticity(2)	M431	Motions of compressible fluid - equation of turbulence motion – Deduced energy equation - mass transfer through porous and non porous media - Applications	2	2	-	3
M433	Mathematical Foundations of Quantum & Statistical Mechanics (2)	M331	Linear operators – Principle postulates – Quantum mechanical viewpoint of harmonic oscillator – Quantum angular momentum – Motion in a central field – Hydrogen atom – Some approximation methods – Grand canonical ensemble – Theory of real gases – Bose–Einstein and Fermi–Dirac perfect gases – Internal partition function – Applications.	2	2	-	3
M434	Mathematical Modeling	M334	Principles of Mathematical models – Steps in building Math. – Model Approxiximation of Models(representation of dada, algebraic equations, differential equations,)- the relation of models to data- sources for errors- Adjusting data – Evaluation of Math – Model – Maths. For models- Optimization – Applications (Economic – Trafic – inflation – Population – Physics and engineering).	3	-	-	3
M436	Special Topics in Applied Mathematics (2)	Dept. concept	Elected by Math. Dept. to meet new directions in Applied Mathematics	3	-	-	3

\_

Course No.	Course Title	Pre-	Contents		Hours/Week			
& Code	Course The	requisites		L	Р/Т	- -	С	
M437	Mathematical Foundations of Electromagnetic Theory and Special Theory of Relativity (2)	M332	Principal Equations - Slow and Quasi Steady Motion - Motion of Charged Particles Under Electric and Magnetic Fields - General Solution of Dalambert Equations - Theory of radiation - Propagation of Electromagnetic Waves.	2	-	2	3	
MS440	Statistical Computations	MS347	Random number generation and Monte Carlo methods - Regression computations and application Simulation techniques - Basic likelihood tools - Fundamental principles of modeling - Bayesian computation techniques.	3	-	-	3	
MS441	Statistical Distributions	MS347	Central and noncentral $\chi 2$ , t and F distributions - Extreme value, Logistic and Pareto distributions – systems of distributions: Pearson and Burr - Compound, mixtures and finite distributions and their applications Identifiably – applications to exponential and Weibull distributions - Inferences using censored data.	2	-	-	2	
MS442	Mathematical Statistics	MS242	Distribution of Functions of Random Variables – Sampling distributions - Point Estimation - Interval Estimation - Hypothesis Testing.	3	-	-	3	
MS443	Reliability Theory	MS347	Reliability (survivor) function, failure (hazard) rate function and the relation between them and the distribution function – Some important distributions in reliability theory – Series and parallel systems – Partially redundant systems – Standby systems and switching – Mean time to failure – Effect of spare parts – Accelerated testing and models.	2	-	-	2	
MS444	Order Statistics	MS441	Order Statistics – Distribution of an order statistic – Jaint distribution of two order statistics – Properties of order statistics – Discrete order statistics – Order statistics from some specific distributions – Manumits relations – Bounds and approximations – Order statistics in statistical inference.	3	-	-	3	
MS446	Nonparametric Statistics	MS347	One-Sample problems - Two-Sample Problems - K-Sample Problems - Randamized Bloeks, goodness of Fit Tests.	3	-	-	3	
MS447	Experimental Design Models	MS347	Fundamental assumptions in analysis of variance – Completely Randomized design – Randomized block design – Latin square and related designs – Factorial designs – Hierarchical designs – Analysis of covariance.	3	-	-	3	

Course	Course Title		Contents		Hours/Week				
No. & Code		Pre- requisites		L	P/T	C			
MS448	Multivariate Analysis	MS347	The Multivariate normal distribution – Estimation of the mean vector and the covariance matrix – The maximum likelihood estimates of the mean vector and covariance matrix – the distributions and uses of sample correlation coefficients – Classification and observations.	3		3			
MS449	Queuing Theory	MS347	Queuing models and Kendall's notation – Occupation rate – Performance measures – Little's law – Pasta property – M/M/1 queue – M/M/C queue – M/Er/1 queue – M/G/1 queue – G/M/1 queue – Priority Queues – Simulation.	3		3			
MC451	Scientific Computations(1)	MC356	Numerical software packages; NAG, SPSS, Minitab – Methods for random number generators - Monte Carlo simulation – Interval Computation – Some problems in computational physics; (e.g., solution of transcendental equations arising from physics, Kepler equation ) – Some problem in computational chemistry; (e.g., Stiff ordering differential equations in chemical reaction Kinetics.)	2	2 -	3			
MC452	Distributed Computing	MC354	Introduction - Parallel and Distributed Architectures - Parallel Algorithm Design - Message-Passing Programming - Shared-Memory Programming - Performance Analysis – Applications	2		2			
MC453	Computer Security	MC354	Overview, characteristics of computer intrusion, points of security vulnerability, methods of defense, Basic encryption and decryption: different types of ciphers, characteristic of good ciphers, Security involving programs, database security, reliability and integrity, sensitive data, the inference problem, multilevel data security.	2		2			
MC455	Special Topics in Computer Science	Dept. concept	Elected by Math. Dept. to meet new directions in Computer Science	2	2 -	3			
MC457	Theory of Computation	M223& MC353	Models of computers including finite automata and Turing machines. Basics of formal languages with applications to the syntax of programming languages. Alternate characterizations of language classes. Proving unrecognizability. Unsolvable problems and their relevance to the semantics of programming.	2		2			

Course No.	Course Title	Pre-	Contents	Ho	Hours/Week		
& Code		requisites		L	P/T	(	С
MC458	Compilers	MC457	This course studies the principles of programming languages with an emphasis on programming language implementation and compiler design. This includes various techniques for describing and defining a language, as well as techniques for implementing compilers. Topics to be covered over two terms include: lexical analysis, syntactic analysis, recursive descent parsing, LR parsing, syntax-directed translation, type checking, run-time environments, code generation, code optimization, and various language design issues.	2	 	-	2
MC461	Computer Graphics	MC351	Software and hardware for interactive computer graphics. Implementation of device drivers, 3-D transformations, clipping, perspective, and input routines. Data structures, hidden surface removal, graphics devices and languages, 2- and 3-D object representations, and various aspects of rendering realistic images. Students will be expected to implement programs which span all stages of the 3-D graphics pipeline, including clipping.	2	2	-	3
MC462	Scientific Computations(2)	MC451	Soft computing; genetic and evolutionary algorithms, neural networks, Granular Computing, and swarm intelligence – Methods of cryptography – Methods for computational fluid dynamics – Elements of Computational Biology and bioinformatics, and their applications.	2	2	-	3
MC463	Data Communications	MC354	The study of remote access to and communications between computers. Network architectures and topology; communication protocols and interfaces, functional layers; transmission facilities including communications equipment, line utilization, switching, and error handling; standard protocols; network interfaces including routing and flow control.	2	2	-	3
MC464	Data Mining	MC352	Data Mining Overview – Data Warehouse – Data Preprocessing – Classification – Clustering – Prediction - Logistic Regression – Association Rules	2	2	-	3
MC466	Cryptography	MC354	Basics of Modern Cryptography - Cryptographic Tasks - Public Key Cryptography - Ciphers and Hashes - Cryptanalysis - Cryptographic Software	2	2	-	3
MC467	Software Design and Engineering	MC351	Design and engineering perspectives. Software construction. Decomposition and modularity; coding style; naming; configuration; testing; efficiency. Object-oriented design. Interaction styles; user models; requirements gathering; prototyping; evaluation. Design challenges. Project management. Models and metaphors of development	2	2	-	3
MC469	Computer Applications in Mathematics	MC252 & M323	Some applications in numerical analysis, operation research, differential equations and statistics using applications software	2	2	-	3

Course No.	Course Title	Due neguiaites	Contents			Hours/Week			
& Code	course rule	Pre-requisites				С			
M400 or MS400 or MC400	Research project/Article	Accomplishing of 100 C.H	selected topics in Mathematics or Statistics or Computer Science	2	-	- 2			

\_