NATIONAL UNIVERSITY

First Year Syllabus
Department of Computer Science and Engineering

Four Year B.Sc. Honours Course
Effective from the Session: 2017–2018

National University

Subject: Computer Science and Engineering
Syllabus for Four Year B.Sc. Honours Course
Effective from the Session: 2017-2018

Year wise courses and marks distribution.

FIRST YEAR

Semester I

Course Code	Course Title	Credit Hours
	Major Theory Courses	
510201	Structured Programming Language	3.0
	Major Lab Courses	
510202	Structured Programming Language Lab	1.5
	Minor Theory Courses	
510203	Electrical and Electronic Circuit	3.0
510205	Calculus	3.0
510207	Physics	3.0
510209	English	3.0
	Minor Lab Courses	
510204	Electrical and Electronic Circuit Lab	1.5
	Total Credits in 1st Semester	**18.0**

Semester II

Course Code	Course Title	Credit Hours
	Major Theory Course	
510211	Discrete Mathematics	3.0
	Minor Theory Courses	
510213	Digital Systems Design	3.0
510215	Linear Algebra	3.0
510217	Statistics and Probability	3.0
510219	History of the Emergence of Independent Bangladesh	3.0
	Minor Lab Courses	
510212	Digital Systems Lab	1.5
	Total Credits in 2nd Semester	**16.5**

Detailed Syllabus

First Semester

Course Code : 510201	**Marks : 80**	**Credits : 3**	**Class Hours : 45**
Course Title :	**Structured Programming Language**		

Computer Programming Techniques: flowchart, pseudocode and algorithm; structured programming language: data types, operators, expressions; control structures; functions and program structure: parameter passing conventions, scope rules and storage classes, recursion; header files; preprocessor; pointers and arrays; strings; multidimensional array; dynamic memory allocation; linked list: single linked list, double linked list, circular linked list; user defined data types: structures, unions, enumerations; bitwise operations; input and output: standard input and output, formatted input and output; error handling; file access; variable length argument list; command line parameters; error handling; graphics; linking; library functions.

Reference language: *C*

Reference Books:

1) *Shaum's Outline of Theory and Problems of Programming with C,*B. S. Gottfried, McGraw Hill, 3rdEdition.
2) *Teach Yourself C*Herbert Schildt, Published by Osborne, 3rd Edition.

Course Code : 510202	**Marks : 40**	**Credits : 1.5**	**Class Hours : 23**
Course Title :	**Structured Programming Language Lab**		

Objectives: Laboratory classes are based on course CSE 510201. The goal of this lab is to provide students with the skills needed to effectively design, develop, implement, debug, test, and maintain programs and more generally to solve problems in C programming language using a computer. Students will be asked to solve various problems in a regular basis to increase their programming ability. At the end of the course, students will have to develop a simple real-life programming project.

Course Code : 510203	**Marks : 80**	**Credits : 3**	**Class Hours : 45**
Course Title :	**Electrical and Electronic Circuit**		

AC Fundamentals and Circuit Theory : Basic Principles of AC Generators, Equations of Alternating Voltages and Currents, Definition of Frequency, Time Period, Amplitude, Phase and Phase Difference, RMS Value, Average Value and Form Factor, Addition of two AC quantities, AC through Resistance, Inductance, Capacitance, RLC Series Connection and Resonance, Parallel Resonance, RLC Transients, Series and Parallel AC Circuits, Methods of Analysis – AC networks: Theorems – AC networks, Power – AC networks.

Introduction to Semiconductors: Semiconductors and their properties, Bonds in semiconductor, Classification- Intrinsic and extrinsic semiconductors.

Semiconductor Diodes and Special Purpose Diodes: The pn junction- formation, properties and V-I characteristics, Basic constructions, characteristics, operations and uses of special diodes: Light-emitting diode (LED), Photo diode, Tunnel diode, Varactor diode, Shockley diode, Zener diode.

Bipolar Junction Transistors:npn and pnp transistors, Amplifying and switching actions of transistor, Transistor characteristics in CB, CE & CC configurations, Operating point, Transistor load line analysis.

BJT Biasing: Faithful amplification, Inherent variation of transistor parameters and thermal runway, Stabilization and stability factor, Methods of BJT biasing, Analysis and design of biasing circuits.

Single Stage Transistor Amplifier: Single stage amplifier circuit, Phase reversal, dc and ac equivalent circuits, Load line analysis, Voltage gain and power gain, Classification of amplifiers, Amplifier equivalent circuits.

Field Effect Transistors: Classification of FET, Construction, operation and characteristics of JFET, Transfer characteristics and Shockley's equation, Operation and characteristics curves of MOSFET, DC biasing of JFET.

Power Electronics: Operations, characteristics and applications of industrial electronics devices: SCR (Silicon Controlled Rectifier), TRIAC, DIAC, UJT (Unijunction Transistor)

Feedback Techniques and Op-amps: Concepts- negative and positive feedback, characteristics and gain with negative voltage and current feedback**,** Emitter Follower, Basic Op-amps- characteristics, inverting, non-inverting, integrators, differentiators, summing amplifiers.

Regulated Power Supply: Voltage regulation, Rectifiers – operation and efficiency, half-wave and full-wave rectifiers, Ripple factor, Filter circuits – capacitor input filter, LC filter and RC filter, Voltage regulator circuits- Zener diode and transistor voltage regulator.

Oscillators: Theory of oscillation, Tuned collector oscillator, Wien Bridge oscillator, Colpitt's oscillator, Hartley oscillator, Phase shift oscillator, Quartz crystal oscillator.

Reference Books:

1) *A Textbook of Electrical Technology,*Volume I, B.L.Theraja and A.K. Theraja

2) *Electronic Devices and Circuit Theory,* Robert L. Boylestead and Louis Nashelsky

Course Code : 510204	**Marks : 40**	**Credits : 1.5**	**Class Hours : 23**
Course Title :	**Electrical and Electronic Circuit Lab**		

Objectives: Laboratory classes are based on CSE 510203. The students will gain knowledge about single stage amplifier, regulated power supply etc. Several experiments will be performed with the operation amplifiers. The students will be introduced with differentiator, integrator, comparator etc. The students will construct and test the different passive and active filter circuits.

Course Code : 510205	**Marks : 80**	**Credits : 3**	**Class Hours : 45**
Course Title :	**Physics**		

Waves and Oscillations: Simple harmonic motion: Differential equation of a simple harmonic oscillator, Total energy and average energy, Combination of simple harmonic oscillations, Lissajous figures, Spring-mass system, Calculation of time period of torsional pendulum, Damped oscillation, Forced oscillation, Resonance; Wave: basic definitions, Differential equation

of a progressive wave, Power and intensity of wave motion, Stationary wave, Group velocity and phase velocity; Architectural acoustics, Reverberation and Sabine's formula.

Physical Optics: Theories of light, Interference of light, Young's double slit experiment; Displacement of fringes and its uses, Frenels Bi-prism, Interference at wedge shaped films, Newton's rings, Interferometers; Diffraction of light, Frenel and Fraunhoffer diffraction; Polarized light, Brewter's law, Malus law, Polarization by double refraction, Retardation plates, Nicol prism, Optical activity, Polarimeters, Polaroid.

Electricity and Magnetism: Electrostatics: Fields, Potentials, Capacitors and Dielectrics; Steady-State Current, RC Circuits, Time Varying Current And Fields, Steady-State Magnetic Fields, Electromagnetic Induction, Maxwell's Equations, Poynting's Theorem, Wave Equation, Waves in Vacuum and in Materials, Transmission and Reflection at Boundaries, Guided Waves, Dispersion.

Modern Physics: Special Theory of Relativity:Postulates of Special Theory of Relativity, Length Contraction, Time Dilation, Relativity of Mass, Mass and Energy Relation, Velocity Addition Theorem, Twin Paradox, Massless Particles; Atomic Structure: Electron Orbits, Atomic Spectra, The Bohr Atom, Energy Level and Spectra, Corresponding Principle, Atomic Excitation.

Reference Books:

1) *Fundamental of Physics,* Halliday, Resnick and Walker
2) *Physics,* Halliday, Resnick and Krane
3) *Physics for Engineers,* Part I, Dr. GiasUddin Ahmad
4) *Modern Physics,* Arthur Beizer

Course Code : 510207	**Marks : 80**	**Credits : 3**	**Class Hours : 45**
Course Title :	**Calculus**		

Differential Calculus

Function and their graphs (polynomial and rational functions, logarithmic and exponential functions, trigonometric functions and their inverses, hyperbolic functions and their inverses, combination of such functions).

Limits of Functions: Definition. Basic limit theorems with proofs: limit at infinity and infinite limits, Continuous functions. Algebra of continuous functions. Properties Continuous functions on closed and boundary intervals (no proof required).

Differentiation : Tangent lines and rates of change. Definition of derivative. One-sided derivatives. Rules of differentiation (proofs and applications). Successive differentiation.
Leibnitz theorem. Related rates. linear approximations and differentials.

Rolle's theorem: Lagrange's and Cauchy's mean value theorems. Extrema of functions. problems involving maxima and minima. Concavity and points of inflection.

Taylor's theorem with general form of the remainder ; Lagrange's and Cauchy's forms the remainder. Taylor's series. Differentiation and integration of series. Validity of Taylor expansions and computations and computations with series. indeterminate forms. L-Hospital's rules.

Integral Calculus

Integrals: Antiderivatives and indefinite-integrals. Techniques of Integration.Definite Integration using antiderivatives. Definite Integration using Riemann sums.
Fundmental theorems of Calculus, Basic properties of Integration.Integration by reduction.

Application of Integration: Plane areas. Solids of revolutions. Volumes by cylindrical shells volumes by cross-sections. Arc length and Surface of revolution.
Improper integrals. Gamma and Beta functions.

Graphing in polar co-ordinates. Tangents to polar curves. Area and length in polar coordinates.

Reference Books:

1) *Differential Calculus,* B. C. Das, B. N. Mukherjee
2) *Integral Calculus,* Dr. Abdul Matin
3) *A Text Book on Differential Calculus,* Mohammad, Bhattacharjee and Latif

Course Code : 510209	**Marks : 80**	**Credits : 3**	**Class Hours : 45**
Course Title :	**English**		

This course adopts an integrative approach to teaching the four basic skills: speaking, listening, reading and writing. Special emphasis will be given to the development of reading and writing skills. To ensure maximum benefit from this course, 30% of the total marks will be allotted to class work in reading and writing. **Speaking:** Students will focus on developing speaking which will include strategies for communication and an acquaintance with phonetics. Effective oral presentation. Tasks will include making statements, requests, inquiries, disagreeing, complaining and apologizing, discussing, and other oral presentations. **Listening:** Students will practice listening to spoken English and taking useful notes. **Reading:** Extracts from literary and general essays will be used to develop comprehension as well as an understanding of the nature of literary communication. Students will develop the following reading strategies: **Grammar in Use:** While grammar will generally be taught in context, some attention to grammar may be necessary a this stage. The following aspects may be taught: articles, verb patterns, sentence combining-subordination and coordination, conditional sentences, the infinitive, gerund, and participle, subject-verb agreement. **Writing:** Paragraph, précis and analytical writings, writing on current affairs, Scientific writing. **Commercial Correspondences:** Defining context, feedback and semantic gap. Different types of commercial and business letter writing, tender-notice and pre-qualification notice writing. Writing of different types of reports on specific topics.

Reference Books:

1) *College Writing Skills with Readings,* John Langan.
2) *The Craft of Business Letter Writing*, Matthew M Monippally, Tata McGraw-Hill Publishing Company Limited.
3) *Advanced Learners' Degree General English,* Chowdhury and Hossain.

Second Semester

Course Code :510211	Marks : 80	Credits : 3	Class Hours : 45
Course Title :	Discrete Mathematics		

Methods of Proof: Mathematical Induction, strong induction.

Counting: PigeonHole Principle, permutations and combinations, inclusion-exclusion principle.**Propositional and Predicate Calculus:** Statements and Compound statements, tautologies and contradictions, logical equivalence, arguments, variables and quantifiers, theory of inference. **Theory of Sets:** Basic concepts sets and elements, Venn diagram and membership table, set operations, algebra of sets duality classes of sets, power set. Introduction to principles of mathematical induction.**Functions:** Basic concept, types of functions. **Relations:** Basic concepts, presentation of relations, types of relations, properties of relations, partial orderings and equivalence relation closure properties. **Recurrence Relation:** Solving recurrence relation, generating functions. **Number Theory:** Division Algorithms-GCD, LCM,prime numbers and prime factorization, modular arithmetic and congruence, modular exponentiation, Euclidean algorithm. **Algebraic Systems:** operators, groups, semigroups, rings and fields. **Graph:** Basic definitions and different types of graphs, Representation of Graphs, Isomorphism, Connectivity, Planner Graphs, Euler's Formula, Kuratowski's Theorem, Eulerian and Hamiltonian Graphs, Graph Coloring techniques and applications. **Tree:** Properties of Tree, rooted trees, tree traversal, spanning tree.

Reference Books:

1) *Discrete Mathematics And Its Applications,* Kenneth H. Rosen
2) *Theory and Problems of Discrete Mathematics, Schaum's Outlines,* Lipschutz S.,Lipson M., TATA McGraw-Hill.

Course Code : 510213	Marks : 80	Credits : 3	Class Hours : 45
Course Title :	Digital System Design		

Introduction: Introductory concepts, Logic gates and Boolean algebra.

Combinatorial Logic: Combinational Circuits design using logic gates, universal gates. Minimization of switching functions, algebraic simplification, the Karnaugh map, Prime Implement.

Introduction to VHDL and CAD tools: hardware description and simulation.

Sequential Logic: NAND and NOR latches. Clocked SR. JK D and T flip-flops. FF timing consideration. Master-slave FF.

Complex Sequential logic: Frequency division and counting troubleshooting. Asynchronous ripple up and down counters, counters with any MOD numbers asynchronous IC counters, propagation delay. Parallel up down and up/down counters. Presentable counters. The 74193 counter. Decoding a counter. Cascading counters. Shift registers, IC shift, digital clock, troubleshooting case studies. MSI logic circuits: BCD-to-Decimal decoders, BCD-to-7 segment decoder/drivers. Encoders.

Multiplexer and Demultiplexer: Multiplexer and their applications, Demultiplexers, Troubleshooting case studies, Analog-to-Digital conversion, digital-ramp, successive approximation, flash ADC, Digital-to-Analog conversion: circuits, specifications, Sample and hold

circuits, Analog multiplexers, Data acquisition, digital voltmeter.

Memory Devices: Semiconductor memory technologies ROM architecture timing and type of ROM, EPROM, EEPROM, ROM applications. RAM architecture static and dynamic RAM, DRAM structure operation and refreshing. Expanding word size and capacity. Magnetic bubble and CCD memories trouble shooting case studies. Introduction to sequential circuits, formal representation of sequential circuits.

Arithmetic circuits: The half-adder full adder. Parallel adders, 2's complement addition and troubleshooting case studies.

Reference Books:

1) *Digital Systems: Principals and Applications,* Ronald J. Tocci, Neal S. Wildmer.
2) *Hand Book of Modern Digital Electronics,* G. Moazzam and M. ShorifUddin.
3) *Modern Digital Electronics*, R P Jain.
4) *An Engineering Approach to Digital Design*, William I. Fletcher.

Course Code : 510215	**Marks : 80**	**Credits : 3**	**Class Hours : 45**
Course Title :	**Linear Algebra**		

Vectors in R^n and C^n. Review of Geometric vectors on R^2 and R^3 space. Vectors in R^n and C^n. Inner product. Norm and distance in R^n and C^n.

Matrices and Determinants: Notion of matrix. Types of matrices. Matrix operation of matrix Algebra, Determinant function, Properties of determinants, Minors, Cofactors. Expansion and evaluation of determinants. Elementary row and column operation and row-reduces echelon matrices, Invertible matrices,Block matrices.

System of Linear Equations: Linear equations. System of linear equations (homogeneous and non-homogeneous) and determinants for solving system of linear equations.

Linear Transformations: Linear transformation. Kernel and image of a linear transformation and their properties. Matrix representation of linear transformation. Change of basis.

Eigenvalues and Eigenvectors : Eigenvalues and eigenvectors. Diagonalization andApplication.

Reference Books:

1) *Elementary Linear Algebra, Howard Anton, Chris Rorres*
2) *Linear Algebra, AbdurRahman*

Course Code : 510217	**Marks : 80**	**Credits : 3**	**Class Hours : 45**
Course Title :	**Statistics and Probability**		

Statistics – Definition and scope: past and present, its nature and characteristics, population and sample, descriptive and inferential statistics, scope and applications of statistics, abuse of statistics, sources of statistical data, primary and secondary sources. Data collection tools, types, etc. Construction of questionnaire and other field problems of data collection. Types of data, cross sectional, longitudinal, follow-up and panel data.

Processing of data: measurement scales, variables, attributes, classification, characteristic and basis of classification, array formation, tabulation, different types of tables, frequency distribution.

Presentation of data: graphical presentation of data, details of different types of graphs and charts with their relative merits and dements, concept of explorative data analysis, stem-and-leaf plot, schematic plots, extremes and median, hinges, outliers and 5 number summaries.
Characteristics of statistical data: measures of location, dispersion, skewness, kurtosis and their properties, moments, box -and- whiskers plots, trimean, trimmed mean, interpretation of data with these measures.
Correlation analysis: bivariate data, scatter diagram, simple correlation, rank correlation, correlation ratio, multiple and partial correlations, intraclass and biserial correlation.
Regression analysis: basic concept of regression, regression model, estimation of parameters (OLS method) in regression model, properties of estimators, interpreting the constants, some ideas of polynomial regression, 3-variable regression, estimation of parameters, standard error and other properties.
Association of attributes: concepts of independence, association and disassociation, contingency table, measure of association for nominal and data in contingency tables, partial association: different forms of correlation table.

Reference Books:

1) *Statistics for Business and Economics,* Paul Newbold, William Carlson, Betty Thorne.
2) *Business Statistics,* Md. Abdul Aziz.
3) *An Introduction to Statistics,* M. Nurul Islam.

Course Code : 510219	**Marks : 80**	**Credits : 4**	**Class Hours : 45**
Course Title :	**History of the Emergence of Independent Bangladesh**		

Introduction: Scope and description of the emergence of Independent Bangladesh.

1. Description of the country and its people.
a. Geographical features and their influence.
b. Ethnic composition.
c. Language.
d. Cultural syncretism and religious tolerance.
e. Distinctive identity of Bangladesh in the context of undivided Bangladesh.

2. Proposal for undivided sovereign Bengal and the partition of the Sub Continent, 1947.
a. Rise of communalism under the colonial rule,
b. Lahore Resolution 1940.
c. The proposal of Suhrawardi and Sarat Bose for undivided Bengal : consequences
d. The creation of Pakistan 1947.

3. Pakistan: Structure of the state and disparity.
a. Central and provincial structure.
b. Influence of Military and Civil bureaucracy.
C. Economic, social and cultural disparity

4. Language Movement and quest for Bengali identity
a. Misrule by Muslim League and Struggle for democratic politics.

b. Foundation of Awami League, 1949
c. The Language Movement: context and phases.
d. United front of Haque – Vasani – Suhrawardi: election of 1954, consequences.

5. Military rule: the regimes of Ayub Khan and Yahia Khan (1958-1971)

a. Definition of military rules and its characteristics.
b. Ayub Khan's rise to power and characteristics of his rule (Political repression, Basic democracy, Islamisation)
c. Fall of Ayub Khan and Yahia Khan's rule (Abolition of one unit, universal suffrage, the LegalFramework Order)

6. Rise of nationalism and the Movement for self-determination.

a. Resistance against cultural aggression and resurgence of Bengali culture.
b. The six point movement of Sheikh MujiburRahman
c. Reactions, importance and significance of the Six Point Movement.
d. The Agortola Case1968.

7. The mass-upsurge of 1969 and 11 point movement:

a. Background
b. Program significance and consequences.

8. Election of 1970 Non-cooperation movement of March 1971 and the Declaration of Independence by Bangobondhu

a. Election result and centres refusal to comply
b. The Non Co-operation movement, the 7th March Address of Bangobondhu, Operation Searchlight
c. Declaration of Independence by Bangobondhu and his arrest

9. The war of Liberation 1971

a. Genocide, repression of women, refugees
b. Formation of Bangladesh government and proclamation of Independence
c. The spontaneous early resistance and subsequent organized resistance (MuktiFouz, Mukti Bahini, guerillas and the frontal warfare)
d. Publicity Campaign in the war of Liberation (Shadhin Bangla Betar Kendra, the Campaigns abroad and formation of public opinion)
e. Contribution of students, women and the masses (Peoples war)
f. The role of super powers and the Muslim states in the Liberation war.
g. The Anti-liberation activities of the occupation army, the Peace Committee, Al- Badar, Al-Shams, Rajakars, pro Pakistan political parties and Pakistani Collaborators, killing of the intellectuals.
h. Trial of Bangabondhu and reaction of the World Community.
i. The contribution of India in the Liberation War
j. Formation of joint command and the Victory
k. The overall contribution of Bangabondhu and his leadership in the Independence struggle.

10. **The Bangabondhu Regime 1972-1975**

a. Homecoming
b. Making of the constitution
c. Reconstruction of the war ravaged country
d. The murder of Bangabondhu and his family and the ideological turn-around.

Reference Books:

1) *History of the Emergence of Independent Bangladesh,* Professor Dr. MuntasirMamun

2) *History of the Emergence of Independent Bangladesh, Professor Md. MozammelHaque*

3) *History of the Emergence of Independent Bangladesh, Md. A Salam, S M Nasir, Md. Nazrul Islam.*

Course Code :510220	**Marks : 40**	**Credits : 1.5**	**Class Hours : 23**
Course Title :	**Digital Systems Lab**		

Objectives: Laboratory assignments range from investigation of the properties of basic logic gates and flip-flops to the design of combinational and sequential circuits. Students experience the designing, implementation, testing and troubleshooting of digital/logic circuits using small and medium-scale integrated circuits devices. Computer-Aided Design tools and hardware description programming language (VHDL) are used for design, simulation, and verification.