

**Bengal College of Engineering and Technology**

**COURSE OUTCOMES (COs)**

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**Modified Course Outcomes**

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**Department of Information Technology**

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# First Year

Semester – I

(1st Semester)

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|  |                                       |
|--|---------------------------------------|
| <b>Course Title: Mathematics –IA</b>   | <b>Code: BS-M101</b>                  |
| <b>Type of Course: Theory</b>          | <b>Course Designation: Compulsory</b> |
| <b>Semester: 1st</b>                   | <b>Contact Hours: 3L+1T/week</b>      |
| <b>Continuous Assessment: 25 Marks</b> | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Outcomes</b> | <b>Details</b>  | <b>Action Verb</b> | <b>Knowledge Level</b> |
|------------------------|---|--------------------|------------------------|
| <b>BS-M101.CO1</b>     | Introduce the concepts of differential calculus including mean value theorems and Taylor/Maclaurin series to deal with the problems of engineering and optimization problems. | Introduce          | K2                     |
| <b>BS-M101.CO2</b>     | Understand definite and improper integrals, surface areas and volumes of solids of revolution.  | Understand         | K2                     |
| <b>BS-M101.CO3</b>     | Apply concepts of matrices, including operations, rank, and inversion to the systems of linear equations.   | Apply              | K3                     |
| <b>BS-M101.CO4</b>     | Analyze vector spaces, basis, dimension, and linear transformations, Rank-Nullity theorem.  | Analyze            | K4                     |
| <b>BS-M101.CO5</b>     | Evaluate eigen values and eigenvectors for square matrices and Develop the concept of diagonalization and inner product spaces for practical applications in engineering.     | Evaluate, Develop  | K5, K6                 |

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|--|---------------------------------------|
| <b>Course Title: Physics-I</b>         | <b>Code: BS-PH101</b>                 |
| <b>Type of Course: Theory</b>          | <b>Course Designation: Compulsory</b> |
| <b>Semester: 1st</b>                   | <b>Contact Hours: 3L+1T/week</b>      |
| <b>Continuous Assessment: 25 Marks</b> | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Outcomes</b> | <b>Details</b>  | <b>Action Verb</b> | <b>Knowledge Level</b> |
|------------------------|---|--------------------|------------------------|
| <b>BS-PH101.CO1</b>    | State and apply the basic concepts of mechanics.  | State, Apply       | K1, K3                 |
| <b>BS-PH101.CO2</b>    | Discuss Physical optics and Explain principles of lasers with applications.                               | Discuss, Explain   | K2                     |
| <b>BS-PH101.CO3</b>    | Describe and classify Dielectric and Magnetic properties of materials, Evaluate Maxwell's equations.      | Describe, Evaluate | K2, K5                 |
| <b>BS-PH101.CO4</b>    | Differentiate Classical Physics and Quantum Physics by Introducing Planck's law.                          | Differentiate      | K4                     |
| <b>BS-PH101.CO5</b>    | Explain wave particle duality, Davisson-Germer experiment and Compare different statistics for particles. | Explain, Compare   | K2, K4                 |

|   |                                       |
|---|---------------------------------------|
| <b>Course Title: Basic Electrical Engineering</b> | <b>Code: ES-EE101</b>                 |
| <b>Type of Course: Theory</b>                     | <b>Course Designation: Compulsory</b> |
| <b>Semester: 1st</b>                              | <b>Contact Hours: 3L+1T/week</b>      |
| <b>Continuous Assessment: 25 Marks</b>            | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Out-comes    | Details   | Action Verb         | Knowledge Level |
|---------------------|---|---------------------|-----------------|
| <b>ES-EE101.CO1</b> | Understand and apply basic laws and theorems in DC and AC circuits.   | Understand, Apply   | K2, K3          |
| <b>ES-EE101.CO2</b> | Analyze AC circuits using phasor; evaluate power and resonance conditions.  | Analyze             | K4              |
| <b>ES-EE101.CO3</b> | Explain and analyze the working principles and characteristics of transformers.   | Explain, Analyze    | K2, K4          |
| <b>ES-EE101.CO4</b> | Evaluate and describe construction, operation, and control of electrical machines.  | Discover, Determine | K4, K5          |
| <b>ES-EE101.CO5</b> | Apply power electronics basics for converters and inverters and Estimate energy consumption and design simple electrical installations with safety. | Apply, Design       | K3, K6          |

|   |                                       |
|---|---------------------------------------|
| <b>Course Title: Physics-I Laboratory</b> | <b>Code: BS-PH191</b>                 |
| <b>Type of Course: Practical</b>          | <b>Course Designation: Compulsory</b> |
| <b>Semester: 1st</b>                      | <b>Contact Hours: 3P/week</b>         |
| <b>Continuous Assessment: 40 Marks</b>    | <b>Final Exam: 60 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Out-comes    | Details  | Action Verb           | Knowledge Level |
|---------------------|--|-----------------------|-----------------|
| <b>BS-PH191.CO1</b> | Recall facts and read data in slide calliper's, screw gauge. Calculate different modulus of elasticity and coefficient of viscosity of water by applying basic knowledge of Physics.   | Recall                | K1              |
| <b>BS-PH191.CO2</b> | Implement sequential connection in electrical experiment to verify Kirchhoff's law and related phenomena.  | Implement             | K3              |
| <b>BS-PH191.CO3</b> | Organize optical instruments to illustrate physical properties of light and to observe spectral lines of light. Examine Hydrogen spectrum and calculate Rydberg constant by studying Hydrogen spectrum.                                  | Organize, Examine     | K4, K3          |
| <b>BS-PH191.CO4</b> | Evaluate Band Gap and Hall coefficient of a given intrinsic semiconductor and distinguish between different intrinsic semiconductors. Determine the dielectric constant of different dielectric materials and their usage in capacitors. | Evaluate, Distinguish | K5, K4          |
| <b>BS-PH191.CO5</b> | Investigate the values of Planck's const and stefan's constant applying modern Physics.  | Investigate           | K6              |

|   |                                       |
|---|---------------------------------------|
| <b>Course Title: Basic Electrical Engineering Lab</b> | <b>Code: ES-EE191</b>                 |
| <b>Type of Course: Practical</b>                      | <b>Course Designation: Compulsory</b> |
| <b>Semester: 1st</b>                                  | <b>Contact Hours: 2P/week</b>         |
| <b>Continuous Assessment: 40 Marks</b>                | <b>Final Exam: 60 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Out-comes</b> | <b>Details</b>   | <b>Action Verb</b>   | <b>Knowledge Level</b> |
|-------------------------|--|----------------------|------------------------|
| <b>ES-EE191.CO1</b>     | Understand basic electrical safety, and correctly handle lab instruments.  | Understand           | K2                     |
| <b>ES-EE191.CO2</b>     | Identify and operate electrical components (resistors, capacitors, inductors, machines, etc.).   | Apply                | K3                     |
| <b>ES-EE191.CO3</b>     | Calibrate instruments and perform measurements on electrical circuits.   | Analyze              | K4                     |
| <b>ES-EE191.CO4</b>     | Evaluate performance of single-phase and three-phase transformers.   | Evaluate             | K5                     |
| <b>ES-EE191.CO5</b>     | Interpret torque-speed characteristics of DC and Induction motors. And Demonstrate the application of converters and LT switchgear components. | Analyze, Demonstrate | K4, K2                 |

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|--|---------------------------------------|
| <b>Course Title: Workshop</b>          | <b>Code: ES-ME192</b>                 |
| <b>Type of Course: Practical</b>       | <b>Course Designation: Compulsory</b> |
| <b>Semester: 1st</b>                   | <b>Contact Hours: 1L+4P/week</b>      |
| <b>Continuous Assessment: 40 Marks</b> | <b>Final Exam: 60 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Out-comes</b> | <b>Details</b>  | <b>Action Verb</b> | <b>Knowledge Level</b> |
|-------------------------|---|--------------------|------------------------|
| <b>ES-ME192.CO1</b>     | Build thorough knowledge of various tools, machines, devices used in engineering practice.  | Understand         | K2                     |
| <b>ES-ME192.CO2</b>     | Acquire thorough knowledge of carrying out various operations in mechanical engineering workshop.   | Apply              | K3                     |
| <b>ES-ME192.CO3</b>     | Utilize measuring skills gained in workshop practice.   | Create             | K6                     |
| <b>ES-ME192.CO4</b>     | Students are able to demonstrate the various hand tools used in the basic mechanical engineering workshop sections–smithy, carpentry, assembling, welding etc.  | Understand         | K2                     |
| <b>ES-ME192.CO5</b>     | Practical knowledge of the dimensional accuracies and dimensional tolerances possible with different Manufacturing processes and Produce small devices of their interest, by assembling different components. | Evaluate           | K5                     |

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# First Year

Semester – II

(2nd Semester)

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|--|---------------------------------------|
| <b>Course Title: Chemistry-I</b>       | <b>Code: BS-CH 201</b>                |
| <b>Type of Course: Theory</b>          | <b>Course Designation: Compulsory</b> |
| <b>Semester: 2nd</b>                   | <b>Contact Hours: 3L+1T/week</b>      |
| <b>Continuous Assessment: 25 Marks</b> | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Outcomes</b> | <b>Details</b>  | <b>Action Verb</b> | <b>Knowledge Level</b> |
|------------------------|---|--------------------|------------------------|
| <b>BS-CH 201.CO1</b>   | Explain fundamental principles of atomic and molecular structure, including Schrodinger's equation, molecular orbital theory, and crystal field theory. | Understand         | K2                     |
| <b>BS-CH 201.CO2</b>   | Apply spectroscopic techniques such as electronic, vibrational, and NMR spectroscopy to analyze molecular structure and chemical properties.            | Apply              | K3                     |
| <b>BS-CH 201.CO3</b>   | Analyze intermolecular forces and predict physical properties of substances.  | Analyze            | K4                     |
| <b>BS-CH 201.CO4</b>   | Evaluate chemical equilibria using thermodynamic principles and apply the Nernst equation to electrochemical systems.                                   | Evaluate           | K5                     |
| <b>BS-CH 201.CO5</b>   | Compare periodic properties of elements and predict their physical and chemical behaviour.  | Compare            | K4                     |

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|--|---------------------------------------|
| <b>Course Title: Mathematics –IIA</b>  | <b>Code: BS-M201</b>                  |
| <b>Type of Course: Theory</b>          | <b>Course Designation: Compulsory</b> |
| <b>Semester: 2nd</b>                   | <b>Contact Hours: 3L+1T/week</b>      |
| <b>Continuous Assessment: 25 Marks</b> | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Outcomes</b> | <b>Details</b>   | <b>Action Verb</b> | <b>Knowledge Level</b> |
|------------------------|--|--------------------|------------------------|
| <b>BS-M201.CO1</b>     | Recall and explain fundamental concepts of probability, random variables, and standard distributions such as Binomial, Poisson, and Normal.                    | Remember           | K1                     |
| <b>BS-M201.CO2</b>     | Interpret and compute probabilities for discrete and continuous random variables using appropriate probability distributions.                                  | Apply              | K3                     |
| <b>BS-M201.CO3</b>     | Analyze concepts of joint, marginal, and conditional distributions to solve problems involving multiple random variables.                                      | Analyze            | K4                     |
| <b>BS-M201.CO4</b>     | Evaluate data using statistical measures such as mean, variance, skewness, and kurtosis, and evaluate the fit of data to theoretical distributions.            | Evaluate           | K5                     |
| <b>BS-M201.CO5</b>     | Relate appropriate statistical tests (e.g., t-test, chi-square test, F-test) to draw conclusions from sample data, and design basic hypothesis testing models. | Analyze            | K4                     |

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|--|---------------------------------------|
| <b>Course Title: Programming for Problem Solving</b> | <b>Code: ES-CS201</b>                 |
| <b>Type of Course: Theory</b>                        | <b>Course Designation: Compulsory</b> |
| <b>Semester: 2nd</b>                                 | <b>Contact Hours: 3L+1T/week</b>      |
| <b>Continuous Assessment: 25 Marks</b>               | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Out-comes</b> | <b>Details</b>   | <b>Action Verb</b> | <b>Knowledge Level</b> |
|-------------------------|--|--------------------|------------------------|
| <b>ES-CS201.CO1</b>     | Understand simple algorithms for arithmetic and logical problems, Translate the algorithms to programs in C language.                                | Understand         | K2                     |
| <b>ES-CS201.CO2</b>     | Execute, test and interpret correct syntax and logical errors in conditional branching and looping, with iteration Vs recursion.                     | Execute            | K3                     |
| <b>ES-CS201.CO3</b>     | Define array, string and functions to synthesize problem formulation.  | Define             | K1                     |
| <b>ES-CS201.CO4</b>     | Differentiate between different programming tools and techniques in (control structures, recursions, allocations array types, structures and union). | Differentiate      | K4                     |
| <b>ES-CS201.CO5</b>     | Assemble the knowledge of different programming tools and problem solving techniques in complex program.   | Assemble           | K6                     |

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|--|---------------------------------------|
| <b>Course Title: English</b>           | <b>Code: HM-HU201</b>                 |
| <b>Type of Course: Theory</b>          | <b>Course Designation: Compulsory</b> |
| <b>Semester: 2nd</b>                   | <b>Contact Hours: 2L/week</b>         |
| <b>Continuous Assessment: 25 Marks</b> | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Out-comes</b> | <b>Details</b>  | <b>Action Verb</b> | <b>Knowledge Level</b> |
|-------------------------|---|--------------------|------------------------|
| <b>HM-HU201.CO1</b>     | Recognize vocabulary building techniques, classify the word origins. Memorize prefixes, suffixes, antonyms, synonyms, acronyms. | Recognize          | K2                     |
| <b>HM-HU201.CO2</b>     | Apply correct sentence structure implementing correct syntax and punctuation. To organize ideas with precision.                 | Apply              | K3                     |
| <b>HM-HU201.CO3</b>     | Judge the common errors in writing through in-depth knowledge of grammar and practice to enhance linguistic efficacy.           | Judge              | K5                     |
| <b>HM-HU201.CO4</b>     | Select requisite data to demonstrate professional writing.  | Demonstrate        | K3                     |
| <b>HM-HU201.CO5</b>     | Develop overall language competency to cater to the linguistic requisites of the current industry trends.                       | Develop            | K6                     |

|   |                                       |
|---|---------------------------------------|
| <b>Course Title: Chemistry-I Laboratory</b> | <b>Code: BS-CH291</b>                 |
| <b>Type of Course: Practical</b>            | <b>Course Designation: Compulsory</b> |
| <b>Semester: 2nd</b>                        | <b>Contact Hours: 3P/week</b>         |
| <b>Continuous Assessment: 40 Marks</b>      | <b>Final Exam: 60 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Out-comes    | Details  | Action Verb | Knowledge Level |
|---------------------|--|-------------|-----------------|
| <b>BS-CH291.CO1</b> | Perform conductometric, potentiometric, and pH-metric titrations to determine the strength of acid and base solutions.                                       | Apply       | K3              |
| <b>BS-CH291.CO2</b> | Analyze the composition of water samples by determining dissolved oxygen, chloride ions, and hardness using appropriate analytical techniques.               | Analyze     | K4              |
| <b>BS-CH291.CO3</b> | Evaluate physicochemical properties such as surface tension, viscosity, and conductance of various substances and solutions.                                 | Evaluate    | K5              |
| <b>BS-CH291.CO4</b> | Carry out experiments to determine kinetic parameters like reaction rate constants and understand reaction mechanisms.                                       | Apply       | K3              |
| <b>BS-CH291.CO5</b> | Determine partition coefficient of a compound and perform synthesis-based and qualitative analysis experiments, such as polymer synthesis and salt analysis. | Determine   | K5              |

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|--|---------------------------------------|
| <b>Course Title: Programming for Problem Solving Lab</b> | <b>Code: ES-CS291</b>                 |
| <b>Type of Course: Practical</b>                         | <b>Course Designation: Compulsory</b> |
| <b>Semester: 2nd</b>                                     | <b>Contact Hours: 4P/week</b>         |
| <b>Continuous Assessment: 40 Marks</b>                   | <b>Final Exam: 60 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Out-comes    | Details   | Action Verb | Knowledge Level |
|---------------------|---|-------------|-----------------|
| <b>ES-CS291.CO1</b> | Choose appropriate data type for implementing programs in C language.                               | Choose      | K2              |
| <b>ES-CS291.CO2</b> | Write code to perform various mathematical calculations.  | Write       | K6              |
| <b>ES-CS291.CO3</b> | Analyze modular program involving input output operations, decision making and looping constructs.  | Analyze     | K4              |
| <b>ES-CS291.CO4</b> | Implement Arrays and functions and recursion. Apply pointers with arrays, structures and functions. | Implement   | K3              |
| <b>ES-CS291.CO5</b> | Select tools for effective handling of files.   | Evaluate    | K5              |

|  |                                       |
|--|---------------------------------------|
| <b>Course Title: Engineering Graphics and Design</b> | <b>Code: ES-ME291</b>                 |
| <b>Type of Course: Practical</b>                     | <b>Course Designation: Compulsory</b> |
| <b>Semester: 2nd</b>                                 | <b>Contact Hours: 1L+4P/week</b>      |
| <b>Continuous Assessment: 40 Marks</b>               | <b>Final Exam: 60 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Outcomes</b> | <b>Details</b>   | <b>Action Verb</b> | <b>Knowledge Level</b> |
|------------------------|--|--------------------|------------------------|
| <b>ES-ME291.CO1</b>    | Understand the applications of hand tools and machine tools.   | Understand         | K2                     |
| <b>ES-ME291.CO2</b>    | Analyze the safety measures required to be taken while using the tools.  | Analyze            | K4                     |
| <b>ES-ME291.CO3</b>    | Select the appropriate tools required to manufacture an object of predetermined shape and size considering least wastage and cost.         | Evaluate           | K5                     |
| <b>ES-ME291.CO4</b>    | Fabricate components with their own hands and Produce small devices of their interest by assembling different components.                  | Create             | K6                     |
| <b>ES-ME291.CO5</b>    | Confident on practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes. | Understand         | K2                     |

|  |                                       |
|--|---------------------------------------|
| <b>Course Title: Language Laboratory</b> | <b>Code: HM-HU291</b>                 |
| <b>Type of Course: Practical</b>         | <b>Course Designation: Compulsory</b> |
| <b>Semester: 2nd</b>                     | <b>Contact Hours: 2P/week</b>         |
| <b>Continuous Assessment: 40 Marks</b>   | <b>Final Exam: 60 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Outcomes</b> | <b>Details</b>  | <b>Action Verb</b>   | <b>Knowledge Level</b> |
|------------------------|---|----------------------|------------------------|
| <b>HM-HU291.CO1</b>    | List the linguistic/paralinguistic features (pronunciation/phonetics/voice modulation/stress/intonation/pitch and accent) of connected speech.  | List                 | K1                     |
| <b>HM-HU291.CO2</b>    | Understand and select data for effective professional communication.  | Understand, Select   | K2                     |
| <b>HM-HU291.CO3</b>    | Apply English language presentation skill in academic and professional communication.   | Apply                | K3                     |
| <b>HM-HU291.CO4</b>    | Analyze ideas, viewpoints to enhance critical thinking skills and evaluate individual thought process through the productive skills (writing, speaking) of English.   | Analyze and Evaluate | K4/K5                  |
| <b>HM-HU291.CO5</b>    | Creating an integration of the four language skills. Developing grammar skills for error-free communicative competence. Apply receptive skills (reading and listening) of English in academics and in Engineering profession. | Apply, Develop       | K3, K6                 |

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## Second Year

Semester – III

(3rd Semester)

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|---|---------------------------------------|
| <b>Course Title: Analog and Digital Electronics</b> | <b>Code: ESC 301</b>                  |
| <b>Type of Course: Theory</b>                       | <b>Course Designation: Compulsory</b> |
| <b>Semester: 3rd</b>                                | <b>Contact Hours: 3L/week</b>         |
| <b>Continuous Assessment: 25 Marks</b>              | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Out-comes</b> | <b>Details</b>   | <b>Action Verb</b> | <b>Knowledge Level</b> |
|-------------------------|--|--------------------|------------------------|
| <b>ESC 301.CO1</b>      | Understand the operations of different types of power amplifier as well as oscillator and multivibrators, Schmitt Trigger circuits, 555 Timer.   | Understand         | K2                     |
| <b>ESC 301.CO2</b>      | Implement number system and Boolean algebra, as well as all the combinational circuits (Adder and Subtractor circuits, Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator.). | Illustrate         | K3                     |
| <b>ESC 301.CO3</b>      | Analyze latch and all the Sequential circuits (SR, JK, D, T and JK Master-slave Flip Flops).   | Analyze            | K4                     |
| <b>ESC 301.CO4</b>      | Distinguish the basic concept of Registers (SISO, SIPO, PIPO, PISO) and Counters (Ring counter, Johnson counter, Synchronous and Asynchronous counters, Mod N Counter).                                  | Distinguish        | K4                     |
| <b>ESC 301.CO5</b>      | Evaluate the basic concepts of logic families (TTL, ECL, MOS, CMOS) and illustrate A/D and D/A conversion techniques.  | Evaluate           | K5                     |

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|--|---------------------------------------|
| <b>Course Title: Mathematics-III</b>   | <b>Code: BSC 301</b>                  |
| <b>Type of Course: Theory</b>          | <b>Course Designation: Compulsory</b> |
| <b>Semester: 3rd</b>                   | <b>Contact Hours: 2L/week</b>         |
| <b>Continuous Assessment: 25 Marks</b> | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Outcomes | Details  | Action Verb          | Knowledge Level |
|-----------------|--|----------------------|-----------------|
| BSC 301.CO1     | Recall and explain the fundamental concepts of sequences, series convergence test and Taylor's series for various function.  | Remember, Understand | K1, K2          |
| BSC 301.CO2     | Apply the techniques of multivariable differentiation, including partial derivatives, Jacobians and gradients to determine maxima, minima and saddle points of multi variable functions. | Apply                | K3              |
| BSC 301.CO3     | Analyze multivariable integrals using Cartesian and polar coordinates and apply fundamental theorems such as Green's, Gauss's and Stoke's Theorems to solve related problems.            | Analyze              | K4              |
| BSC 301.CO4     | Evaluate first-order and second-order ordinary differential equations using appropriate methods including variation of parameter, D-operator and Cauchy-Euler's methods.                 | Evaluate             | K5              |
| BSC 301.CO5     | Apply concepts of graph theory and mathematical techniques to develop solutions for engineering problems.  | Apply                | K3              |

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|--|---------------------------------------|
| <b>Course Title: Economics for Engineers (Humanities-II)</b> | <b>Code: HSMC 301</b>                 |
| <b>Type of Course: Theory</b>                                | <b>Course Designation: Compulsory</b> |
| <b>Semester: 3rd</b>   | <b>Contact Hours: 3L/week</b>         |
| <b>Continuous Assessment: 25 Marks</b>                       | <b>Final Exam: 70 Marks</b>           |

### COURSE OUTCOMES (COs)

*On completion of the course students will be able to*

| Course Outcomes | Details  | Action Verb | Knowledge Level |
|-----------------|--|-------------|-----------------|
| HSMC 301.CO1    | Understand major principles of economic analysis for decision making among alternative courses of action in engineering. | Understand  | K2              |
| HSMC 301.CO2    | Apply economic principles to prices and quantities in competitive supply and demand for goods and for money.             | Apply       | K3              |
| HSMC 301.CO3    | Describe various cost concepts and maintenance of break even scenario for a business.                                    | Remember    | K1              |
| HSMC 301.CO4    | Evaluate the overall functions of Demand, Supply, Price, Income of the firms.  | Create      | K5              |
| HSMC 301.CO5    | Analyze the impact of LPG on the Indian economy and solve economic problems using analytical techniques.                 | Analyze     | K4              |

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|--|---------------------------------------|
| <b>Course Title: Data Structure and Algorithms</b> | <b>Code: PCC-CS301</b>                |
| <b>Type of Course: Theory</b>                      | <b>Course Designation: Compulsory</b> |
| <b>Semester: 3rd</b>                               | <b>Contact Hours: 3L/week</b>         |
| <b>Continuous Assessment: 25 Marks</b>             | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Outcomes | Details   | Action Verb        | Knowledge Level |
|-----------------|---|--------------------|-----------------|
| PCC-CS301.CO1   | Define and explain basic data structures and algorithm analysis techniques.                   | Define             | K1              |
| PCC-CS301.CO2   | Implement and analyze searching and sorting algorithms in terms of time and space complexity. | Implement, Analyze | K3, K4          |
| PCC-CS301.CO3   | Apply stack and queue data structures in solving expression-related problems.                 | Apply              | K3              |
| PCC-CS301.CO4   | Analyze operations on different types of linked lists.  | Analyze            | K4              |
| PCC-CS301.CO5   | Design trees, graphs, and hashing techniques with their associated algorithms.                | Design             | K6              |

|  |                                       |
|--|---------------------------------------|
| <b>Course Title: Computer Organization</b> | <b>Code: PCC-CS302</b>                |
| <b>Type of Course: Theory</b>              | <b>Course Designation: Compulsory</b> |
| <b>Semester: 3rd</b>                       | <b>Contact Hours: 3L/week</b>         |
| <b>Continuous Assessment: 25 Marks</b>     | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Outcomes | Details  | Action Verb | Knowledge Level |
|-----------------|--|-------------|-----------------|
| PCC-CS302.CO1   | Understand basics of Computer Organization, concepts of computers and the Von Neumann architecture as sequences and operation of computers.      | Understand  | K2              |
| PCC-CS302.CO2   | Design arithmetic and logical operations with integer Binary numbers, representation of signed and unsigned numbers and floating-point operands. | Design      | K6              |
| PCC-CS302.CO3   | To describe the function of the instruction execution cycle, instruction formats, addressing modes, instruction set.                             | Describe    | K1              |
| PCC-CS302.CO4   | Distinguish the organization of various part of a system memory hierarchy.   | Distinguish | K4              |
| PCC-CS302.CO5   | Explain computer architectures and I/O communication with standard interfaces.   | Explain     | K2              |

|   |                                       |
|---|---------------------------------------|
| <b>Course Title: Analog and Digital Electronics Lab</b> | <b>Code: ESC 391</b>                  |
| <b>Type of Course: Practical</b>                        | <b>Course Designation: Compulsory</b> |
| <b>Semester: 3rd</b>                                    | <b>Contact Hours: 4P/week</b>         |
| <b>Continuous Assessment: 40 Marks</b>                  | <b>Final Exam: 60 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Outcomes | Details  | Action Verb | Knowledge Level |
|-----------------|--|-------------|-----------------|
| ESC 391.CO1     | Understand of the fundamental concepts and techniques used in digital electronics.   | Understand  | K2              |
| ESC 391.CO2     | Understand and examine the structure of various number systems and its application in digital design.                          | Understand  | K2              |
| ESC 391.CO3     | Apply the basic requirements for a design application and propose a cost effective solution of various combinational circuits. | Apply       | K3              |
| ESC 391.CO4     | Analyze basic requirements for a design application and propose a cost effective solution of various sequential circuits.      | Analyze     | K4              |
| ESC 391.CO5     | Design and verify analog circuits and troubleshoot digital circuit hazards.  | Design      | K6              |

|   |                                       |
|---|---------------------------------------|
| <b>Course Title: Data Structure and Algorithm Lab</b> | <b>Code: PCC-CS391</b>                |
| <b>Type of Course: Practical</b>                      | <b>Course Designation: Compulsory</b> |
| <b>Semester: 3rd</b>                                  | <b>Contact Hours: 4P/week</b>         |
| <b>Continuous Assessment: 40 Marks</b>                | <b>Final Exam: 60 Marks</b>           |

#### COURSE OUTCOMES (COs)

*On completion of the course students will be able to*

| Course Outcomes | Details  | Action Verb      | Knowledge Level |
|-----------------|--|------------------|-----------------|
| PCCCS391.CO1    | Implement linear data structures like arrays, stacks, queues, and circular queues.                                     | Implement        | K3              |
| PCCCS391.CO2    | Develop and perform operations on linked lists, including inversion and using them for stack and queue implementation. | Develop, Perform | K4              |
| PCCCS391.CO3    | Evaluate polynomial addition and multiplication using appropriate data structures.                                     | Evaluate         | K5              |
| PCCCS391.CO4    | Construct recursive and non-recursive tree traversals and perform AVL tree operations.                                 | Construct        | K6              |
| PCCCS391.CO5    | Apply threaded tree traversal, hashing, and sorting/searching algorithms in data processing.                           | Apply            | K3              |

|  |                                       |
|--|---------------------------------------|
| <b>Course Title: Computer Organization Lab</b> | <b>Code: PCC-CS392</b>                |
| <b>Type of Course: Practical</b>               | <b>Course Designation: Compulsory</b> |
| <b>Semester: 3rd</b>                           | <b>Contact Hours: 4P/week</b>         |
| <b>Continuous Assessment: 40 Marks</b>         | <b>Final Exam: 60 Marks</b>           |

#### COURSE OUTCOMES (COs)

*On completion of the course students will be able to*

| Course Outcomes | Details   | Action Verb | Knowledge Level |
|-----------------|---|-------------|-----------------|
| PCC-CS392.CO1   | Examine and verify the functionality of basic combinational circuits such as multiplexers, decoders, encoders, and comparators. | Examine     | K4              |
| PCC-CS392.CO2   | Design and implement arithmetic circuits such as adders, subtractors, and BCD adders.   | Design      | K6              |
| PCC-CS392.CO3   | Explain the concept of carry-look-ahead logic in designing high-speed adders.   | Explain     | K2              |
| PCC-CS392.CO4   | Implement Arithmetic and Logic Units (ALU) using multiplexer-based circuits for single-bit and multi-bit operations.            | Implement   | K3              |
| PCC-CS392.CO5   | Apply RAM operations and hardware description methods for computer organization.  | Evaluate    | K5              |

|                                 |                                |
|---------------------------------|--------------------------------|
| Course Title: IT Workshop       | Code: PCC-CS393                |
| Type of Course: Practical       | Course Designation: Compulsory |
| Semester: 3rd                   | Contact Hours: 4P/week         |
| Continuous Assessment: 40 Marks | Final Exam: 60 Marks           |

### COURSE OUTCOMES (COs)

*On completion of the course students will be able to*

| Course Outcomes | Details  | Action Verb   | Knowledge Level |
|-----------------|--|---------------|-----------------|
| PCC-CS393.CO1   | Understand the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.   | Understand    | K2              |
| PCC-CS393.CO2   | Develop the concept of Conditionals iteration (Loops, if-else statement) and Conditional Control (Break, Continue statement) in Python Programming to deal with real world simulation. | Develop       | K6              |
| PCC-CS393.CO3   | Discover the strategy to deal with String Manipulation, Strategy formation and Method Handling.  | Discover      | K4              |
| PCC-CS393.CO4   | Differentiate the different data-structure (List, Tuple, and Dictionary) for complete automation and bulk data handling.   | Differentiate | K5              |
| PCC-CS393.CO5   | Apply modular programming with functions, file handling, exception handling, and library packages for robust programs.   | Interpret     | K2              |

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## Second Year

Semester – IV

(4th Semester)

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|---|---------------------------------------|
| <b>Course Title: Discrete Mathematics</b> | <b>Code: PCC-CS401</b>                |
| <b>Type of Course: Theory</b>             | <b>Course Designation: Compulsory</b> |
| <b>Semester: 4th</b>                      | <b>Contact Hours: 3L+1T/week</b>      |
| <b>Continuous Assessment: 25 Marks</b>    | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Out-comes | Details  | Action Verb | Knowledge Level |
|------------------|--|-------------|-----------------|
| PCC-CS401.CO1    | Define fundamental mathematical concepts such as sets, relations, functions, and integers. | Define      | K1              |
| PCC-CS401.CO2    | Explain the concept of finite set, infinite set, countable and uncountable set.            | Explain     | K2              |
| PCC-CS401.CO3    | Apply inclusion-exclusion and Pigeon-hole principle to a real-life problem.                | Apply       | K3              |
| PCC-CS401.CO4    | Determine conjunctive normal form and disjunctive normal form of a logical problem.        | Determine   | K5              |
| PCC-CS401.CO5    | Analyze group homomorphism, integral domain and field.                                     | Analyze     | K4              |

|  |                                       |
|--|---------------------------------------|
| <b>Course Title: Computer Architecture</b> | <b>Code: PCC-CS402</b>                |
| <b>Type of Course: Theory</b>              | <b>Course Designation: Compulsory</b> |
| <b>Semester: 4th</b>                       | <b>Contact Hours: 3L/week</b>         |
| <b>Continuous Assessment: 25 Marks</b>     | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Out-comes | Details   | Action Verb       | Knowledge Level |
|------------------|---|-------------------|-----------------|
| PCC-CS402.CO1    | Memorize the fundamentals of computer architecture, performance metrics, and quantitative design techniques.  | Remember          | K1              |
| PCC-CS402.CO2    | Discuss the principles of pipelining including instruction and arithmetic pipelines, hazards, and exception handling.   | Understand        | K2              |
| PCC-CS402.CO3    | Apply techniques to handle pipeline hazards and optimize pipeline performance through hardware and compiler-level improvements.   | Apply             | K3              |
| PCC-CS402.CO4    | Describe hierarchical memory technologies including cache and virtual memory.   | Describe          | K2              |
| PCC-CS402.CO5    | Analyze instruction-level parallelism techniques such as superscalar, super pipelined, and VLIW architectures and Evaluate non-von Neumann architectures such as dataflow, reduction, and systolic systems. | Analyze, Evaluate | K4, K5          |

|  |                                       |
|--|---------------------------------------|
| <b>Course Title: Formal Language and Automata Theory</b> | <b>Code: PCC-CS403</b>                |
| <b>Type of Course: Theory</b>                            | <b>Course Designation: Compulsory</b> |
| <b>Semester: 4th</b>                                     | <b>Contact Hours: 3L/week</b>         |
| <b>Continuous Assessment: 25 Marks</b>                   | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Out-comes</b> | <b>Details</b>   | <b>Action Verb</b>  | <b>Knowledge Level</b> |
|-------------------------|--|---------------------|------------------------|
| <b>PCC-CS403.CO1</b>    | Understand the concept of abstract machines and their power to recognize the languages.  | Understand          | K2                     |
| <b>PCC-CS403.CO2</b>    | Demonstrate finites machines for modeling and solving computing problems.  | Apply               | K3                     |
| <b>PCC-CS403.CO3</b>    | Analyze Finite automata, Regular expression and regular grammars to describe regular languages.  | Analyze             | K4                     |
| <b>PCC-CS403.CO4</b>    | Develop context free grammars to generate strings from a context free language.  | Create              | K6                     |
| <b>PCC-CS403.CO5</b>    | Describe equivalence of languages accepted by Push Down Automata and languages generated by context free grammars and Distinguish an understanding of decidability and undecidability. | Understand, Analyse | K2, K4                 |

|  |                                       |
|--|---------------------------------------|
| <b>Course Title: Design and Analysis of Algorithms</b> | <b>Code: PCC-CS404</b>                |
| <b>Type of Course: Theory</b>                          | <b>Course Designation: Compulsory</b> |
| <b>Semester: 4th</b>                                   | <b>Contact Hours: 3L/week</b>         |
| <b>Continuous Assessment: 25 Marks</b>                 | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Out-comes</b> | <b>Details</b>   | <b>Action Verb</b> | <b>Knowledge Level</b> |
|-------------------------|--|--------------------|------------------------|
| <b>PCC-CS404.CO1</b>    | Analyze running time of Algorithms using asymptotic methods.   | Analyze            | K4                     |
| <b>PCC-CS404.CO2</b>    | Illustrate the techniques of Greedy paradigm, Branch and Bound, Backtracking etc and compare and contrast them.                | Illustrate         | K2                     |
| <b>PCC-CS404.CO3</b>    | Develop the algorithm techniques (example Divide and Conquer, Dynamic Programming etc) to solve different mathematical models. | Develop            | K6                     |
| <b>PCC-CS404.CO4</b>    | Apply optimization problems using backtracking and branch and Bound techniques.  | Apply              | K3                     |
| <b>PCC-CS404.CO5</b>    | Understand the concepts of NP Completeness, Randomized and Approximation Algorithms.   | Understand         | K2                     |

|  |                                       |
|--|---------------------------------------|
| <b>Course Title: Biology</b>           | <b>Code: BSC 401</b>                  |
| <b>Type of Course: Theory</b>          | <b>Course Designation: Compulsory</b> |
| <b>Semester: 4th</b>                   | <b>Contact Hours: 2L+1T/week</b>      |
| <b>Continuous Assessment: 25 Marks</b> | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Out-comes</b> | <b>Details</b>  | <b>Action Verb</b> | <b>Knowledge Level</b> |
|-------------------------|---|--------------------|------------------------|
| <b>BSC 401.CO1</b>      | Describe with examples the biological observations lead to major discoveries.   | Describe           | K1                     |
| <b>BSC 401.CO2</b>      | Explain the classification of kingdom and building blocks of life, classification at cellular, energy and excretory level, habitat, study of model organisms, explain techniques of biophysics to study biological phenomena, cancer diagnosis and treatment. | Explain            | K2                     |
| <b>BSC 401.CO3</b>      | Identify DNA as genetic material in the molecular basis of information transfer.  | Identify           | K3                     |
| <b>BSC 401.CO4</b>      | Analyze biological processes at the reductionistic level.   | Analyze            | K4                     |
| <b>BSC 401.CO5</b>      | Apply thermodynamic principles to biological systems and Identify microorganism.  | Apply, Identify    | K3                     |

|   |                                       |
|---|---------------------------------------|
| <b>Course Title: Environmental Sciences</b> | <b>Code: MC-401</b>                   |
| <b>Type of Course: Theory</b>               | <b>Course Designation: Compulsory</b> |
| <b>Semester: 4th</b>                        | <b>Contact Hours: 1L/week</b>         |
| <b>Continuous Assessment: 25 Marks</b>      | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Out-comes</b> | <b>Details</b>  | <b>Action Verb</b> | <b>Knowledge Level</b> |
|-------------------------|---|--------------------|------------------------|
| <b>MC-401.CO1</b>       | Resolve different open-ended problems related to air pollution acquiring the detailed knowledge about source, effect and mechanism of the pollution.  | Resolve            | K3                     |
| <b>MC-401.CO2</b>       | Conceive the basic of the need of natural resource management, environmental protection and population control.                                       | Conceive           | K2                     |
| <b>MC-401.CO3</b>       | Acquire skills for scientific problem-solving related to air, water, noise and land pollution.  | Acquire            | K1                     |
| <b>MC-401.CO4</b>       | Determine the issues related to noise pollution after studying the existing situation in detail.  | Determine          | K5                     |
| <b>MC-401.CO5</b>       | Develop awareness about the geographical feature of the country considering biodiversity and the variety of ecological systems present in the nature. | Develop            | K6                     |

|  |                                       |
|--|---------------------------------------|
| <b>Course Title: Computer Architecture Lab</b> | <b>Code: PCC-CS492</b>                |
| <b>Type of Course: Practical</b>               | <b>Course Designation: Compulsory</b> |
| <b>Semester: 4th</b>                           | <b>Contact Hours: 4P/week</b>         |
| <b>Continuous Assessment: 40 Marks</b>         | <b>Final Exam: 60 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Out-comes | Details   | Action Verb | Knowledge Level |
|------------------|---|-------------|-----------------|
| PCC-CS492.CO1    | Define the basic concepts and syntax of HDL used for digital system modeling.                             | Define      | K1              |
| PCC-CS492.CO2    | Construct digital logic circuits using HDL for basic arithmetic operations like addition and subtraction. | Construct   | K6              |
| PCC-CS492.CO3    | Analyze the working of 8-bit register and memory units designed using HDL.                                | Analyze     | K4              |
| PCC-CS492.CO4    | Describe the architecture of a simple 8-bit ALU and CPU using HDL.  | Describe    | K2              |
| PCC-CS492.CO5    | Evaluate different methods of interfacing between memory and CPU using HDL.                               | Evaluate    | K5              |

|  |                                       |
|--|---------------------------------------|
| <b>Course Title: Design and Analysis Algorithm Lab</b> | <b>Code: PCC-CS494</b>                |
| <b>Type of Course: Practical</b>                       | <b>Course Designation: Compulsory</b> |
| <b>Semester: 4th</b>                                   | <b>Contact Hours: 4P/week</b>         |
| <b>Continuous Assessment: 40 Marks</b>                 | <b>Final Exam: 60 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Out-comes | Details   | Action Verb    | Knowledge Level |
|------------------|---|----------------|-----------------|
| PCC-CS494.CO1    | Analyse different types of applications of Divide and Conquer techniques.   | Analyze        | K4              |
| PCC-CS494.CO2    | Understanding to implement Dynamic Programming techniques.  | Understand     | K2              |
| PCC-CS494.CO3    | Examine to implement knapsack, Job sequencing with deadlines, Prim's and Kruskal's algorithms by using greedy method.                       | Examine        | K4              |
| PCC-CS494.CO4    | Discuss the implementation of the N-Queen and Graph Coloring Problem by using Backtracking.   | Discuss        | K6              |
| PCC-CS494.CO5    | Apply 15 Puzzle problem by using Branch and Bound and Explain the way of implementation of BFS and DFS by using Graph Traversal Algorithms. | Apply, Explain | K3, K2          |

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## Third Year

Semester – V

(5th Semester)

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|---|---------------------------------------|
| <b>Course Title: Introduction to Industrial Management (Humanities III)</b> | <b>Code: HSMC-501</b>                 |
| <b>Type of Course: Theory</b>   | <b>Course Designation: Compulsory</b> |
| <b>Semester: 5th</b>  | <b>Contact Hours: 3L/week</b>         |
| <b>Continuous Assessment: 25 Marks</b>                                      | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Outcomes</b> | <b>Details</b>  | <b>Action Verb</b> | <b>Knowledge Level</b> |
|------------------------|---|--------------------|------------------------|
| <b>HSMC-501.CO1</b>    | Remember the principles of accounting and identify the various systems utilized in business settings.   | Remember           | K1                     |
| <b>HSMC-501.CO2</b>    | Discuss the creation of the right accounting tool needed for practical issues.  | Discuss            | K2                     |
| <b>HSMC-501.CO3</b>    | Explain the application of economic principles.   | Explain            | K2                     |
| <b>HSMC-501.CO4</b>    | Examine and model a sequential accounting tool for a process or system that is suitable for the necessary level of accuracy.  | Examine and model  | K3                     |
| <b>HSMC-501.CO5</b>    | Create a step-by-step economic strategy that complies with the necessary requirements and explain why a particular accounting method is appropriate for achieving the specified goal. | Create             | K6                     |

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|--|-------------------------------------|
| <b>Course Title: Artificial Intelligence</b> | <b>Code: PEC-IT501B</b>             |
| <b>Type of Course: Theory</b>                | <b>Course Designation: Elective</b> |
| <b>Semester: 5th</b>                         | <b>Contact Hours: 3L/week</b>       |
| <b>Continuous Assessment: 25 Marks</b>       | <b>Final Exam: 70 Marks</b>         |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Outcomes</b> | <b>Details</b>  | <b>Action Verb</b> | <b>Knowledge Level</b> |
|------------------------|---|--------------------|------------------------|
| <b>PEC-IT501B.CO1</b>  | Define fundamental concepts of AI, including intelligent agents, search algorithms, and knowledge representation.   | Remember           | K1                     |
| <b>PEC-IT501B.CO2</b>  | Explain and interpret various informed and uninformed search strategies used in AI applications.  | Understand         | K2                     |
| <b>PEC-IT501B.CO3</b>  | Apply AI techniques to solve complex engineering problems, considering ethical, societal, and environmental impacts.  | Apply              | K3                     |
| <b>PEC-IT501B.CO4</b>  | Analyze and differentiate between different AI methods and paradigms for given problem scenarios such as Understand and Apply Predicate Logic.  | Analyze            | K4                     |
| <b>PEC-IT501B.CO5</b>  | Evaluate the effectiveness of machine learning algorithms, including supervised and unsupervised learning techniques, for real-world applications; understand knowledge representation issues and concept learning. | Evaluate, Explain  | K5, K2                 |

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|--|-------------------------------------|
| <b>Course Title: Constitution of India</b> | <b>Code: MC-CS501</b>               |
| <b>Type of Course: Theory</b>              | <b>Course Designation: Elective</b> |
| <b>Semester: 5th</b>                       | <b>Contact Hours: 3L/week</b>       |
| <b>Continuous Assessment: 25 Marks</b>     | <b>Final Exam: 70 Marks</b>         |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Out-comes</b> | <b>Details</b>  | <b>Action Verb</b> | <b>Knowledge Level</b> |
|-------------------------|---|--------------------|------------------------|
| <b>MC-CS501.CO1</b>     | Describe the meaning and historical evolution of the Constitution of India, including its sources and salient features such as Citizenship, Preamble, Fundamental Rights and Duties, and Directive Principles of State Policy.  | Describe           | K2                     |
| <b>MC-CS501.CO2</b>     | Explain the federal structure and working of the Union Government, including the powers and roles of the President, Prime Minister, Council of Ministers, and the structure of the Parliament and Central Secretariat.  | Explain            | K2                     |
| <b>MC-CS501.CO3</b>     | Illustrate the structure and functions of State Government administration, focusing on the role of the Governor, Chief Minister, and State Secretariat.   | Illustrate         | K3                     |
| <b>MC-CS501.CO4</b>     | Demonstrate understanding of local self-government by evaluating the roles of elected and appointed officials at District, Block, and Village levels and the significance of grassroot democracy.   | Demonstrate        | K3                     |
| <b>MC-CS501.CO5</b>     | Evaluate the functioning of the Election Commission of India and State Election Commissions in promoting electoral integrity and democratic values, and analyze the roles of constitutional bodies and welfare institutions in protecting the interests of SC/ST/OBC and women within the framework of social justice and equity in governance. | Evaluate           | K5                     |

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|---|---------------------------------------|
| <b>Course Title: Software Engineering</b> | <b>Code: ESC501</b>                   |
| <b>Type of Course: Theory</b>             | <b>Course Designation: Compulsory</b> |
| <b>Semester: 5th</b>                      | <b>Contact Hours: 3L/week</b>         |
| <b>Continuous Assessment: 25 Marks</b>    | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Outcomes | Details  | Action Verb | Knowledge Level |
|-----------------|--|-------------|-----------------|
| ESC501.CO1      | Apply various process model approaches and techniques in each phase of SDLC to solve real world problem.   | Applying    | K3              |
| ESC501.CO2      | Analyze the various Software Engineering principles to understand the system and Requirement Engineering process.  | Analyzing   | K4              |
| ESC501.CO3      | Evaluate the various project models based on the analysis and design Engineering and Determine product quality through testing techniques – Unit, Integration, and System testing. | Evaluating  | K5              |
| ESC501.CO4      | Demonstrate the principles, processes and main knowledge areas for Software Project Management.  | Demonstrate | K2              |
| ESC501.CO5      | Design various types of UML diagram (like Activity, Class, Sequence, Object) with proper knowledge when use a particular type of tools based on the software product requirements. | Design      | K6              |

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|--|---------------------------------------|
| <b>Course Title: Compiler Design</b>   | <b>Code: PCC-CS501</b>                |
| <b>Type of Course: Theory</b>          | <b>Course Designation: Compulsory</b> |
| <b>Semester: 5th</b>                   | <b>Contact Hours: 3L/week</b>         |
| <b>Continuous Assessment: 25 Marks</b> | <b>Final Exam: 70 Marks</b>           |

#### COURSE OUTCOMES (COs)

*On completion of the course students will be able to*

| Course Outcomes | Details  | Action Verb | Knowledge Level |
|-----------------|--|-------------|-----------------|
| PCC-CS501.CO1   | Explain the phases in compilation process (lexical analysis, syntax analysis, semantic analysis, intermediate code generation, code optimization and code generation) and model a lexical analyzer.                        | Explain     | K5              |
| PCC-CS501.CO2   | Model language syntax using Context Free Grammar and construct Top-Down Parsers.   | Construct   | K3              |
| PCC-CS501.CO3   | Compare different types of parsers (Bottom-up and Top-down) and construct parser for a given grammar.  | Compare     | K5              |
| PCC-CS501.CO4   | Demonstrate the applications of SDT and different types of intermediate-code generation.   | Demonstrate | K2              |
| PCC-CS501.CO5   | Identify the storage organization used to support the runtime environment of a program and effectively generate machine code, while analyzing code optimization and code generation techniques in the compilation process. | Identify    | K1              |

|  |                                       |
|--|---------------------------------------|
| <b>Course Title: Operating Systems</b> | <b>Code: PCC-CS502</b>                |
| <b>Type of Course: Theory</b>          | <b>Course Designation: Compulsory</b> |
| <b>Semester: 5th</b>                   | <b>Contact Hours: 3L/week</b>         |
| <b>Continuous Assessment: 25 Marks</b> | <b>Final Exam: 70 Marks</b>           |

#### COURSE OUTCOMES (COs)

On completion of the course students will be able to

| Course Outcomes | Details   | Action Verb | Knowledge Level |
|-----------------|---|-------------|-----------------|
| PCC-CS502.CO1   | Demonstrate the concepts of Operating System Services, System calls, structure and types and basic principles used in the design of modern operating system and process.  | Demonstrate | K3              |
| PCC-CS502.CO2   | Discuss details of process management and threads for multiprogramming and multi-threading.   | Discuss     | K2              |
| PCC-CS502.CO3   | Develop different algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response.  | Develop     | K6              |
| PCC-CS502.CO4   | Evaluate different algorithmic solutions to process synchronization problems for Inter-Process communication.   | Evaluate    | K5              |
| PCC-CS502.CO5   | Analyze the necessary conditions and mechanisms for deadlock detection, avoidance, and prevention, and explain various techniques of memory management, including virtual memory, I/O hardware, and file and disk management systems. | Analyze     | K4              |

|  |                                       |
|--|---------------------------------------|
| <b>Course Title: Object Oriented Programming</b> | <b>Code: PCC-CS503</b>                |
| <b>Type of Course: Theory</b>                    | <b>Course Designation: Compulsory</b> |
| <b>Semester: 5th</b>                             | <b>Contact Hours: 3L/week</b>         |
| <b>Continuous Assessment: 25 Marks</b>           | <b>Final Exam: 70 Marks</b>           |

### COURSE OUTCOMES (COs)

On completion of the course students will be able to

| Course Outcomes | Details   | Action Verb | Knowledge Level |
|-----------------|---|-------------|-----------------|
| PCC-CS503.CO1   | Demonstrate proficiency in crafting simple yet effective programs that incorporate branching and looping structures, showcasing the ability to apply foundational programming techniques.   | Demonstrate | K3              |
| PCC-CS503.CO2   | Describe and implement classes with appropriate data members and methods for given scenarios, articulating the relationships among components to create cohesive object-oriented solutions.   | Describe    | K2              |
| PCC-CS503.CO3   | Analyze the principles of inheritance, interfaces, and exception handling to devise innovative solutions for real-world challenges, fostering adaptable programming skills.   | Analyze     | K4              |
| PCC-CS503.CO4   | Develop advanced multithreading programs, utilize packages effectively, and integrate wrapper classes to build robust and efficient applications.   | Develop     | K6              |
| PCC-CS503.CO5   | Apply common object-oriented design patterns to address general programming problems with an emphasis on reusable and maintainable code structures, and develop intuitive GUI applications using applet classes, Swing components, and event-handling mechanisms to deliver an interactive user experience. | Apply       | K3              |

|   |                                       |
|---|---------------------------------------|
| <b>Course Title: Software Engineering Lab</b> | <b>Code: ESC591</b>                   |
| <b>Type of Course: Practical</b>              | <b>Course Designation: Compulsory</b> |
| <b>Semester: 5th</b>                          | <b>Contact Hours: 4P/week</b>         |
| <b>Continuous Assessment: 40 Marks</b>        | <b>Final Exam: 60 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Outcomes | Details   | Action Verb | Knowledge Level |
|-----------------|---|-------------|-----------------|
| ESC591.CO1      | Understand a variety of approaches and perspectives of system development.  | Understand  | K2              |
| ESC591.CO2      | Identify the requirements which are relevant to the design of a system.   | Identify    | K2              |
| ESC591.CO3      | Design Software model with a set of objects and their relationships using structural modeling.                              | Design      | K6              |
| ESC591.CO4      | Develop use case diagrams, activity diagrams, class diagrams, sequence diagrams, object diagrams and collaboration diagram. | Develop     | K6              |
| ESC591.CO5      | Evaluate activities using behavioral modeling and analyze components through architectural modeling.                        | Evaluate    | K5              |

|   |                                       |
|---|---------------------------------------|
| <b>Course Title: Operating System Lab</b> | <b>Code: PCC-CS592</b>                |
| <b>Type of Course: Practical</b>          | <b>Course Designation: Compulsory</b> |
| <b>Semester: 5th</b>                      | <b>Contact Hours: 4P/week</b>         |
| <b>Continuous Assessment: 40 Marks</b>    | <b>Final Exam: 60 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Outcomes | Details  | Action Verb | Knowledge Level |
|-----------------|--|-------------|-----------------|
| PCC-CS592.CO1   | Understand different Unix/Linux commands and shell programming.  | Understand  | K2              |
| PCC-CS592.CO2   | Demonstrate the creation of processes and POSIX threads.   | Demonstrate | K3              |
| PCC-CS592.CO3   | Develop the problems of process scheduling and process synchronization (Signal and Semaphore).                                     | Develop     | K6              |
| PCC-CS592.CO4   | Evaluate the deadlock avoidance and detection algorithms.  | Evaluate    | K5              |
| PCC-CS592.CO5   | Analyze different memory allocation and file accessing techniques, and interpret inter-process communication through system calls. | Analyze     | K4              |

|  |                                       |
|--|---------------------------------------|
| <b>Course Title: Object Oriented Programming Lab</b> | <b>Code: PCC-CS593</b>                |
| <b>Type of Course: Practical</b>                     | <b>Course Designation: Compulsory</b> |
| <b>Semester: 5th</b>                                 | <b>Contact Hours: 4P/week</b>         |
| <b>Continuous Assessment: 40 Marks</b>               | <b>Final Exam: 60 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Outcomes</b> | <b>Details</b>  | <b>Action Verb</b> | <b>Knowledge Level</b> |
|------------------------|---|--------------------|------------------------|
| <b>PCC-CS593.CO1</b>   | Identify appropriate programming constructs and object-oriented principles to implement solutions for real-world scenarios, demonstrating a strong grasp of problem-solving skills.   | Identify           | K2                     |
| <b>PCC-CS593.CO2</b>   | Understand the fundamentals of object-oriented programming by exploring the key concepts of classes, objects, Constructors, Method Overloading, Method Overriding, Inheritance, and polymorphism through hands-on practice.   | Understand         | K2                     |
| <b>PCC-CS593.CO3</b>   | Develop and debug Programs using String Manipulation, and Arrays.   | Develop            | K3                     |
| <b>PCC-CS593.CO4</b>   | Develop and debug Programs using Wrapper Class and Vector.  | Develop            | K3                     |
| <b>PCC-CS593.CO5</b>   | Analyze and utilize an integrated development environment by creating and accessing packages, implementing multithreaded programming, and applying exception handling, while developing dynamic and user-friendly GUI applications using applets, Swing components, and event handling. | Analyze            | K4                     |

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## Third Year

Semester – VI

(6th Semester)

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|--|---------------------------------------|
| <b>Course Title: Database Management Systems</b> | <b>Code: PCC-CS601</b>                |
| <b>Type of Course: Theory</b>                    | <b>Course Designation: Compulsory</b> |
| <b>Semester: 6th</b>                             | <b>Contact Hours: 3L/week</b>         |
| <b>Continuous Assessment: 25 Marks</b>           | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Outcomes | Details   | Action Verb     | Knowledge Level |
|-----------------|---|-----------------|-----------------|
| PCC-CS601.CO1   | Explain the architecture of database systems, data abstraction, data independence, data models, and data manipulation operations.   | Explain         | K2              |
| PCC-CS601.CO2   | Apply relational query languages (Relational Algebra, Relational Calculus, SQL) and analyze relational database design using normalization, functional dependencies, and dependency preservation. | Apply / Analyze | K3 / K4         |
| PCC-CS601.CO3   | Demonstrate storage and indexing strategies such as B-trees and hashing for efficient data retrieval.   | Demonstrate     | K3              |
| PCC-CS601.CO4   | Analyze transaction processing concepts including concurrency control, recovery techniques, and ACID properties to ensure reliable database operations.   | Analyze         | K4              |
| PCC-CS601.CO5   | Evaluate database security mechanisms, advanced database models (object-oriented, distributed, web databases), and concepts of data warehousing and data mining.                                  | Evaluate        | K5              |

|  |                                       |
|--|---------------------------------------|
| <b>Course Title: Computer Networks</b> | <b>Code: PCC-CS602</b>                |
| <b>Type of Course: Theory</b>          | <b>Course Designation: Compulsory</b> |
| <b>Semester: 6th</b>                   | <b>Contact Hours: 3L/week</b>         |
| <b>Continuous Assessment: 25 Marks</b> | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Outcomes | Details  | Action Verb         | Knowledge Level |
|-----------------|--|---------------------|-----------------|
| PCC-CS602.CO1   | Define the basic concepts of Networking types, Networking Technologies and Layered Architecture.   | Define              | K1              |
| PCC-CS602.CO2   | Explain the representation of data and signals in data communication.                              | Explain             | K2              |
| PCC-CS602.CO3   | Demonstrate the physical layer and data link layer functioning and Design the individual networks. | Demonstrate/ Design | K3/K6           |
| PCC-CS602.CO4   | Examine the MAC sub-layer and their operations.  | Examine             | K4              |
| PCC-CS602.CO5   | Identify the different types of protocols and their functions within a network.                    | Identify            | K2              |

|  |                                     |
|--|-------------------------------------|
| <b>Course Title: Image Processing</b>  | <b>Code: PEC-IT601D</b>             |
| <b>Type of Course: Theory</b>          | <b>Course Designation: Elective</b> |
| <b>Semester: 6th</b>                   | <b>Contact Hours: 3L/week</b>       |
| <b>Continuous Assessment: 25 Marks</b> | <b>Final Exam: 70 Marks</b>         |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Out-comes      | Details  | Action Verb         | Knowledge Level |
|-----------------------|--|---------------------|-----------------|
| <b>PEC-IT601D.CO1</b> | Understand the fundamental concepts of a digital image processing (DIP) system.                    | Understand          | K2              |
| <b>PEC-IT601D.CO2</b> | Remember different techniques employed for the enhancement of images.                              | Remember            | K1              |
| <b>PEC-IT601D.CO3</b> | Apply the Frequency domain Techniques to real life image Processing.                               | Apply               | K3              |
| <b>PEC-IT601D.CO4</b> | Analyze image segmentation and representation techniques.  | Analyze             | K4              |
| <b>PEC-IT601D.CO5</b> | Analyze image restoration procedures and Understand the rapid advances of (DIP) in Machine vision. | Analyze/ Understand | K4/K2           |

|  |                                     |
|--|-------------------------------------|
| <b>Course Title: Pattern Recognition</b> | <b>Code: PEC-IT602D</b>             |
| <b>Type of Course: Theory</b>            | <b>Course Designation: Elective</b> |
| <b>Semester: 6th</b>                     | <b>Contact Hours: 3L/week</b>       |
| <b>Continuous Assessment: 25 Marks</b>   | <b>Final Exam: 70 Marks</b>         |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Out-comes      | Details  | Action Verb | Knowledge Level |
|-----------------------|--|-------------|-----------------|
| <b>PEC-IT602D.CO1</b> | Define the basic concepts of pattern recognition (measuring objects, features and patterns, representation, pre-processing, distance and similarity measures) and analyses bayes classifiers in terms of error probabilities, discriminant functions, decision surfaces, normal density and discriminant functions, discrete features. | Define      | K1              |
| <b>PEC-IT602D.CO2</b> | Explain the parameter estimation methods using the maximum-likelihood estimation, gaussian mixture models, expectation-maximization method and bayesian estimation and the non-parametric techniques such as k-Nearest neighbours, parzen window for density estimation.   | Explain     | K2              |
| <b>PEC-IT602D.CO3</b> | Analyze the linear discriminant function based classifier design such as perceptron and support vector machines.   | Analyze     | K4              |
| <b>PEC-IT602D.CO4</b> | Apply the Non-metric methods for pattern classification and formulate the dimension reduction methods such as principal component analysis, fischer's discriminant Analysis.   | Apply       | K3              |
| <b>PEC-IT602D.CO5</b> | Explain unsupervised learning and clustering algorithms, and analyses their strengths and weakness.  | Explain     | K2              |

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|--|-------------------------------------|
| <b>Course Title: Numerical Methods</b> | <b>Code: OEC-IT601A</b>             |
| <b>Type of Course: Theory</b>          | <b>Course Designation: Elective</b> |
| <b>Semester: 6th</b>                   | <b>Contact Hours: 3L/week</b>       |
| <b>Continuous Assessment: 25 Marks</b> | <b>Final Exam: 70 Marks</b>         |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Out-comes</b> | <b>Details</b>  | <b>Action Verb</b> | <b>Knowledge Level</b> |
|-------------------------|---|--------------------|------------------------|
| <b>OEC-IT601A.CO1</b>   | Demonstrate the basic concept of error analysis in Computational schemes.   | Demonstrate        | K2                     |
| <b>OEC-IT601A.CO2</b>   | Apply various interpolation methods and finite difference concepts.   | Apply              | K3                     |
| <b>OEC-IT601A.CO3</b>   | Explain the concept of numerical integration and its importance.  | Explain            | K2                     |
| <b>OEC-IT601A.CO4</b>   | Identify various numerical methods to solve linear and non-linear equation and its application in non-linear analysis.  | Identify           | K1                     |
| <b>OEC-IT601A.CO5</b>   | Apply numerical methods to find solutions of algebraic Equations using different techniques under various conditions, and define different types of differential equations numerically. | Apply              | K3                     |

|   |                                       |
|---|---------------------------------------|
| <b>Course Title: Research Methodology</b> | <b>Code: PROJ-CS601</b>               |
| <b>Type of Course: Theory</b>             | <b>Course Designation: Compulsory</b> |
| <b>Semester: 6th</b>                      | <b>Contact Hours: 3L/week</b>         |
| <b>Continuous Assessment: 25 Marks</b>    | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Out-comes</b> | <b>Details</b>  | <b>Action Verb</b> | <b>Knowledge Level</b> |
|-------------------------|---|--------------------|------------------------|
| <b>PROJ-CS601.CO1</b>   | Define and understand the motivation and objectives of research work.   | Define             | K1                     |
| <b>PROJ-CS601.CO2</b>   | Explain how to define and formulate a research problem.   | Explain            | K2                     |
| <b>PROJ-CS601.CO3</b>   | Identify the importance of literature review in a research work.  | Identify           | K3                     |
| <b>PROJ-CS601.CO4</b>   | Examine the appropriate statistical methods required for a particular research design and develop the appropriate research hypothesis for a research project. | Examine            | K4                     |
| <b>PROJ-CS601.CO5</b>   | Develop the skill set to correctly present a research work by following the protocols of writing a standard research report.                                  | Develop            | K6                     |

|   |                                       |
|---|---------------------------------------|
| <b>Course Title: Database Management System Lab</b> | <b>Code: PCC-CS691</b>                |
| <b>Type of Course: Practical</b>                    | <b>Course Designation: Compulsory</b> |
| <b>Semester: 6th</b>                                | <b>Contact Hours: 4P/week</b>         |
| <b>Continuous Assessment: 40 Marks</b>              | <b>Final Exam: 60 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Outcomes</b> | <b>Details</b>   | <b>Action Verb</b> | <b>Knowledge Level</b> |
|------------------------|--|--------------------|------------------------|
| <b>PCC-CS691.CO1</b>   | Design relational schemas and create tables, constraints, and indexes using SQL.   | Apply              | K3                     |
| <b>PCC-CS691.CO2</b>   | Manipulate and manage data using SQL DML and schema-alteration commands such as INSERT, UPDATE, DELETE, TRUNCATE, ALTER, and DROP.       | Apply              | K3                     |
| <b>PCC-CS691.CO3</b>   | Retrieve and analyze data using advanced SQL queries with WHERE conditions, aggregate functions, GROUP BY/HAVING, joins, and subqueries. | Analyze            | K4                     |
| <b>PCC-CS691.CO4</b>   | Administer database objects and security by creating views, managing users, and implementing privilege control through GRANT and REVOKE. | Apply              | K3                     |
| <b>PCC-CS691.CO5</b>   | Develop modular database applications by writing PL/SQL programs using cursors, exception handling, and stored procedures.               | Create             | K6                     |

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|--|---------------------------------------|
| <b>Course Title: Computer Networks Lab</b> | <b>Code: PCC-CS692</b>                |
| <b>Type of Course: Practical</b>           | <b>Course Designation: Compulsory</b> |
| <b>Semester: 6th</b>                       | <b>Contact Hours: 4P/week</b>         |
| <b>Continuous Assessment: 40 Marks</b>     | <b>Final Exam: 60 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Out-comes | Details  | Action Verb       | Knowledge Level |
|------------------|--|-------------------|-----------------|
| PCC-CS692.CO1    | Describe the Networking cables (CAT5, UTP), Connectors (RJ45, T-connector) and installation of Network Interface Card.   | Describe          | K1              |
| PCC-CS692.CO2    | Explain the working and difference of various networking devices like Hub, Bridge, Network Switch, Router and Modem.   | Explain           | K2              |
| PCC-CS692.CO3    | Developed a client server socket programming using TCP and UDP approach in C and Java and generate techniques Data link Layer Flow control mechanisms like Stop and Wait and Sliding Window using C. | Develop/ Generate | K3/K4           |
| PCC-CS692.CO4    | Explain how to implement Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check) and error control mechanism like Selective Repeat and GoBack-N algorithm using C.                       | Explain           | K5              |
| PCC-CS692.CO5    | Create the server setup configuration using different process like FTP, DNS, TelNet, NFS and concept of Firewall.  | Create            | K6              |

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## Fourth Year

Semester – VII

(7th Semester)

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|--|-------------------------------------|
| <b>Course Title: Machine Learning</b>  | <b>Code: PEC-IT701D</b>             |
| <b>Type of Course: Theory</b>          | <b>Course Designation: Elective</b> |
| <b>Semester: 7th</b>                   | <b>Contact Hours: 3L/week</b>       |
| <b>Continuous Assessment: 25 Marks</b> | <b>Final Exam: 70 Marks</b>         |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Out-comes      | Details  | Action Verb         | Knowledge Level |
|-----------------------|--|---------------------|-----------------|
| <b>PEC-IT701D.CO1</b> | Understand the Basic need of incorporating Self train ML model over Traditional Programming to identify the co-relative pattern using Statistical Approach for Classification (Discrete-data) and Regression (Continuous-data) analysis. | Understand          | K2              |
| <b>PEC-IT701D.CO2</b> | Differentiate the concept of Supervised ML (DT, LR, and Logistic Regression) and Un-Supervised ML (Clustering) and different standard algorithm for optimizing real world problem for non-linearity behavior over linearity.             | Differentiate       | K5              |
| <b>PEC-IT701D.CO3</b> | Identify the need of dimensionality Reduction techniques (LDA, PCA) to handle bias-variance trade-off to increase the model accuracy by reducing variance.   | Identify            | K1              |
| <b>PEC-IT701D.CO4</b> | Demonstrate the concept of Feature Engineering and handling of Time series data by using (RNN, LSTM model).  | Demonstrate         | K2              |
| <b>PEC-IT701D.CO5</b> | Evaluate the different approaches to select a ML model and Construct the concept of Bayesian Inference, Hidden Markov model, Deep-Learning framework, Reinforcement Learning to optimize situation dependent real world problem.         | Evaluate, Construct | K5, K6          |

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|--|-------------------------------------|
| <b>Course Title: Cyber Security</b>    | <b>Code: PEC-IT702F</b>             |
| <b>Type of Course: Theory</b>          | <b>Course Designation: Elective</b> |
| <b>Semester: 7th</b>                   | <b>Contact Hours: 3L/week</b>       |
| <b>Continuous Assessment: 25 Marks</b> | <b>Final Exam: 70 Marks</b>         |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| Course Out-comes      | Details   | Action Verb | Knowledge Level |
|-----------------------|---|-------------|-----------------|
| <b>PEC-IT702F.CO1</b> | Explain the different types of cyber-crime on cyber space.  | Explain     | K2              |
| <b>PEC-IT702F.CO2</b> | Recall the different laws related to cyber-crimes.  | Remember    | K1              |
| <b>PEC-IT702F.CO3</b> | Implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software or tools.        | Apply       | K3              |
| <b>PEC-IT702F.CO4</b> | Design and develop security architecture for an organization.   | Create      | K6              |
| <b>PEC-IT702F.CO5</b> | Analyze software vulnerabilities and find solutions in cyber-crime investigations, evidence and applicable law for real world case studies. | Analyze     | K4              |

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|--|---------------------------------------|
| <b>Course Title: Project Management and Entrepreneurship</b> | <b>Code: HSMC 701</b>                 |
| <b>Type of Course: Theory</b>                                | <b>Course Designation: Compulsory</b> |
| <b>Semester: 7th</b>   | <b>Contact Hours: 2L+1T/week</b>      |
| <b>Continuous Assessment: 25 Marks</b>                       | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Outcomes</b> | <b>Details</b>  | <b>Action Verb</b> | <b>Knowledge Level</b> |
|------------------------|---|--------------------|------------------------|
| <b>HSMC 701.CO1</b>    | Identify the phases of project management (Initiation, Planning, Execution, Monitoring and Controlling, and Closing).   | Identify           | K1                     |
| <b>HSMC 701.CO2</b>    | Demonstrate a clear understanding of the core concepts of project management, including scope, time, cost, quality, risk, and resources.  | Demonstrate        | K2                     |
| <b>HSMC 701.CO3</b>    | Apply project management methodologies (e.g., Waterfall, Agile, Scrum) to develop detailed project plans, timelines, and budgets.   | Apply              | K3                     |
| <b>HSMC 701.CO4</b>    | Analyze strategic decisions that entrepreneurs need to make the ability to engage in strategic planning and evaluate team performance by aligning skills, roles, and responsibilities within project constraints. | Analyze, Evaluate  | K4, K5                 |
| <b>HSMC 701.CO5</b>    | Develop clear communication strategies to keep all stakeholders informed and aligned with project goals.  | Develop            | K6                     |

|  |                                     |
|--|-------------------------------------|
| <b>Course Title: Soft Skills &amp; Interpersonal Communication</b> | <b>Code: OEC-IT701C</b>             |
| <b>Type of Course: Theory</b>                                      | <b>Course Designation: Elective</b> |
| <b>Semester: 7th</b>   | <b>Contact Hours: 3L/week</b>       |
| <b>Continuous Assessment: 25 Marks</b>                             | <b>Final Exam: 70 Marks</b>         |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Outcomes</b> | <b>Details</b>   | <b>Action Verb</b> | <b>Knowledge Level</b> |
|------------------------|--|--------------------|------------------------|
| <b>OEC-IT701C.CO1</b>  | Define soft skill, the process, importance and measurement of soft skill development.  | Define             | K1                     |
| <b>OEC-IT701C.CO2</b>  | Identify and discuss the communication models in interpersonal relations, classify the barriers; develop effective team communication skills.  | Identify, Discuss  | K2                     |
| <b>OEC-IT701C.CO3</b>  | Execute essential formal writing skills; implement corporate communication styles; time management; etiquette and manners; analyze skills, methods, strategies and essential tips for effective public speaking. | Execute, Analyze   | K3, K4                 |
| <b>OEC-IT701C.CO4</b>  | Judge, argue/defend in group discussions; face interviews; prepare and deliver presentations; enhance presentation skills.   | Judge, Evaluate    | K5                     |
| <b>OEC-IT701C.CO5</b>  | Design precise reports and technical documents/presentation slides; personality development; develop competent industry-specific interview skills.   | Design, Develop    | K6                     |

|  |                                       |
|--|---------------------------------------|
| <b>Course Title: Project-II</b>        | <b>Code: PROJ-IT781</b>               |
| <b>Type of Course: Sessional</b>       | <b>Course Designation: Compulsory</b> |
| <b>Semester: 7th</b>                   | <b>Contact Hours: 12P/week</b>        |
| <b>Continuous Assessment: 25 Marks</b> | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Out-comes</b> | <b>Details</b>  | <b>Action Verb</b> | <b>Knowledge Level</b> |
|-------------------------|---|--------------------|------------------------|
| <b>PROJ-IT781.CO1</b>   | Identify the Problem and Problem Domain in the broad field of Computer Science and Engineering. | Identify           | K3                     |
| <b>PROJ-IT781.CO2</b>   | Understand the Research Methodologies and Field Study.  | Understand         | K2                     |
| <b>PROJ-IT781.CO3</b>   | Understand the Tools and Techniques used.   | Understand         | K2                     |
| <b>PROJ-IT781.CO4</b>   | Identify of the Relevant Resources and Data Set.  | Identify           | K3                     |
| <b>PROJ-IT781.CO5</b>   | Prepare of s/w and h/w requirement analysis and Develop goal in line with flow of work.         | Prepare, Develop   | K6                     |

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## Fourth Year

Semester – VIII

(8th Semester)

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|--|-------------------------------------|
| <b>Course Title: Cryptography and Network Security</b> | <b>Code: PEC-IT801B</b>             |
| <b>Type of Course: Theory</b>                          | <b>Course Designation: Elective</b> |
| <b>Semester: 8th</b>                                   | <b>Contact Hours: 3L/week</b>       |
| <b>Continuous Assessment: 25 Marks</b>                 | <b>Final Exam: 70 Marks</b>         |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Outcomes</b> | <b>Details</b>   | <b>Action Verb</b> | <b>Knowledge Level</b> |
|------------------------|--|--------------------|------------------------|
| <b>PEC-IT801B.CO1</b>  | Classify the Symmetric encryption techniques and illustrate various private key cryptographic techniques.                | Understand         | K2                     |
| <b>PEC-IT801B.CO2</b>  | Make use of modular arithmetic's and public key cryptosystem to protect the data over network.                           | Apply              | K3                     |
| <b>PEC-IT801B.CO3</b>  | Evaluate the authentication and hash algorithms.   | Evaluate           | K4                     |
| <b>PEC-IT801B.CO4</b>  | Identify different protocols for effective key management, distribution and authentication in public key infrastructure. | Identify           | K3                     |
| <b>PEC-IT801B.CO5</b>  | Explain various security practices and system security standards.  | Explain            | K2                     |

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|---|-------------------------------------|
| <b>Course Title: E-Commerce and ERP</b> | <b>Code: OEC-IT802A</b>             |
| <b>Type of Course: Theory</b>           | <b>Course Designation: Elective</b> |
| <b>Semester: 8th</b>                    | <b>Contact Hours: 3L/week</b>       |
| <b>Continuous Assessment: 25 Marks</b>  | <b>Final Exam: 70 Marks</b>         |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Outcomes</b> | <b>Details</b>  | <b>Action Verb</b> | <b>Knowledge Level</b> |
|------------------------|---|--------------------|------------------------|
| <b>OEC-IT802A.CO1</b>  | Explain the fundamental concepts, advantages, disadvantages, threats, rules, and regulations of E-Commerce, including cyber laws. | Explain            | K2                     |
| <b>OEC-IT802A.CO2</b>  | Apply different technologies for E-Commerce including internet, intranet, extranet, mobile computing, and web security.           | Apply              | K3                     |
| <b>OEC-IT802A.CO3</b>  | Analyze and differentiate business models of E-Commerce (B2B, B2C, C2B, C2C, E-Governance) and strategies for development.        | Analyze            | K4                     |
| <b>OEC-IT802A.CO4</b>  | Evaluate supply chain management, e-payment mechanisms, content management, call centers, and marketing strategies in E-Commerce. | Evaluate           | K5                     |
| <b>OEC-IT802A.CO5</b>  | Design and appraise ERP systems, business process re-engineering, ERP modules, and integration of ERP with E-Commerce.            | Design             | K6                     |

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|---|-------------------------------------|
| <b>Course Title: Cyber Law and Ethics</b> | <b>Code: OEC-CS801B</b>             |
| <b>Type of Course: Theory</b>             | <b>Course Designation: Optional</b> |
| <b>Semester: 8th</b>                      | <b>Contact Hours: 3P/week</b>       |
| <b>Continuous Assessment: 25 Marks</b>    | <b>Final Exam: 70 Marks</b>         |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Out-comes</b> | <b>Details</b>  | <b>Action Verb</b>       | <b>Knowledge Level</b> |
|-------------------------|---|--------------------------|------------------------|
| <b>OEC-CS801B.CO1</b>   | Define and describe fundamental concepts of cybercrime, such as forgery, hacking, software piracy, and network intrusion.                         | Define / Describe        | K1                     |
| <b>OEC-CS801B.CO2</b>   | Classify categories of cybercrimes and explain how criminals plan passive and active attacks, including cyber stalking.                           | Classify / Explain       | K2                     |
| <b>OEC-CS801B.CO3</b>   | Illustrate security challenges related to mobile and wireless devices, and demonstrate cryptographic techniques to mitigate risks.                | Illustrate / Demonstrate | K3                     |
| <b>OEC-CS801B.CO4</b>   | Explain phishing techniques and analyze identity theft mechanisms and online identity protection strategies.                                      | Explain / Analyze        | K2 / K4                |
| <b>OEC-CS801B.CO5</b>   | Evaluate legal and ethical frameworks including Indian IT Act, public key certificates, and the role of cyber security law in digital governance. | Evaluate                 | K5                     |

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| <b>Course Title: Project-III</b>       | <b>Code: PROJ-CS881</b>               |
| <b>Type of Course: Sessional</b>       | <b>Course Designation: Compulsory</b> |
| <b>Semester: 8th</b>                   | <b>Contact Hours: 12P/week</b>        |
| <b>Continuous Assessment: 25 Marks</b> | <b>Final Exam: 70 Marks</b>           |

**COURSE OUTCOMES (COs)**

*On completion of the course students will be able to*

| <b>Course Out-comes</b> | <b>Details</b>  | <b>Action Verb</b> | <b>Knowledge Level</b> |
|-------------------------|---|--------------------|------------------------|
| <b>PROJ-CS881.CO1</b>   | Understand the underlying technical concepts and theory.  | Understand         | K2                     |
| <b>PROJ-CS881.CO2</b>   | Practice hands on experience to build the basic models and Integrate all the parts and deployment of the project. | Apply              | K3                     |
| <b>PROJ-CS881.CO3</b>   | Develop mathematical generalize of the solution.  | Create             | K6                     |
| <b>PROJ-CS881.CO4</b>   | Prepare a Dissertation and Presentation in the standard format for being evaluated by the Department.             | Create             | K6                     |
| <b>PROJ-CS881.CO5</b>   | Prepare a paper for Conference presentation/Publication in Journals, if possible.                                 | Create             | K6                     |