Faculty of Engineering & Technology

P. K. University Shivpuri (MP)

Department of Electronics Engineering

Evaluation Scheme & Syllabus for

B.Tech. - Electronics & Instrumentation Engineering

4TH year

(VII & VIII Semester)

CHOICE BASED CREDIT SYSTEM (CBCS)

[Effective from the Session: 2025-26]

STUDY AND EVALUATION SCHEME FOR B.TECH ELECTRONICS & INSTRUMENTATION ENGG.

YEAR 4th/SEMESTER-7th

SUBJECT CODE	SUBJECTS NAME	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	T	P		Th	Pr	Tot	Th	Pr	Tot	
UENTREI701	Entrepreneurship Development	3	0	0	3	30	-	30	70	-	70	100
UPOWEEI702	Power Plant Instrumentation	3	1	0	4	30	-	30	70	-	70	100
UOPTIEI703	Optical Instrumentation	3	1	0	4	30	-	30	70	-	70	100
UCONTEI704	Control System II	3	1	0	4	30	-	30	70	-	70	100
UTELEEI705	Telemetry Principles	3	0	0	3	30	-	30	70	-	70	100
UMINOEI706	Minor Project	0	0	2	1	-	25	25	-	25	25	50
UCONTEI707	Control Lab II	0	0	2	1	-	25	25	-	25	25	50
UINDUEI708	Industrial Training	0	0	2	1	-	25	25	-	25	25	50
Total		15	3	6	21	150	75	225	350	75	425	650

B.Tech. - Electronics & Instrumentation Engineering

4th YEAR / SEMESTER-VIII

SUBJECT CODE	SUBJECTSNAME	STUDY SCHEME Periods/Week			Credits	Marks In Evaluation Scheme						Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	T	P		Th	Pr	Tot	Th	Pr	Tot	
UNONCEI801	Non-Conventional Energy Resources	3	0	0	3	30	-	30	70	-	70	100
UCLOUEI802	Cloud Computing	3	1	0	4	30	-	30	70	-	70	100
UAUTOEI803	Automation And Robotics	3	1	0	4	30	-	30	70	-	70	100
UCOMPEI804	Computerized Process Control	3	-	0	3	30	-	30	70	-	70	100
UMAJOEI805	Major Project	-	-	12	7	-	100	100	-	200	200	300
Total		12	2	12	21	120	100	220	280	200	480	700

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L	T	P
3	0	0

UENTREI701: ENTREPRENEURSHIP DEVELOPMENT

UNIT -I

Entrepreneurship- definition. growth of
small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

UNIT -IV

Project Planning and control:

The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

Text / Reference Books:

I Forbat, John, “Entrepreneurship” New Age International.

J Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International

K Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

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L	T	P
3	1	0

UPOWEEI702: POWER PLANT INSTRUMENTATION

Unit I

Energy sources, their availability, worldwide energy production, energy scenario of India. Introduction to **Power generation-** Classification: Renewable and non-renewable energy generation resources. Renewable: small hydro; modern biomass; wind power; solar; geothermal and bio fuels. Non-renewable: fossil fuels (coal, oil and natural gas) and nuclear power.

Boiler: Types of boilers, boiler safety standards. Boiler instrumentation, control and optimization, combustion control, air to fuel ratio control, three element drum level control, steam temperature and pressure control ,boiler interlocks, sequence event recorder, data acquisition systems

Unit II

Thermal Power Plant- Method of power generation, layout and energy conversion process, Types of Turbines & control, Types of Generators, condensers. Types of pumps and Fans, variable speed pumps and Fans, Material handling system, study of all loops-water, steam, fuel etc.

Unit III

Hydroelectric Power Plant- Site selection, Hydrology, Estimationelectric power to be developed, classification of Hydropower plants, Types of Turbines for hydroelectric power plant, pumped storage plants, storage reservoir plants

Unit IV

Wind Energy: Power in wind, Conversion of wind power, Aerodynamics of wind turbine, types of wind turbine, and modes of operation, power control of wind turbines, Betz limit, Pitch & Yaw control, wind mill, wind pumps, wind farms, different generator protections, data recording, trend analysis, Troubleshooting & safety. Solar Energy: solar resource, solar energy conversion systems: Solar PV technology: Block diagram of PV system, advantages and limitations. Solar thermal energy system: Principle, solar collector and its types, solar concentrator and its types, safety

Unit V

Nuclear Power Plant: Nuclear power generation, control station and reactor control. Comparison of various plants: Comparison of thermal power plant, hydroelectric power plant, wind, solar, nuclear power plant on the basis of: Performance, efficiency, site selection, Economics-capital and running, safety standards, pollution, effluent management and handling. Power plant safety, Pollution monitoring, control Sound, Air, smoke, dust, study of Electrostatic precipitator

Text Books:

1. G.F. Gilman, “Boiler Control Systems Engineering”, ISA Publication.
2. P. K. Nag, “Power Plant Engineering”, McGraw Hill.

Reference Books:

1. B. H. Khan, “Non-conventional Energy Resources”, McGraw Hill.
2. Chetan Singh Solanki, “Renewable Energy Technology”, Prentice Hall Publication.
3. S. P. Sukhatme, “Solar Energy”, Tata McGraw Hill.
4. G. D. Rai, “Nonconventional Energy Sources”, Khanna Publication.

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L	T	P
3	1	0

UOPTIEI703: OPTICAL INSTRUMENTATION

Unit I

I Light Sourcing, Transmitting and Receiving Concept of Light, Classification of different phenomenon based on theories of light, Basic light sources and its Characterization, Polarization , Coherent and Incoherent sources, Grating theory, Application of diffraction grating, Electro - optic effect, Acousto-optic effect and Magneto-optic effect

Unit II

Opto –Electronic devices and Optical Components: Photo diode, PIN, Photo-Conductors, Solar cells, ,Phototransistors, Materials used to fabricate LEDs and Lasers Design of LED for Optical communication, Response times of LEDs ,LED drive circuitry, Lasers Classification :Rubylasers, Neodymium Lasers, He-Ne Lasers, CO2 Lasers, Dye Lasers, Semiconductors Lasers, Lasers Application

Unit III

Interferometry: Interference effect, Radio-metry, types of interference phenomenon and its Application, Michelson's Interferometer and its application Fabry-perot interferometer, Refractometer, Rayleigh's interferometers, Spectrographs and Monochromators, Spectrophotometers, Calorimeters, Medical Optical Instrument

Unit IV

Holography: Principle of Holography, On-axis and Off axis Holography, Application of Holography, Optical data storage. Optical Fiber Sensors: Active and passive optical fiber sensor, Intensity modulated, displacement type sensors, Multimode active optical fiber sensor (Micro bend sensor)Single Mode fiber sensor -Phase Modulates and polarization sensors

Unit V

Fiber optic fundamentals and Measurements: Fundamental of Fibers, Fiber Optic Communication system, Optical Time domain Reflectometer (OTDR), Time domain dispersion measurement, Frequency Domain dispersion measurement, Laser Doppler velocity meter.

Text Books:

1. J. Wilson & J. F. B. Hawkes, "Optoelectronics: An Introduction" PHI/ Pearson
2. Rajpal S. Sirohi "Wave Optics and its Application", Hyderabad, Orient longman Ltd.
3. A. Yariv, "Optical Electronics", C. B. S. Collage Publishing, New York, 1985.

Reference Books:

1. G. Hebbar, "Optical Fiber Communication", Cengage

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L	T	P
3	1	0

UCONTEI704: CONTROL SYSTEM-II

Unit I-

Sampling and Signal Conversion: Sampled-Data Control Systems, Digital to Analog Conversion, Sample and Hold operations, Sample and Hold Devices, frequency–Domain Characteristic of Zero order Hold. The Z-Transform: Linear Difference equations, The Pulse Response, The Definition of the Z transform, Relationship between the Laplace transform and the Z transform, Relationship between S -plane and the Z-plane, The constant Damping Loci, The constant Frequency Loci, The constant-Damping Ratio Loci, The Inverse Z-Transform, Theorems of the Ztransform, Limitations of the Z-transform, Application of the Z-transform ,Stability Analysis, Systems with Dead-Time.

Unit- II

Transfer Functions, Block Diagrams, and Signal flow Graphs The Pulse Transfer Function and The Z-Transfer Function, The Pulse Transfer Function of the Zero-Order Hold and the Relation Between G(s) and G(z), Closed loop systems, The Sampled Signal flow Graph, The Modified Z transfer function, Multirate Discrete Data System. Transform Design of Digital Controls Design of position Servo Design Specifications, Design on the W- plane, Design of the W-plane, the Digital PID Controllers.

Unit- III

State Space Analysis of Sampled Data Systems Discrete time state equations. Similarity Transformations, The Cayley-Hamilton Theorem, Realization of Pulse Transfer function, State Equations for sampled Data Systems, Concepts of Controllability and Observability, Liapunov Stability
Analysis Systems with Dead time.

Unit- IV

Design of digital controls using State Space analysis Formulation of the optimal control Problem Optimal State Regulator, Use of State Regulator results, Eigen value Assignment by State feedback, State observers Stochastic optimal State Estimation.

Unit- V

Mechanization of Control algorithms Using Micro Processors General Description of Microcontrollers, Digital quantization, Microprocessor based Position Control System.

Text Books:

1. M. Gopal, “Digital Control Engineering”, New Age International Publishers.
2. B.C. Kuo,“Digital Control Systems”, Oxford University Press. Reference Books:
Reference Books:
1. Venkatesh & Rao, “Control Systems”, Cengage

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UTELEEI705:TELEMETRY PRINCIPLES

L	T	P
3	0	0

Unit -I Introduction to Telemetry Principles:
Basic System, Classification, Non electrical telemetry systems, Voltage and current Telemetry systems, Frequency Telemetering, Power line carrier Communication.

Unit –II Multiplexed System:
Frequency Division Multiplex System- FDM, IRIG Standards, FM circuits, Phase Modulation Circuits, Receiving end, Phase Locked Local Loop, Mixers.
Time Division Multiplexed System – TDM/PAM system, PAM/ PM systems,
TDMPCM System, Digital Multiplexer, PCM Reception, Coding for varying level, DPCM, Standards.

Unit -III Modem:
Modems Introduction, QAM, modem protocol.

Unit -IV Transmitter and Receiver:
Transmitters, Transmission Techniques, Inter stage Coupling, Receiver Antennas: The Ideal structure, dipoles, arrays, current distribution and design consideration, Microwave Antennas.

Unit -V Filters:
Polynomial, Filters, Active RC Filters, Universal Filter Circuits, Switched Capacitor Filters, Digital Filters Basics of Satellite and Fiber Optic Telemetry Data Acquisition Systems (DAS), μP based DAS, Remote Control

Text Book:

1. D Patranabis, Telemetry Principle; TMH Ed 1 1999.
2.

Course Outcomes: At the end of this course students will demonstrate the ability to:
1. Explain the concept of Basic System, Classification, Non electrical telemetry systems, Voltage and current Telemetry systems, Frequency Telemetering, Power line carrier communication.
2. Design Phase Locked Local Loop, Mixers. Time Division Multiplexed System – TDM/PAM system.
3. Realize Modems & modem protocol.
4. Formulate Transmission Techniques, Inter stage Coupling, Receiver Antennas: The Ideal structure dipoles.
5. Design Active RC Filters, Universal Filter Circuits, Switched Capacitor Filters, Digital Filters Basics of Satellite and Fiber Optic.

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L	T	P
0	0	2

UCONTEI707: CONTROL LAB -II

LIST OF EXPERIMENTS:

1. Discrete Time LTI model.
2. Discrete pole locations & transients response

Small damping ($\varepsilon = 0.1$ $Wn = 4\pi/5T$) Medium damping ($\varepsilon = 0.4$ $Wn = 11\ \pi\ /5T$)

Large damping ($\varepsilon = 0.8$ $Wn = \pi\ /4T$)

3. Digital DC motor Speed control with PID controller.
4. Designing Lead & Lag Compensators.
5. Kalman Filter design.
6. State space design for the Inverted pendulum.
7. Consider modeling of DC Motor shown in figure.

The motor Physical Parameters are

(J) Moment of inertia of the rotor 0.01 kg.m2

(b) Motor viscous friction constant 0.1 N.m.s

(Ke) Electromotive force constant 0.01 V/rad/sec

(Kt) Motor torque constant 0.01 N.m/Amp

(R) Electric resistance 1 Ohm

(L) Electric inductance 0.5 H

and the design requirements are

i. Settling time less than 2 seconds

ii. Overshoot less than 5%

iii. Steady-state error less than 1%

Write a Matlab Program to find

a) LTI characteristics

b) PID control response

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L	T	P
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UMINOEI706: MINOR PROJECT

Students will carry out minor project during seventh semester as a part of curriculum .

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IVYear VII Semester

UMINOEI708: INDUSTRIAL TRAINING

Students shall carryout industrial training as a part of their curriculum after the completion of their 3rd year for 6 WEEKS/ 45 DAYS. After this their performance shall be evaluated during 7th semester by SUBMITTING TRAINING REPORT & CERTIFICATE, taking viva of each and every student.

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L	T	P
3	0	0

UNONCEI801: NON-CONVENTIONAL ENERGY RESOURCES

UNIT-I Introduction

Various non-conventional energy resources- Introduction, availability, classification, relative merits & demerits.

Solar Cells: Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations.

UNIT-II Solar Thermal Energy:

Solar radiation, flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

UNIT-III Geothermal Energy:

Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations.

Magneto-hydrodynamics (MHD):

Principle of working of MHD Power plant, performance and limitations.

Fuel Cells:

Principle of working of various types of fuel cells and their working, performance and limitations.

UNIT-IV

Thermo-electrical and thermionic Conversions:

Principle of working, performance and limitations.

Wind Energy:

Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems.

UNIT-V

Bio-mass:

Availability of bio-mass and its conversion theory. Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations.

Wave and Tidal Wave:

Principle of working, performance and limitations. Waste Recycling Plants.

Text/References Books:

1. Raja etal, “Introduction to Non-Conventional Energy Resources” Scitech Publications.
2. John Twideu and Tony Weir, “Renewal Energy Resources” BSP Publications, 2006.
3. M.V.R. KoteswaraRao, “ Energy Resources: Conventional & Non-Conventional “ BSPPublications,2006.
4. D.S. Chauhan,”Non-conventional Energy Resources” New Age International.
5. C.S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI Learning

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L	T	P
3	1	0

UCLOUEI802: CLOUD COMPUTING

UNIT-I

Introduction: Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed, History of Cloud Computing - Cloud Architecture - Types of Clouds - Business models around Clouds – Major Players in Cloud Computing issues in Clouds - Eucalyptus - Nimbus - Open Nebula, Cloud Sim.

UNIT-II

Cloud Services: Types of Cloud services: Software as a Service- Platform as a Service –Infrastructure as a Service - Database as a Service - Monitoring as a Service –Communication as services. Service providers- Google, Amazon, Microsoft Azure, IBM, Sales force.

UNIT-III

Collaborating Using Cloud Services: Email Communication over the Cloud - CRM Management – Project Management-Event Management - Task Management – Calendar - Schedules - Word Processing – Presentation – Spreadsheet - Databases – Desktop - Social Networks and Groupware.

UNIT-IV

Virtualization for Cloud: Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization – System VM, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - supervisors – Xen, KVM, VMware, Virtual Box, Hyper-V.

UNIT-V

Security, Standards and Applications: Security in Clouds: Cloud security challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium – The Distributed management Task Force – Standards for application Developers – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud. Hadoop – MapReduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine

Text Books:

1. David E.Y. Sarna, “Implementing and Developing Cloud Application”, CRC press 2011.
2. Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud computing synopsis and recommendation, May 2011.
3. Anthony T Velte, Toby J Velte, Robert Elsenpeter, “Cloud Computing: A Practical Approach”, McGrawHill 2010.
4. Haley Beard, “Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs”, Emereo Pty Limited, July 2008.

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L	T	P
3	1	0

UAUTOEI803: AUTOMATION AND ROBOTICS

Unit I

Automation: Definition, Advantages, goals, types, need, laws and principles of Automation. Elements of Automation. Fluid power and its elements, application of fluid power, Pneumatics vs. Hydraulics, benefit and limitations of pneumatics and hydraulics systems, Role of Robotics in Industrial Automation.

Unit II

Manufacturing Automation: Classification and type of automatic transfer machines; Automation in part handling and feeding, Analysis of automated flow lines, design of single model, multimode and mixed model production lines. Programmable Manufacturing Automation CNC machine tools, Machining centers, Programmable robots, Robot time estimation in manufacturing operations.

Unit III

Robotics: Definition, Classification of Robots - Geometric classification and Control classification, Laws of Robotics, Robot Components, Coordinate Systems, Power Source. Robot anatomy, configuration of robots, joint notation schemes, work volume, manipulator kinematics, position representation, forward and reverse transformations, homogeneous transformations in robot kinematics, D-H notations, kinematics equations, introduction to robot arm dynamics.

Unit IV

Robot Drives and Power Transmission Systems: Robot drive mechanisms: Hydraulic/Electric/Pneumatics, servo & stepper motor drives, Mechanical transmission method: Gear transmission, Belt drives, Rollers, chains, Links, Linear to Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearings. Robot end Effectors: Classification of End effectors – active and passive grippers, Tools as end effectors, Drive system for rippers. Mechanical, vacuum and magnetic grippers. Gripper force analysis and gripper design. 08

Unit V

Robot Simulation: Methods of robot programming, Simulation concept, Off-line programming, advantages of offline programming. Robot Applications: Robot applications in manufacturing-Material transfer and machine loading/unloading, Processing operations like Welding & painting, Assembly operations, Inspection automation, Limitation of usage of robots in processing operation. Robot cell design and control, Robot cell layouts-Multiple robots & Machine interference. 08

Text Books:

1 An Introduction to Robot Technology, by Coifet Chirroza, Kogan Page.

2 Robotics for Engineers, by Y. Koren, McGraw Hill.

3 Robotic: Control, Sensing, Vision and Intelligence, by Fu, McGraw Hill.

4 Introduction to Industrial Robotics, by Nagrajan, Pearson India.

5 Robotics, by J.J. Craig, Addison-Wesley.

6 Industrial Robots, by Groover, McGraw Hill.

7 Robotic Engineering - An Integrated Approach : Richard D. Klafter Thomas A.

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L	T	P
3	0	0

UCOMPEI804: COMPUTERISED PROCESS CONTROL

Unit I Basics of Computer-

Aided Process Control: Role of computers in process control, Elements of a computer aided Process control System, Classification of a Computer –Aided Process Control System Computer Aided Process–control Architecture: Centralized Control Systems, Distributed control Systems, Hierarchical Computer control Systems. Economics of Computer-Aided Process control. Benefits of using Computers in a Process control. Process related Interfaces: Analog Interfaces, Digital Interfaces, Pulse Interfaces, Standard Interfaces.

Unit II Industrial communication System: Communication Networking, Industrial communication Systems, Data Transfer Techniques, Computer Aided Process control software, Types of Computer control Process Software, Real Time Operating System

Unit III Process Modelling for computerized Process control:
Process model, Physical model, Control Model, Process modelling. Modelling Procedure: Goals Definition, Information Preparation, Model Formulation, Solution Finding, Results Analysis,Model Validation

Unit IVAdvanced Strategies For Computerized Process control:
Cascade Control, Predictive control, Adaptive Control, Inferential control, Intelligent Control, Statistical control.
Unit V Examples of Computerized Process Control:
Electric Oven Temperature Control, Reheat Furnace Temperature control, Thickness and Flatness control System for metal Rolling, Computer-Aided control of Electric Power Generation Plant.

Text Books:
1. S. K. Singh, “Computer Aided Process control”, PHI.
Reference Books:
1. C. L. Smith, “Digital computer Process Control”, Ident Educational Publishers.
2. C. D. Johnson, “Process Control Instrumentation Technology”, PHI.
3. Krishan Kant, “Computer Based Industrial Control”
4. Pradeep B. Deshpande & Raymond H. Ash, “ Element of Computer Process Control with Advance Control Applications”, Instrument Society of America, 1981.
5. C. M. Houpis & G. B. Lamond, “Digital Control System Theory”, Tata McGraw Hill.
COURSE OUTCOME: After completion of the course student will be able to:
CO1 Understand the Role of computers in process control, Elements of a computer aided Process control System, Classification of a Computer.
CO2 Design Phase Locked Local Loop, Mixers. Time Division Multiplexed System – TDM/PAM system
CO3 Realize Process model, Physical model, Control Model. Modelling Procedure.
CO4 Formulate of Cascade Control, Predictive control, Adaptive Control, Inferential control, Intelligent Control, Statistical control.
CO5 Design Electric Oven Temperature Control, Reheat Furnace Temperature control.

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L	T	P
0	0	14

UMAJOEI805: MAJOR PROJECT

Major project, include the project's design, implementation, and analysis, and a presentation showcasing the project's functionality and a comprehensive report detailing. Examples include smart energy systems, automation projects, robotics, or renewable energy solutions.