

Overview of Industrial Engineering Capstone Projects

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(A concise, structured guide for students, faculty, and industry partners)

1. Purpose of the Capstone

Objective	Why It Matters
Integrate theory & practice	Applies core IE concepts (operations research, ergonomics, supply chain, quality) to real-world problems.
Develop professional skills	Project management, teamwork, communication, data-driven decision making.
Create value for stakeholders	Delivers actionable recommendations or prototypes for a host organization.
Showcase competence	Serves as a portfolio piece for employment or graduate studies.

2. Typical Project Lifecycle

Phase	Key Activities	Deliverables
1. Initiation	- Identify sponsor (company, lab, NGO) - Define problem scope & objectives - Sign a project charter	Project charter, stakeholder register
2. Planning	- Conduct literature & benchmark review - Develop work-breakdown structure (WBS) - Create schedule (Gantt) and risk register - Gather process data (time studies, simulations, surveys)	Detailed project plan, risk mitigation matrix
3. Data Collection & Analysis	- Apply statistical tools (ANOVA, regression, DOE) - Model systems (linear programming, queuing, discrete-event simulation)	Data set, analysis report, model validation

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4. Solution Development	• Generate alternative feasible design, automation, layout, inventory policy) • Evaluate using cost?benefit, ROI, sensitivity analysis • Select optimal solution • Draft implementation roadmap (phases, resources, training)	Decision matrix, financial analysis, recommended solution
5. Implementation Planning	• Prepare SOPs, control charts, KPI dashboards • Conduct risk & change?management assessment	Implementation plan, control plan
6. Presentation & Documentation	• Write final report (executive summary, methodology, results, recommendations) • Prepare oral/visual presentation (slides, posters, demo) • Archive data & code in repository	Final report, slide deck, project repository
7. Reflection & Evaluation	• Capture lessons learned • Obtain sponsor feedback • Self?assessment of competencies	Lessons?learned document, evaluation forms

3. Common Themes & Project Types

Category	Example Topics	Typical Tools & Methods
Process Improvement	• Reducing cycle time in a machining cell • Lean value?stream mapping for Sigma DMAIC, time?study software a hospital pharmacy	Value?stream mapping, Kaizen, Six
Supply Chain & Logistics	• Designing a multi?modal distribution network • Inventory policy for perishable goods	Linear programming, network optimization, simulation (AnyLogic, Simio)

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Facilities Planning	• Layout redesign of a warehouse • Facility location for a new plant	CRAFT, CLASP, GIS tools, facility layout software
Quality & Reliability	• Implementing SPC for a PCB assembly line • Reliability growth analysis of a medical device	Control charts, Weibull analysis, R&R studies
Human Factors & Ergonomics	• Workstation redesign to reduce musculoskeletal risk • Designing an ergonomic assembly workstation	RULA/REBA, digital human modeling (Jack, AnyBody)
Data Analytics & Industry 4.0	• Predictive maintenance using sensor	