
SCOPE:	This course will present a modern approach to highway bridge analysis, design and evaluation based on the American Association of State Highway and Transportation Officials <i>LRFD Bridge Design Specification</i> , 2004 edition (with 05 and 06 interims). Course topics will include Types of Bridges, Site Design Overview, Highway Bridge Loading, Bridge Analysis, Bridge Deck Slabs, Steel Bridge Design, Prestressed Concrete Bridge Design, Substructure Design, Fatigue, Bridge Rating, and Testing and Evaluation.								
TEXTS	American Association of State Highway and Transportation Officials, <i>LRFD Bridge Design Specifications</i> , Washington, DC., 3 rd Edition, 2004 with 2005 and 2006 interims. R.M. Barker and J.A. Puckett, <i>Design of Highway Bridges</i> , John Wiley and Sons, Inc., New York, 1997. (optional)								
COURSE NOTES	Engineering Copy Center - required.								
INSTRUCTOR	Dr. J.A. Laman, 231J Sackett Building, jlaman@psu.edu Office Hours: Monday and Wednesday, 1:30 to 3:30								
LECTURES	M, W, F, 12:20 pm to 1:10 pm, Room 138 S. Henderson								
DESIGN REQMT'S	Homework will be assigned to provide design experience in the major aspects of bridge engineering and experience with commercially available software packages. Homework will not be graded, however, solutions will be posted for student review. In addition, a comprehensive, open-ended bridge design project will be completed by each student and presented to the class at the end of the semester.								
MID-TERM EXAMS	Two evening exams are scheduled. Date, time, and place to be announced.								
FINAL EXAM	A comprehensive written exam covering the main design aspects of the course. Date and time to be announced by University scheduling.								
GRADING	<table> <tr> <td>Mid-term</td> <td>2 @ 20% = 40%</td> </tr> <tr> <td>Project</td> <td>35%</td> </tr> <tr> <td>Final</td> <td>25%</td> </tr> <tr> <td>Total</td> <td>100%</td> </tr> </table>	Mid-term	2 @ 20% = 40%	Project	35%	Final	25%	Total	100%
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ADDITIONAL REFERENCES

- American Association of State Highway and Transportation Officials, *Standard Specifications for Highway Bridges*, Washington, DC., 1996, 16th Edition.
- American Association of State Highway and Transportation Officials, *Manual for Maintenance Inspection of Bridges*, Washington DC., 1983.
- American Concrete Institute, *Analysis and Design of Reinforced Concrete Bridge Structures*, ACI Committee 343 Report, Detroit, 1988.
- Ministry of Transportation, *Ontario Highway Bridge Design Code*, 3rd Edition, Downsview, Ontario, Canada, 1993.
- Bakht, B. and Jaeger, L.G., *Bridge Analysis Simplified*, McGraw-Hill Book Company, New York, 1985.
- Jaeger, L.G. and Bakht, B., *Bridge Analysis by Microcomputer*, McGraw-Hill Book Company, New York, 1989.
- Heins, C.P. and Firmage, D.A., *Design of Modern Steel Highway Bridges*, John Wiley and Sons, Inc., New York, 1979.
- Heins, C.P. and Lawrie, R.A., *Design of Modern Concrete Highway Bridges*, John Wiley, New York, 1984.
- Priestly, M.J.N., Seible, F, and Calvi, G.M., *Seismic Design and Retrofit of Bridges*, John Wiley and Sons, Inc., New York, 1996.
- Taly, N., *Design of Modern Highway Bridges*, McGraw-Hill Book Company, New York, 1998.
- Troitsky, M.S., *Planning and Design of Bridges*, John Wiley and Sons, Inc., New York, 1994.
- Xanthakos, P.P., *Theory and Design of Bridges*, John Wiley and Sons, Inc., New York, 1994.

Course Outline

Lecture Week	Reading	Topic
1	B&P Ch 1, 2, 3. AASHTO Sect 1 and 2.	Introduction to bridge engineering; historical perspective; bridge types; selection of site; hydraulics and scour.
2	B&P Ch 4 and 5 AASHTO Sect 3.1-3.8, 3.11, 3.13. West pp. 232-270.	Bridge loads, load combinations, and dynamics; design lane;
3	B&P Ch 5 AASHTO Sect 4	Influence lines for statically determinate structures. I.L. for statically indeterminate structures; influence surfaces
4	B&P Ch 6 pp. 255-342. AASHTO Sect 6	Application of STAAD III and SAP2000, bridge analysis methods including approximate, harmonic, and grillage. Transverse load distribution by AASHTO approx. methods.
5	B&P Ch 7 pp. 505-544. AASHTO Sect 9.1-9.7.	AASHTO concrete deck slab criteria and design example.
6	B&P Ch 8.4, 8.7-8.10 AASHTO Sect 6.1-6.5, 6.7, 6.10, A6.1, A6.2, B6.1-B6.3	AASHTO steel girder design criteria for: <ul style="list-style-type: none"> • composite compact and noncompact. • noncomposite compact and noncompact. Composite steel girder bridge design example.
7		Continue composite steel girder bridge design example.
8		Complete composite steel girder bridge design example. Project objectives tasks, deadlines.
9	B&P Ch 7 AASHTO Sect 5.1-5.5, 5.7, 5.9, 5.10.1-5.10.8, 5.10.10	AASHTO prestressed girder design criteria for moment: <ul style="list-style-type: none"> • Prestressed losses. • Steel and concrete stress limits. • Ultimate strength. Prestressed concrete girder bridge design example.
10		Continue prestressed concrete girder bridge design example.
11	AASHTO Sect 5.8	AASHTO prestressed concrete girder design criteria for shear. Complete prestressed concrete girder bridge design example.
12	B&P Ch 10 AASHTO A5.5, 10.1-10.7	Bridge substructure - pier, abutment: <ul style="list-style-type: none"> • Abutment types • Loading • Load combinations • Design example from Barker and Puckett
13	B&P Ch 8.2.6 AASHTO Sect 6.6	Fatigue of steel bridges; fatigue loading; fatigue critical details; fatigue design example.
14		Evaluation and rating of existing bridges, evaluation of existing bridges - example.
15		Presentation of projects. Makeup for field trips if scheduled.