SD2180 Ickelinjär akustik 6,0 hp

Non-linear Acoustics

Fastställande

Skolchef vid SCI-skolan har 2022-02-24 beslutat att fastställa denna kursplan att gälla från och med VT 2022, diarienummer: S-2022-0529

Betygsskala

A, B, C, D, E, FX, F

Utbildningsnivå

Avancerad nivå

Huvudområden

Särskild behörighet

Basic courses in mathematics, mechanics.

Engelska B/ Engelska 6

Undervisningsspråk

Undervisningsspråk anges i kurstillfällesinformationen i kurs- och programkatalogen.

Lärandemål

After the course, the participant shall be able to:

- Apply perturbation methods to new situations:
  - Predict the response of a novel, non-linear system – approximated by a conservative, finite degree-of-system – using a perturbation method.
  - Predict the response of a novel, non-linear system – approximated by a non-conservative, finite degree-of-system – using a perturbation method.
  - Calculate all the resonance frequencies of a forced, novel, non-linear system – approximated by a non-conservative, single degree-of-system – using a perturbation method.
  - Demonstrate a correct use of a perturbation method in the prediction of the standing wave response of a novel, non-linear continuous system – such as string, beam, plate or shell.
  - Predict the travelling wave response of a novel, non-linear continuous system using a perturbation method.
- Analyze non-linear acoustic phenomena:
  - Identify the non-linear phenomena for finite degree-of-freedom systems.
  - Point out the reasons for the non-linear phenomena for finite degree-of-freedom systems.
  - Identify the non-linear phenomena for continuous systems.
  - Point out the reasons for the non-linear phenomena for continuous systems.
- Judge the value of applied perturbation methods for a given application:
  - Write a short exposition evaluating the relative merits of the applied perturbation methods.
  - Compare the response results predicted by a perturbation method with those of a basic numerical method.
  - Explain the reasons for a good match between results obtained by a perturbation method and those of a basic numerical method.
  - Explain the reasons for any mismatch between results obtained by a perturbation method and those of a basic numerical method.

Also after the course, for higher grades (A-C), the participant shall be able to:

- Display a scientific attitude towards non-linear problems:
  - Demonstrate curiosity in identifying non-linear problems.
  - Seek natural causes of non-linear phenomena.
  - Demonstrate open-mindedness when seeking solutions.
  - Suspend judgments until all evidence is available.
  - Show objectivity in analyzing evidence and drawing conclusions.
  - Show willingness to revise conclusions as new evidence becomes available.

Kursinnehåll

Conservative and non-conservative systems, forced oscillations of systems, continuous systems and travelling waves. Perturbation methods – such as straightforward expansion, Lindstedt-Poincaré method, method of multiple scales, method of harmonic balance, method of averaging – and basic numerical methods.

Examination

- TEN1 - Tentamen, 6,0 hp, betygsskala: A, B, C, D, E, FX, F

Examinator beslutar, baserat på rekommendation från KTH:s handläggare av stöd till studenter med funktionsnedsättning, om eventuell anpassad examination för studenter med dokumenterad, varaktig funktionsnedsättning.

Examinator får medge annan examinationsform vid omexamination av enstaka studenter.

När kurs inte längre ges har student möjlighet att examineras under ytterligare två läsår.

Övriga krav för slutbetyg

Written home assignments (TEN1; 6 university credits).

Etiskt förhållningssätt

- Vid grupparbete har alla i gruppen ansvar för gruppens arbete.
- Vid examination ska varje student ärligt redovisa hjälp som erhållits och källor som använts.
- Vid muntlig examination ska varje student kunna redogöra för hela uppgiften och hela lösningen.