

## NOTES.

UNIVERSITY OF BERLIN. The mathematical courses announced for the summer semester are the following:—By Professor BAUSCHINGER: Celestial mechanics, modern theories.—By Professor VON BEZOLD: Theoretical meteorology (thermodynamics of the atmosphere); meteorological colloquium; Exercises in the meteorological institute, daily.—By Professor FROBENIUS: Theory of numbers, second part; Theory of determinants.—By Professor FUCHS: On the elements of the theory of functions; Introduction to the theory of differential equations.—By Professor HELMERT: On geometrical methods of determining the figure of the earth; Measurement of altitude.—By Professor SCHWARZ: Synthetic geometry; Elementary geometrical derivation of the most important properties of the conic sections; Applications of the elliptic functions; Mathematical colloquium, twice weekly.—By Professor PLANCK: Mechanics of solid and fluid bodies; Mathematical physical exercises in connection with the lectures.—By Professor HENSEL: Differential equations; Selected chapters in the theory of the Abelian integrals and the Abelian functions.—By Professor HETTNER: On Fourier's series and integrals.—By Professor KNOBLAUCH: Analytical geometry; Integral calculus; Theory of space curves.—By Professor LEHMANN-FILHÉS: Potential and sphere functions; Theory of the hypergeometric series.—By Dr. GLAN: Quaternions; Elements of theoretical physics; Theory of light.—By Dr. HOPPE: Integral calculus; Analytical mechanics.—By Dr. KRIGAR-MENZEL: Graphical representation of physical phenomena.

UNIVERSITY OF GÖTTINGEN. The mathematical courses announced for the summer semester are the following:—By Professor KLEIN: Theoretical mechanics, second part (Mechanics of systems); Mathematical seminar (together with Hilbert); Elementary exercises in mechanics.—By Professor HILBERT: Introduction to the theory of differential equations; Definite integrals and Fourier's series; Selected chapters in the theory of numbers; Seminar: Lectures by members on the differential equations of mechanics (together with Klein).—By Professor SCHÖNFLIES: Analytical geometry; Doctrine of assemblages; Proseminar: Mathematical exercises.—By Dr. BOHLMANN: Differential equations; Mathematical exercises in the seminar for the theory of insurance.

UNIVERSITY OF LEIPZIG. The mathematical courses announced for the summer semester are the following:—By Professor SCHEIBNER: Introduction to the theory of the elliptic functions.—By Professor NEUMANN: Analytical mechanics, second part; Mathematical seminar.—By Professor LIE: Application of the differential and integral calculus to geometry; Introduction to the theory of differential invariants; On the theory of groups and its application to other disciplines.—By Professor MAYER: Calculus of variations; Introduction to algebra and the theory of determinants; Exercises in the calculus of variations.—By Professor ENGEL: Theory of functions according to Weierstrass; Mathematical seminar.—By Dr. HAUSDORFF: Analytical geometry for beginners; Elements of the mathematics of insurance, with practical exercises; Chronology and the construction of calendars.—By Dr. KNOBLAUCH: Fundamental principles of mathematical chemistry.

UNIVERSITY OF MUNICH. The mathematical courses announced for the summer semester are the following:—By Professor BAUER: Analytical geometry of space; Mathematical seminar.—By Professor LINDEMANN: Integral calculus, with exercises; Theory of substitutions and of algebraic equations; On the applications of the Hamiltonian principle; Mathematical seminar.—By Professor SEELIGER: Celestial mechanics, second part; The Jacobi-Hamiltonian perturbation formulæ.—By Professor PRINGSHEIM: Elliptic functions; Selected chapters in the theory of functions.—By Professor GRAETZ: Introduction to theoretical physics; Electromagnetic theory of light.—By Dr. BRUNN: Elements of higher mathematics for students of all departments.—By Dr. DÖHLEMANN: Descriptive geometry, second part, (axonometry, perspective); Exercises in descriptive geometry; Modern synthetic geometry, second part; Exercises in modern geometry.—By Dr. VON WEBER: Determinants with applications; Introduction to the theory of partial and total differential equations.—By Dr. KORN: Analytical mechanics; D'Alembert and Lagrange; Introduction to original research in the field of theoretical physics.

COLUMBIA UNIVERSITY. During the academic year 1898–99 the following advanced courses will be given by the department of mathematics, each course occupying three hours a week throughout the year:—By Professor FISKE: Advanced calculus; Theory of Abelian functions.—By Professor COLE: Riemann's theory of functions including elliptic functions; Theory of linear transformations and the

higher theory of equations.—By Mr. MACLAY: Differential equations.—By Mr. KEYSER: Higher plane curves.—By Dr. CHITTENDEN: Advanced analytical geometry.

THE UNIVERSITY OF CHICAGO. During the four quarters (*su*, *a*, *w*, *sp*) of the year July, 1898—June, 1899, the following advanced mathematical courses (four or five hours weekly) will be offered:—By Professor MOORE: Seminar devoted to research work, especially in groups, algebra, and arithmetic (*w*, *sp*); Transfinite totalities (*a*); Elliptic modular functions (*sp*); Abstract groups (*w*); Projective geometry (*a*).—By Professor BOLZA: Elliptic functions (*a*); Hyperelliptic functions (*w*); Advanced integral calculus (*a*, *w*).—By Associate Professor MASCHKE: Seminar devoted to research work, especially in linear homogeneous substitution groups (*sp*); Theory of invariants (*su*); Functions of a complex variable (*su*) (*w*); Modern analytic geometry (*w*); Higher plane curves (*sp*).—By Assistant Professor YOUNG: Mathematical Pedagogy ( $\frac{1}{2}su$ ); Theory of equations (*a*, *w*).—By Dr. BOYD: Differential equations and applications (*sp*).—By Dr. HANCOCK: Calculus of variations (*su*); Theory of equations (*su*).—By Dr. SLAUGHT: Advanced integral calculus (*su*); Solid analytics (*sp*).—By Dr. LAVES: Analytical mechanics (*a*, *w*, *sp*).—By Dr. MILLER (of Cornell University): Seminar in permutation groups ( $\frac{1}{2}su$ ).

The Mathematical Club, with fortnightly meetings, is under the direction of the departmental faculty.

HARVARD UNIVERSITY. The following advanced mathematical courses are offered for the year 1898-99:—By Professor J. M. PEIRCE: Algebraic plane curves; Quaternions (second course).—By Professor BYERLY: Differential and integral calculus (second course); Dynamics of a rigid body.—By Professors BYERLY and B. O. PEIRCE: Fourier's series, spherical harmonics, potential function.—By Professor B. O. PEIRCE: Theory of surfaces.†—By Professor OSGOOD: Infinite series and products†; Galois's theory of equations†; Riemann's theory of functions (to follow the elementary course in the theory of functions).—By Professor BÔCHER: Theory of equations and invariants.† Theory of functions (first course); Theory of numbers.†—By Dr. BOUTON: Modern methods in geometry; Lie's theories as applied to differential equations.

These courses will each involve three lectures a week throughout the entire academic year except those marked † which involve about half this number of lectures. The

following courses of reading and research are also offered:—By Professor J. M. PEIRCE: Elliott, Algebra of quantities.—By Professor BYERLY: Picard, *Traité d'analyse*, Vol. I.—By Professor OSGOOD: The icosahedron and the elliptic modular functions.—By Professor BÔCHER: Euclid and the hypotheses of geometry.

A mathematical conference will meet twice a month.

The more elementary subjects taught will be the same as in recent years (see BULLETIN for May, 1896).

A good deal of work of a character largely mathematical is also given under the headings *Astronomy*, *Physics*, and *Engineering*.

MR. R. T. GLAZEBROOK, F.R.S., has resigned his position as lecturer in applied mathematics at Cambridge University.

PROFESSOR J. M. SCHAEERLE, astronomer at the Lick Observatory, has resigned his position.

PROFESSOR GEORGE H. DARWIN has been elected a foreign honorary member of the American Academy of Arts and Sciences as successor to the late Professor J. J. Sylvester.

PROFESSOR E. O. KENDALL has presented his mathematical library of about one thousand volumes to the University of Pennsylvania.

THE degree of LL.D. has been conferred by the University of Aberdeen on DR. CHARLES CHREE, superintendent of Kew Observatory.

PROFESSOR HERMANN SCHAPIRA, professor of mathematics at the University of Heidelberg, died at Cologne, May 9th, at the age of 57 years.

A CONSIDERABLE number of mathematical books belonging to the library of the late Professor J. E. OLIVER of Cornell University are offered for sale. A printed price list may be obtained from Mrs. Oliver, Ithaca, N. Y.